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From the Editor

We are pleased to present the August issue of the Turkish Journal of Public Health. This issue covers a variety of public health topics, offering insights into life expectancy predictors, rational antibiotic use, reproductive health in crisis, mental health responses to disasters, community-based interventions, and more.

In a longitudinal study on life expectancy in Türkiye, offer critical guidance for policymakers aiming to enhance life expectancy through strategic resource allocation and public health interventions. Another research article investigates the knowledge and attitudes of health sciences students regarding rational antibiotic use. In an era where antibiotic resistance is a growing global concern, this research sheds light on the gaps in awareness and behavior among future healthcare professionals. The findings underlined the importance of targeted educational interventions to foster responsible antibiotic practices. Following research article highlights the challenges faced by Syrian women in accessing reproductive health services in Türkiye. By examining the effectiveness of services provided through the Minimum Initial Service Package approach, this study provides valuable evidence for improving healthcare delivery for refugees. Mental health, a critical aspect of public health, is explored in the context of the devastating earthquakes in Türkiye. The study on peritraumatic dissociation emphasizes the role of social support and mental health interventions in mitigating long-term psychological impacts, offering possible action methods for disaster recovery efforts. Community health is further explored through an innovative peer-supported weight loss intervention among women. This study contributes to the growing body of evidence supporting community-based health initiatives, highlighting the potential of peer-led programs to drive meaningful health outcomes in populations at risk for obesity and related conditions. Another article in this issue addresses the critical need for food safety, with a study on the detection of residues and additives in meat products in Bosnia and Herzegovina. The findings call for strengthened regulatory frameworks and continuous monitoring to protect public health. Finally, the impact of the COVID-19 pandemic on life expectancy and disparity in Türkiye is analyzed, revealing the pandemic's profound effects on public health and the urgent need for targeted interventions to address these disparities. In review article and letters to the editor, authors explore the application of the RE-AIM framework in public health research, vaccine hesitancy and the ethical challenges faced by healthcare professionals in conflict zones. These contributions reflect the public health specialists' engagement on how to navigate complex ethical, political, and social issues.

We would like to thank the authors and the referees for their contributions. We hope you enjoy reading this issue and the articles will inspire continued efforts to address the diverse public health challenges we face.

Yucel Demiral

Editor in Chief

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ORIGINAL ARTICLE

Predictors of life expectancy at birth in Türkiye: A longitudinal study

Doğancan Çavmak [1], Fatma Banu Beyaz Sipahi[1], Sait Söyler[1]

[1]PhD, Tarsus University, Department of Health Management, Faculty of Applied Sciences, Mersin, Türkiye

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Abstract

Objective: The aim of this study is to examine the impact of social, behavioral, economic, and healthcare system-related factors on life expectancy at birth in Türkiye.

Methods: Enrollment rate in tertiary education, tobacco consumption gram per capita, out-of-pocket payments (OOPHE), and Gross Domestic Product (GDP) per capita were included as predictors. The data were obtained from the database of the Organisation for Economic Co-Operation and Development (OECD), World Bank, and Health Statistics Yearbooks published by the Ministry of the Health in Türkiye for 2000-2019. Johansen Cointegration test was used to define the existence of the long-run statistical relationship between life expectancy at birth and the predictors.

Results: Enrollment rate in tertiary education, GDP per capita, and out-of-pocket payments are positively associated with life expectancy, while tobacco consumption gram per capita has a negative association. It has been concluded that short-term deviations from the equilibrium, using an error correction model, will reach long-term equilibrium approximately one year later. Granger causality test and the estimation result revealed that enrollment rate in tertiary education, tobacco consumption, out-of-pocket health expenditure, and GDP per capita are the short-term and long-term determinants of life expectancy at birth.

Conclusion: This study provides important evidence for policymakers to allocate resources to the social, behavioral, healthcare-related, and economic determinants of health status to increase life expectancy. In addition, the determination of out-of-pocket payments have a positive relationship with life expectancy gives a clue about the need to make more efforts regarding the economic accessibility of healthcare services in the Turkish health system.

Keywords: Life Expectancy, Health Economics, Health Management, Johansen Cointegration Analysis

Correspondence: PhD, Sait Söyler, Tarsus University, Department of Health Management, Faculty of Applied Sciences, Mersin, Türkiye. **E-mail:** saitsoyler@tarsus.edu.tr, **Phone**: +90 531 952 4916

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INTRODUCTION

People naturally seek to be healthy and live longer. Historically, people have made an intense effort to improve their health. In order to improve health, it is necessary to understand the factors that affect health status.[1,2] There are many factors that affect the state of being healthy. These factors, which are expressed as determinants of health, have been discussed in a wide framework. Blum (1974) provided a basic framework for this issue and proposed the determinants of the health model. According to this model, the factors that affect health status are basically genetics, environment, behaviors, and health services. These factors are surrounded by population, cultural system, mental health, ecological balance, and natural resources.[3] In the Dahlgren-Whitehead model, which was later defined as the "rainbow model" and proposed in 1991, environmental conditions are emphasized more as determinants of health.[4] More recently, Exworthy (2008) categorized the determinants of health as social, economic, healthcare services accessibility, and behavioral factors.[5] Today, in addition to the factors in these models, the social determinants of health are defined by the World Health Organization (WHO) as "non-medical factors that affect health". These factors consist of the conditions in which people are born, grow, work, live, and age.[6] Studies in the literature have provided evidence that social factors, along with other factors, are among the strong determinants of health. It has been determined that social factors, including socioeconomic factors, have a significant impact on many health outcomes in different settings and populations.[7]

Examining and investing in these factors, known as "determinants of health", is extremely important in terms of health promotion. In a study, it was determined that Gross Domestic Product (GDP), unemployment, nitrogen oxide per capita, tobacco consumption, sugar consumption, oil consumption, and the number of physicians per thousand people, which are among the determinants of health, are associated with life expectancy at birth, while GDP and alcohol use are associated with mortality.[1] Gisselmann (2005) found that low maternal education level is associated with low birth weight and infant mortality.[8] Jeong et al. (2007) suggested that healthy lifestyle behaviors are important in improving health outcomes.[9] Nixon and Ulmann (2006) concluded that health expenditures were related to health outcomes.[10] Owusu et al. (2021) stated that health expenditures in low- and middle-income countries would potentially reduce maternal and infant mortality.[11] Ali and Bibi (2017) determined that women's education, family planning and health services, and access to food have an impact on the survival rate under the age of five.[12]

Ho and Hendi (2018) suggested life expectancy at birth as "the most important indicator of a country's well-being".[13] Life expectancy at birth is defined as the average number of years a person would still live at birth. It is stated that it is an important indicator for evaluating the economic and social development of a country or region.[14] The average life expectancy in a country is under the influence of various economic, social, and environmental factors in that country.[15] In a study of 15 European countries, it has been determined that education level and life expectancy are related. On the other hand, smoking, low income, and high body weight

are associated with lower life expectancy.[16] In a study conducted in Türkiye, it was revealed that general education level, purchasing power, and economic development have an effect on life expectancy.[2] Bagus Wirayuda et al. (2022) concluded that sociodemographic, macroeconomic, and health factors affect life expectancy.[17]

Considering that the health services sector is growing rapidly and the costs related to health and insurance are increasing, examining the determinants of life expectancy for countries emerges as a very important issue.[15] Examining these determinants can provide policymakers with the necessary evidence for optimal resource allocation for optimal health outcomes. Therefore, this study attempted to examine the impact of enrollment in tertiary education as a social determinant, tobacco consumption gram per capita as a behavioral determinant, out-of-pocket payments as a healthcare services accessibility determinant, and GDP per capita as an economic determinant on life expectancy at birth.

METHODS

Data

The dependent variable is defined as the life expectancy at birth in this study. The determinants of life expectancy were examined in four main categories based on the model of social determinants of health which was formed by Exworthy in 2008.[5] These are social, economic, healthcare services accessibility, and behavioral factors.

In social factors, the enrollment rate in tertiary education was chosen to be included in the model. In Türkiye, compulsory education is for 12 years including primary and secondary education. That is why the effect of higher education was examined in this mode. To evaluate the effect of economic conditions, gross domestic product (GDP) per capita was chosen. Healthcare services-related factors were considered in terms of health financing policies. WHO has been highlighting the importance of financing, especially universal health coverage, in accessibility to healthcare for a very long time.[18] Many studies have used health expenditure as a percentage of GDP, health expenditure per capita, or public health expenditure and reported significant results.[19-21] However, to consider financial accessibility, in this study, out-of-pocket health expenditure was included in the model. Because, in universal health coverage, it provides clearer evidence on financial accessibility. Finally, to include the effect of behavioral factors, tobacco consumption gram per capita was chosen.

The data were obtained from the database of the Organisation for Economic Co-Operation and Development (OECD), World Bank, and Health Statistics Yearbooks published by the Ministry of the Health in Türkiye for 2000-2019.

Descriptive statistics of the model are summarized in Table 1.

Table 1. Descriptive statistics of the variables (2000-2019, Türkiye)

	LE	GDP	HE	OOPHE	TC
Mean	75.080	2.063	29.620	18.685	1367.765
Median	74.200	1.990	31.740	17.350	1330.950
Maximum	78.600	5.730	45.640	28.600	1817.000
Minimum	71.100	-3.270	12.560	14.100	1021.000
Std. Dev.	2.700	2.063	11.934	3.479	280.310
Skewness	0.095	-0.487	-0.155	1.284	0.159
Kurtosis	1.404	3.629	1.421	4.318	1.405
Observations	20	20	20	20	20

Accordingly, the mean of life expectancy (LE) at birth was 75.08 years, and the minimum

and maximum values during the period 2000-2019 were 71.10 and 78.60 years, respectively. Additionally, the mean of GDP per capita was 2.063 dollars. The means of enrollment rate in tertiary education (HE) and share of out-of-pocket health expenditure (OOPHE) in total health expenditure and tobacco consumption gram per capita (TC) were 29.620, 18.685, 1367,765 respectively.

Model specification

In this study, the effects of socioeconomic and health-related factors on life expectancy in Turkey were analyzed. The sample size and power calculations for the study were conducted using a two-sample t-test. The assumptions for the analysis are as follows:

The difference in life expectancy between the two groups is 5 years (delta = 5). This effect size has been calculated within the framework of values recommended by Cohen (1988),[22] thus it is considered practically significant. The standard deviation for both groups is set at 10 (sd = 10). The analysis was performed with a Type I error rate (alpha) of 0.05 and a power level of 0.80. The power analysis determined that a sample size of 64 per group is recommended. This results in a total of 128 participants. This sample size is considered sufficient to achieve statistically significant results by controlling for the determined effect size and error level. All statistical analyses conducted in this study were performed using EViews 13 software.

In order to employ the cointegration and causality test, it is compulsory to examine the unit root test on the time series macro-variables in our sample. This is because most macroeconomic time series have unit roots and estimates with non-stationary series often cause spurious regression results. In literature, the common unite root tests in order the check the stationary or non-stationary are Augmented Dickey-Fuller (ADF), Phillips Perron (PP), Kwiatkowski–Phillips–Schmidt–Shin (KPSS), and Ziwot Andrews tests. So for this study, The Phillip-Perron unit root test is adopted for this purpose. Augmented Dickey-Fuller, and Phillips Perron tests were employed to check stationarity in the series, respectively.

In this study, Johansen Cointegration test was used as the methodology to define the existence of the long-run statistical relationship between health status (life expectancy at birth) and its socioeconomic factors (enrollment rate in tertiary education), behavioral factors (tobacco consumption grams per capita), economic indicator (GDP per capita growth –annual %) and healthcare services factors (out-of-pocket health expenditure in total health expenditure) for Türkiye between 2000-2019. The method involves cointegration and the estimation of the Vector Error Correction Model (VECM) in order to define the time series behavior. Cointegration between first-order integrated series by Engle and Granger (1987), who investigated the relationship, revealed the one-way cointegration relationship. Johansen and Juselius's (1990) approach, which brings a multi-equation approach and allows more than one cointegration relationship to be revealed, defines a cointegration relationship as a vector.[23] In order to test the long-term equilibrium relationship between the series with cointegration analysis, the most important issue to be considered is that the series should be integrated at the same degree.[24] The Johansen cointegration approach consists of two parts. Firstly,

whether the series is stationary or not is examined using the unit root test. Secondly, the lag length criteria will be determined to perform the Johansen cointegration Test.

The Linear Model was specified as below:

$$LE=\alpha_0+\alpha_1 GDP+ \alpha_2 OOPHE+ \alpha_3 HE+ \alpha_4 TC+u_t \quad (1)$$

Equation 1 was estimated using life expectancy as a dependent variable.

Where, health status: life expectancy at birth-LE, socioeconomic factors: enrollment rate in tertiary education-HE, behavioral factors: tobacco consumption grams per capita -TC, healthcare services factors: share of out-of-pocket health expenditure in total health expenditure - OOPHE and economic indicator (GDP per capita growth –annual %)- GDP.

Before proceeding to the cointegration test, the Vector Error Correction Model (VECM) was estimated for the variables used in the model. Among the models that demonstrated a cointegration relationship between the series, lacked autocorrelation or heteroscedasticity issues, and had normally distributed residuals, the model with the lowest AIC and SIC values was selected.

In the current study, the Johansen Cointegration test has been used to define the long-term statistical relationships between the series. The results of the cointegration test have laid the groundwork for the application of the Vector Error Correction Model (VECM) and Granger causality test. The results of all these analyses are presented below in order.

RESULTS

In this section, summaries of the tests and analyses conducted, and the findings obtained are explained in detail. It begins with the results of the unit root tests.

Table 2. Unit Root Test Results

	ADF				PP			
	Level		1* Difference		Level		1* Difference	
Series	Constant	Trend	Constant	Trend	Constant	Trend	Constant	Trend
LE	-0.807	-2.16	-4.29***	-4.17**	-0.78	-2.15	-4.29***	-4.17**
GDP	-3.93	-4.55	-6.51***	-6.30***	-3.92	-4.54	-14.20***	-13.68***
HE	-0.91	-0.90	-3.56**	-3.63**	-0.91	-1.07	-3.55**	-3.62**
OOPHE	-2.92	-3.068	-3.53**	-3.31*	-2.48	-3.18	-3.90***	-3.43*
TC	-1.61	-2.30	-2.86*	-3.27**	-1.55	-0.61	-2.81*	-3.37**

* Stationary at the 10 per cent level. ** Stationary at the 5 per cent level.*** Stationary at the 1 per cent level

The findings of the ADF and PP tests results in Table 2 showed that life expectancy at birth, GDP per capita, out-of-pocket health expenditure, enrollment rate in tertiary education, and tobacco consumption are not stationary at level. On the other hand, after taking the first differences of the series, they became stationary providing that all the variables used in the model are integrated order (1). Maximum lag length in unit root analysis is determined according to the SIC information criterion.

It has been determined that there is a cointegration relationship between the series in the estimated VECM model, there is no autocorrelation problem[1], no heteroscedasticity[2], and the residues are

1. LM test results for model 1: Lag (1) prob: 0.941>0.01; Lag (2) prob: 0.372>0.01
2. Heteroskedasticity for model (1) ki-kare prob: 0.465>0.01
3. Jarque-Bera test for model (1) prob: 0.315>0.01

normally distributed[3]. However, Johansen (1988) recommends a trace test and maximum eigenvalue test to determine the number of cointegration vectors.[25] It emphasizes that these calculated test statistics should be compared with the critical values obtained. From this point of view, it is determined whether the variables are cointegrated (long-term) by comparing the statistical values calculated with the critical values.[26] The results of the cointegration test are shown in Table 3.

Table 3. Johansen Cointegration Test

		Model 1		
Hypotheses	**Eigen Value**	**Trace Statistic**	**Critical Value**	**Prob**
	0.95***	101.84	69.82	0.00
	0.73**	49.09	47.86	0.04
	0.63	25.79	29.80	0.14
	0.26	7.95	15.49	0.47
	0.14	2.65	3.84	0.10
Hypotheses	**Eigen Value**	**Max-Eigen Statistic**	**Critical Value**	**Prob**
	0.95	52.75	33.88	0.00
	0.73	23.30	27.58	0.16
	0.63	17.83	21.13	0.14
	0.26	5.31	14.26	0.70
Ho:r≤5	0.14	2.65	3.84	0.10

***denotes 0.01 significance level; **denotes 0.05 significance level; *denotes 0.10 significance level.

Model 1 showed that trace tests, and max eigen statistic 2 and 1 cointegrating equation at 1 and 5 percent significance level, respectively. Therefore, it can be said that the variables affect each other in the long run. Within the framework of these basic criteria, the VEC (1) model, which was estimated with the help of model 3 proposed by Johansen, was estimated as the most appropriate model. Finding the cointegration relationship shows that the short-term deviation tendencies of the variables from equilibrium can be handled within the framework of the vector error correction model.

Table 4. VECM Prediction Results

Model 1	
Lon Term Equation	
Constant	**75.807**
GDP(-1)	**0.212 (-7.25)*** **
HE(-1)	0.129 (-10.55)***
OOPHE (-1)	0.073 (-3.98)***
TC(-1)	**-0.005 (8.851)*** **
Short Term Equation	
$VECT_t$	**-1.104 (-3.108)*** **

***denotes 0.01 significance level; **denotes 0.05 significance level; *denotes 0.10 significance level.

The estimation of long and short term results of the model in which life expectancy is the dependent variable and the other variables in models are independent are given in Table 5. As seen in this table, the error correction coefficients of the model are negative and statistically significant. This indicates that the

error correction mechanism is functioning for the equation. The imbalance that occurs in one period is corrected in the next period. The long-term relationship is consistent in the model established in the relevant period. In the long run, when there is a deviation from the equilibrium, it means that it will return to balance again. Short-term life expectancy fluctuations (1/1.104) can be corrected in less than 1 year and reach long-term equilibrium again.

Long run equation model 1

$$Le=75.807+0.129\ HE+0.212GDP+0.073OOPHE-0.005TC \quad (2)$$

Table 4 and equations 2 show that one-unit increase in GDP per capita growth and out-of-pocket health expenditure in total health expenditure in the long run, increases life expectancy at birth by 0.212 and 0.073 respectively. The long-run effect of enrollment rate in tertiary education is positive and significant on life expectancy at birth. The long-run effect of tobacco consumption is negative on life expectancy at birth. Finally, the long- and short-term causality relationships between the series regarding the model estimation results of Granger block exogeneity are shown in Table 5.

Table 5. Long and Short Term Causality Analysis

Equations	Short Term (Chi Square Analyze)	Long Term (Chi Square Analyze)
	14.204*** (prob:0.0067)	-3.108***
D(GDP)	12.600*** (prob:0.0004)	
D(HE)	3.052* (prob:0.0806)	
D(OOPHE)	0.018 (prob:0.8931)	
D(TC)	3.730** (prob:0067)	

***denotes 0.01 significance level; **denotes 0.05 significance level; *denotes 0.10 significance level.

Following the cointegration test, a causal relationship between life expectancy and its determinants was examined using the block exogeneity Wald test based on VECM. In the short term, enrollment rate in tertiary education, tobacco consumption, out-of-pocket health expenditure, and GDP per capita were found to have a causal effect on life expectancy at birth. These variables on life expectancy are the cause in the long run and the short run. Accordingly, the findings have pointed out that there is a causal relationship between life expectancy and GDP per capita with a probability of 0.0004 at 1% significance. On the other hand, out-of-pocket health expenditure is found to have no causal effect on life expectancy at birth at 0.01, 0.05, or 0.10 significance levels.

DISCUSSION

For decades, many researchers have focused on quantifying the contribution of different factors to health status. This effort is simply related to the motivation of determining areas in which resources must be allocated to improve health status indicators.[27] The WHO Global Commission on Social Determinants of Health (SDH) has also addressed the social factors as leading determinants of health status.[28] This study aimed to investigate the relationship between health status and its determinants in Türkiye. Results showed that enrollment rate in tertiary education, GDP per capita, and out-of-pocket payments are positively associated with life expectancy, while tobacco consumption gram per capita has a negative association. The factor with the highest effect was GDP per capita which is followed by higher education, OOP, and tobacco consumption. All variables have explained the 65% of variance in life expectancy. These

findings support the idea that socio-economic factors are important determinants of health status in Türkiye.

Health status and its determinants were also measured by many papers in the literature using different indicators. The finding of positive effects of GDP per capita, and education on life expectancy in the current study is similar to previous studies in the literature. A study conducted on 28 European Union countries which is identical to our study found that GDP per capita and attained education level were significant predictors of life expectancy.[14] The findings of the current study are also parallel to an extensive panel data analysis of OECD countries which had life expectancy at birth, adjusted mortality, infant mortality, and potential years of life lost as dependent variables (health status) while 19 factors related to socio-economic, physical environmental, health behavior and health services were included as determinants. The results verified that life expectancy was significantly related to determinants such as income, employment, tobacco and alcohol consumption, and the number of doctors.[1] The finding of the current study on the negative association between life expectancy and tobacco consumption has been also verified in this study. A study conducted in Spain has reported a unidirectional and positive causal relationship between per capita income, rate of hospital beds, medical staff-nurses, and life expectancy.[29] A study conducted in Iran is identical to the findings of the previous finding as it shows significant positive effects of GDP per capita, number of doctors, and urbanization. Also, the finding on the importance of literacy in predicting life expectancy in the mentioned study was also supported by the verified positive effect of education on life expectancy in the current study.[30] A study focused on the Asia/Pacific area has used GDP per capita, health expenditure per capita, unemployment rate, and exchange rate as predictors in the model. Some results of the study contradicted to many other studies in the literature and the current study as it has shown a negative relationship between health expenditure and life expectancy.[31] Some studies also provided significant contributions to this topic in Türkiye. A study used many factors' effects on life expectancy such as health expenditures, food availability, smoking, etc.[15] Şentürk and Ali (2021) reported significant effects of education, fertility rates, purchasing power, and environmental degradation on gender-specific life expectancy in Türkiye.[2] These findings are identical to the findings of the current study, considering the positive effect of education and purchasing power on life expectancy. Gulcan (2020) also investigated the determinants of life expectancy in Türkiye and used GDP per capita, CO2 emission, and urbanization as predictors.[35] However, the results showed a long run relationship only between urbanization and life expectancy which contradicts the current findings.

The finding of the positive causal relationship between out-of-pocket health expenditure and life expectancy requires more attention because it is a distinctive and controversial issue in the health systems. There are also some other studies which examined the association between out-of-pocket health expenditure and life expectancy. Some of these studies reported contradicting findings while some were identical to the current study. Ranabhat et al. (2018) reported a negative relationship between out-of-pocket payments[32] while Roffia et al. (2022) found

the same as in the current study that OOP payment was positively associated with life expectancy.[33] Owumi and Eboh (2022) also found that increasing out-of-pocket health expenditure can lead to an enhancement in life expectancy supporting the current study's findings.[34] Considering its significant effect, it can be inferred that out-of-pocket payments are still a prominent way of accessing needed healthcare services. The share of out-of-pocket health expenditure in the model gives a hint about financial accessibility to healthcare services which seems to be still a prominent issue in the Turkish healthcare system. Out-of-pocket payments seem to be an enabler for some people in order to obtain proper medical services. This may be a booster of general health status. However, it can also be a barrier to some people who need medical services.

CONCLUSION

Considering the positive effect of socio-economic factors such as education and income, this study acclaims that investing in the areas which can improve employment rates, purchasing power, food and accommodation availability, education, etc. can enhance the health status of the population. Tobacco consumption was negatively associated with life expectancy. Campaigns towards cigarette cessation can still be beneficial to improve life expectancy in Türkiye. The positive effect of OOP payments can be caused by the people who get proper medical services by paying out-of-pocket. This can be considered a challenge in the health system. Increasing out-of-pocket payments may at some point limit individuals' access to health services and cause inequalities in access. Considering that the positive association found in the present study may be due to some confounding factors, it is recommended that future studies re-examine the effect of this variable on life expectancy. Therefore, policies to reduce out-of-pocket payments while enhancing financial accessibility to healthcare services should be considered. However, there is still a need for further research to discover the causes of this finding.

The study contributes to the literature by providing information on different predictors of life expectancy, especially the effect of out-of-pocket expenditures in Türkiye. The study has several strengths. The selected determinants were from four major factor groups as social, economic, behavioral, and health services. This holistic perspective enabled the researchers to compare the different effects of the determinants. Second, taking the OOP into consideration as a variable related to financial access level to healthcare is kind of an innovative way. There are limited studies exploring the causality between these payments and life expectancy. The finding of the positive effect of OOP may be a special topic for further studies to be more deeply explored. Lastly, the study covered the data of the last two decades. Data for twenty years is an important factor in terms of the strength of the causality.

This study is also not without limitations. The study used life expectancy as the indicator of health status. Many other indicators such as infant and maternal mortality rates may be considered as health status indicators. One of the constraints related to this limitation was the availability of reliable data. Lack of data and multicollinearity also for many other variables for the analysis horizon deterred the authors from including many possible

explanatory variables in the model. Future studies may consider adding a wider array of variables on social, economic, behavioral, and healthcare services related factors to determine their effects on health status in Türkiye.

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REFERENCES

1. Park MB, Nam EW. National level social determinants of health and outcomes: Longitudinal analysis of 27 industrialized countries. SAGE Open 2019:9.
2. Şentürk İ, Ali A. Socioeconomic Determinants of gender-specific life expectancy in Turkey: A time series analysis. Sosyoekonomi. 2021;29:85-111.
3. Blum HL. Planning for Health: Development and Application of Social Change Theory. New York: Human Sciences Press, 1974.
4. Dahlgren G, Whitehead M. Policies and Strategies to Promote Social Equity in Health. Stockholm, Sweden: Institute for Futures Studies, 1991.
5. Exworthy M. Policy to tackle the social determinants of health: using conceptual models to understand the policy process. Health Policy Plann. 2008;23:318-327.
6. World Health Organization (WHO). Social determinants of health [Online]. Available at: https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1. Accessed December 15, 2022.
7. Braveman P, Gottlieb L . The social determinants of health: it's time to consider the causes of the causes. PHR. 2014;129:19-31.
8. Gisselmann MD. Education, infant mortality, and low birth weight in Sweden 1973 1990: emergence of the low birth weight paradox. Scand J Public Health. 2005;33:65–71.
9. Jeong AS, Lee KS, Shin HS. The determinants of health outcome between two health care financing systems. Korean J Health Policy Adm. 2007;17:31-53.
10. Nixon J, Ulmann P. The relationship between health care expenditure and health outcomes. Evidence and caveats for a causal link. Eur J Health Econ. 2006;7:7–18.
11. Owusu PA, Sarkodie SA, Pedersen PA. Relationship between mortality and health care expenditure: Sustainable assessment of health care system. Plos One. 2021;16(2).
12. Ali A, C Bibi. Determinants of social progress and its scenarios under the role of macroeconomic instability: Empirics from Pakistan. PESR. 2017;55:505-40.
13. Ho J, Hendi A. Recent trends in life expectancy across high income countries. Brith Med J. 2018; 362:k2562.
14. Bilas V, Franc S, Bošnjak M. Determinant factors of life expectancy at birth in the European Union countries. Coll Antropol. 2014;38:1-9.
15. Halicioglu F. Modeling life expectancy in Turkey. Econ Model. 2011;28:2075-82.
16. Mackenbach JP, Valverde JR et al. Determinants of inequalities in life expectancy: an international comparative study of eight risk factors. The Lancet Public Health. 2019;4(10):e529-37.
17. Wirayuda AAB, Jaju S, Alsaidi Y, Chan MF. A structural equation model to explore sociodemographic, macroeconomic, and health factors affecting life expectancy in Oman. Pan Afr Med J. 2022; 41(75).
18. World Health Organization (WHO). Universal health coverage [Online]. Available at: https://www.who.int/health-topics/universal-health-coverage#tab=tab_1. Accessed December 15, 2022.
19. Miladinov G. Socioeconomic development and life expectancy relationship: evidence from the EU accession candidate countries. Genus. 2020;76:1-20.
20. Duque AM, Peixoto MV, Lima SV, et al. Analysis of the relationship between life expectancy and social determinants in a north-eastern region of Brazil, 2010-2017. Geospat Health. 2018; 13;702:345-52.
21. Bayati M, Akbarian R, Kavosi, Z. Determinants of life expectancy in eastern mediterranean region: a health production function. International Journal of Health Policy and Management. 2013;1(1): 57-61.

22. Cohen J. Statistical power analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ: Erlbaum, 1988.

23. Mert M, Çağlar AE. Eviews ve Gauss Uygulamalı Zaman Serileri Analizi. Ankara: Detay Publication. 2019.

24. Thomas RL. Modern econometrics, Second Edition, Harlow: Addison Wesley Longman, Inc. 2000.

25. Johansen S. Statistical Analysis of Cointegration Vectors. Journal Econ Dyns Control. 1988;12:231-254.

26. Taban S, Kar M. Beşerî sermaye ve ekonomik büyüme: nedensellik analizi. Sosyal Bilimler Dergisi. 2006; 6:159-82.

27. Figueroa JF, Frakt AB, Jha AK. Addressing social determinants of health: time for a polysocial risk score. Jama. 2020;323:1553-54.

28. World Health Organization (WHO). Commission on Social Determinants of Health [Online]. Available at: https://www.who.int/initiatives/action-on-the-social-determinants-of-health-for-advancing-equity/world-report-on-social-determinants-of-health-equity/commission-on-social-determinants-of-health#:~:text=The%20Commission%20on%20Social%20Determinants,ill%20health%20and%20health%20inequities. Accessed December 20, 2022.

29. Martín Cervantes PA, Rueda López N, Cruz Rambaud S. A causal analysis of life expectancy at birth. Evidence from Spain. Int J Environ Res Public Health. 2019;16(3):1-14.

30. Delavari S, Zandian H, Rezaei S, et al. Life expectancy and its socioeconomic determinants in Iran. Electron Physician. 2016;8(10):3062-68.

31. Blazquez-Fernández C. Cantarero-Prieto D, Pascual-Saez M. Health expenditure and socio-economic determinants of life expectancy in the OECD Asia/Pacific area countries. Applied Economics Letters. 2,17;24(3):167-169.

32. Ranabhat CL, Atkinson J, Park MB, et al. The influence of universal health coverage on life expectancy at birth (LEAB) and healthy life expectancy (HALE): a multi-country cross-sectional study. Front Pharmacol. 2018;9:960.

33. Roffia P, Bucciol A, Hashlamoun S. Determinants of life expectancy at birth: a longitudinal study on OECD countries. Int J Health Econ Manag. 2023; 23:189-212.

34. Owumi BE, Eboh A. An assessment of the contribution of healthcare expenditure to life expectancy at birth in Nigeria. J Public Health. 2022;30:2113-21.

35. Gulcan C. A study on life expectancy in Turkey. EMU J Pharm Sci. 2020;3:86-96.

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ORIGINAL ARTICLE

A descriptive analysis of sexual and reproductive health services for refugees provided through minimum initial service package approach

Şevkat Bahar-Özvarış [1], İlknur Yüksel-Kaptanoğlu[2], Türküler Erdost[3], Hande Konşuk-Ünlü[4]

[1]Prof. Dr., Hacettepe University, Women's Research and Implementation Center (HUWRIC) and Institute of Public Health, Ankara, Türkiye

[2]Assoc. Prof., Hacettepe University, Institute of Population Studies (HUIPS), Ankara, Türkiye

[3]PhD, Social Psychologist, Hacettepe University, Women's Research and Implementation Center (HUWRIC), Ankara, Türkiye

[4]Assoc. Prof., Statistician, Hacettepe University, Institute of Public Health (HUIPH), Ankara, Türkiye

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Abstract

Objective: Sexual and reproductive health (SRH) is a priority public health emergency response for women during humanitarian crisis situations as they face the risk of being neglected in health care systems of the country of arrival. This study aimed to investigate Syrian women's utilization of SRH services through Minimum Initial Service Package (MISP) approach, who received services from Women Health Counseling Units (WHCU) established as part of a collaborative Project in Türkiye.

Methods: Questionnaires were administered face-to-face by Arabic-speaking female interviewers to 413 Syrian women who previously received services from the WHCU. Descriptive statistics were used and Pearson chi-square as well as Exact chi-square tests were conducted to analyse bivariate differences between categorical variables.

Results: Child marriages were common among more than half (59%) of the participants. Majority of deliveries took place in the public hospitals (95%) and as attended by a doctor (93%). The percentage of participants using modern contraceptive methods was found to be 39.7% who were more frequently from younger age groups. However, the withdrawal method was relatively more prevalent among older participants.

Conclusion: Despite the data being gathered from a limited population of Syrian women in Türkiye, the study offers descriptive, evidence-based insights on improving women's access to high-quality SRH services in line with the MISP approach during humanitarian crisis situations.

Keywords: Sexual and Reproductive Health, MISP, Syrian Women, Humanitarian Crises

Correspondence: PhD, Social Psychologist, Türküler Erdost, Hacettepe University, Women's Research and Implementation Center (HUWRIC), Ankara, Türkiye. **E-mail:** turkulerdost@hacettepe.edu.tr **Phone**: + 90 312 305 31 41-42

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INTRODUCTION

The prevalence of humanitarian crises is on the rise, imposing significant burdens on individuals, countries, societies, and economies, often resulting in violations of specifically sexual and reproductive health (SRH) rights. Especially as SRH services can be unforeseen due to the sensitiveness of the issue for migrants, it could bring together a high level of service gap or unmet need. Migrant women's health status and their access to health services are significantly determined by gender dynamics and some other factors[1]. These factors include age, sexual orientation, national or social origin as well as inadequate information about rights and available services[2]. Moreover, migration process imposes additional risks for women and girls, such as human trafficking, sex work, gender based violence (GBV), an increase in sexually transmitted infections, unexpected and unwanted pregnancies and limited access to services.[3,4,5,6]

When humanitarian crises are concerned, the issues of SRH and GBV as defined via the Minimum Initial Service Package (MISP), developed by the Inter-Agency Working Group (IAGW) on Reproductive Health in Crises in 1995, are priority areas of intervention[7]. Starting in 2011, the Central Asian region (EECA), comprising Eastern Europe and India, has made the MISP available. In India alone, close to 600 individuals from non-governmental organizations and government agencies have undergone MISP training[8]. On the other side, the deteriorating economic and political conditions in Venezuela have led to the inaccessibility of SRH services, notably prenatal and postnatal care services, along with heightened health protection risks. As a response, the demand for these services has been met through assistance provided by other countries[9]. Likewise, in the face of severe limitations in providing SRH services, humanitarian aid organizations stepped forward to offer services utilizing the MISP approach[9, 10]. These examples not only underscore the significance of delivering SRH services through the MISP approach but also highlight the importance of cross-country solidarity regarding this matter.

It was demonstrated that, in the year 2015, in 35 countries where contraception services were not adequately provided due to humanitarian crisis situations, maternal mortality rate was 61% of the whole world[8, 11]. Reasons for underutilization were less awareness about availability of and duley low demand for services as well as not knowing the services and the location of service delivery[12]. While the need for SRH services in humanitarian crisis situations is clear, there is limited information on the extent to which these needs are being met in diverse situations. Understanding how a unit and mechanism for service planning using the MISP approach satisfies the requirement in a conflict situation, in particular, will give evidence and experience-based data for humanitarian crisis situations in various locations. A systematic review highlights the necessity for in-depth practice-based research across diverse crisis contexts and populations to identify evidence-based interventions that effectively enhance the utilization of SRH services[13].

Following the outbreak of war and subsequent migration influx in Syria in 2011, the registered Syrian population under temporary protection has continuously increased in Türkiye. Subsequently, the provision of health

care services to Syrian migrants has been a collaborative effort involving the Turkish Ministry of Health (MoH), various UN agencies, donors, and other organizations. As a project run by the authors of this article and as an example of gender-sensitive and migration-focused support services, *'Strengthening Access to Sexual and Reproductive Health, and Sexual and Gender-Based Violence Services for Syrian and Other Refugees through Women and Girl Safe Spaces (WGSS)/Women Health Counselling Units (WHCU) Project'* was conducted by Hacettepe University Women's Research and Implementation Center (HUWRIC) with technical support of the United Nations Population Fund (UNFPA) Türkiye Office and financial support of European Civil Protection and Humanitarian Aid Operations (ECHO) in Ankara. Under the project, services on SRH (training on SRH issues, providing individual and group counselling and services on family planning, antenatal and postnatal care etc.) and GBV were provided to Syrian women in three WHCU established in the Migration Health Centers of the MoH, using the MISP approach. To overcome social, linguistic and cultural barriers and facilitate open communication on matters concerning GBV and SRH, Arabic-speaking female personnel were recruited and the Syrian 'health mediators' were incorporated into the working team. Five health mediators working in each of the three WHCU were employed and regularly trained to serve as a bridge between their respective communities and the WHCU aiming to effectively establish an accessible as well as a safe health care setting where cultural diversity has been addressed. This unique structured model necessitated a comprehensive evaluation to assess how Syrian women utilize their SRH rights and services specifically in relation to MISP approach and to gain insights into the SRH health risks, needs and expectations of Syrian women in this context.

METHODS

Objective of the study

The objective of this study was to identify utilization and practices of Syrian women regarding SRH services and rigths, with a focus on MISP as a critical component of the humanitarian response to crises.

It is noteworthy to mention that, this article focuses only on SRH, excluding GBV component of the services provided, considering the extensive scope of both SRH and GBV, each deserving separate studies to comprehensively address their complexities. Accordingly, hereupon, findings and discussions were contextualized by considering solely SRH issues.

Study setting and study population

The research was conducted in three WHCU strategically located in three different districts of Ankara, specifically chosen for their accessibility to the Syrian female population, offering essential health care services. During the data collection phase between June 30th to August 15th a total of 445 women who had previously utilized services from one of those three WHCU submitted applications to receive further services. All applicants were extended an invitation to participate in the study; of these, 413 women accepted to be participants and were subsequently included in the research. As a descriptive study, although the results of this survey do not claim to represent the whole Syrian women population, it provides insights into how

Syrian women utilize SRH services delivered through the MISP approach.

Data collection tool

The questions and format of the survey were adapted using the global surveys on SRH. The questionnaire was designed so as to identify SRH related awareness, practices and service utilization of Syrian women applying to WHCU. The questionnaire encompassed a comprehensive set of questions covering various crucial topics including demographic characteristics of Syrian women and their household members, the rationale behind their preference for the arrival country, pertinent information prior to migration, aspects pertaining to marital relations, pregnancy and childbirth experiences, the utilization of contraceptives and the reasons for seeking services at the WHCU as well as their levels of satisfaction and expectations from these health care centers. Prior to finalizing the questionnaire, interview-based pre-tests were conducted in three centres serving as a pilot study.

Data collection and data analysis

The fieldwork of the research was conducted one and a half years after the project started and interviews were conducted from June 30th to August 15th by female Turkish interviewers possessing a background in social sciences and fluent in Arabic. The questionnaires were administered through face-to-face interviews, taking place in the WHCU settings. To eliminate the social desirability effect, women were included in the research without obtaining their names or any personal information. Additionally, the women conducting the interviews were individuals unknown to the research subjects, ensuring that the subjects did not feel pressured during the interviews. Before commencing the interviews, written informed consent was obtained from all participants, ensuring their voluntary participation and adherence to ethical principles. In the study, which achieved a response rate of 93%, all individuals who had previously utilized services from the centers and consented to participate were included in the research without any randomization during the period in which the study was conducted.

Data entry and analysis in the survey was conducted by using IBM Statistics Package for Social Sciences (SPSS ver. 23.0). In analyses, descriptive statistics were presented through mean, standard deviation, counts and percentages for categorical variables. Pearson chi-square and Exact chi-square tests were conducted to examine bivariate differences between categorical variables. Statistical significance was determined as p value <0.05.

Ethical considerations

Ethical Committee approvals were obtained from the Hacettepe University Clinical Research Ethics Board (Decision No: GO 17/243-30) and the MoH. Subsequent to receiving written informed consents, interviews were conducted by unknown interviewers in the WHCU buildings as Syrian women had already established trust and felt secure in those familiar environments. This approach also facilitated a comfortable and conducive environment for data collection, fostering open and candid responses from the respondents. The survey was carried out in the Syrian women's own language, minimizing any potential discomfort, misunderstandings, or translation errors that could have arisen from language barriers. Confidentiality and

privacy were safeguarded throughout and following the interviews. Measures were taken to maintain the anonymity of the participants, ensuring that their personal information and responses remained strictly confidential.

RESULTS

Fifty-six percent of 413 women were from the age group 25-44. The mean age of applicants was 33.98 ±11.66 (median: 31.00, min=15, max= 68). The majority of women taking part in the study were literate (81%) while one in every five women was illiterate (19%). Eighty four percent of women had their educational background as secondary education and lower while the number of those with high school or higher education was quite limited (Table 1).

Before their migration to Türkiye almost all used to live in Syria. Being in Türkiye for 3 years in average, women's average duration of stay in Ankara was 2 years. Their preference for Türkiye was based on factors including having relatives or acquaintances in Türkiye (32%); Türkiye's welcome policy for Syrians (24%); ease in transportation (20%) and confidence in Türkiye (17%). When income generating activities outside home considered, it was highlighted via the figures that only 16% of women were working before migration whereas this ration was 5.1% after migration. An overwhelming majority (97%) of Syrian women were currently married. (Table 1).

Table 1. Distribution of Syrian women by their basic characteristics

Basic characteristics of women	n	%
Age (n=413)		
15-19	30	7.3
20-24	61	14.7
25-29	83	20.1
30-44	150	36.3
45+	89	21.6
Literacy (n=413)		
Literate	334	80.9
Illiterate	79	19.1
Educational status* (n=359)		
Uneducated/primary incomplete	49	13.7
Primary education first level	139	38.7
Primary education second level	115	32.0
High school and higher	56	15.6
Marital status (n=413)		
Never married	12	2.9
Married	401	97.1
Income generating activity after migration (n=413)		
Yes	21	5.1
No	392	94.9
Duration of stay in Türkiye (n=413)		
Shorter than 1 year	36	8.7
1 year	47	11.4
2 years	104	25.2
3 years	152	36.8
4 years and longer	74	17.9
Duration of stay in Ankara (n=411)**		
Shorter than 1 year	48	11.7
1 year	77	18.7
2 years	122	29.7
3 years	134	32.6
4 years and longer	30	7.3
Reasons for preferring Türkiye (n=413)		
Having relatives/acquaintances in Türkiye	133	32.2
Türkiye's welcome of Syrians	100	24.2
Ease of transportation	83	20.1
Confidence in Türkiye	72	17.4
Religious reasons	15	3.6
Other	10	2.4
Working for income before moving to Türkiye (n=413)		
Yes	64	15.5
No	349	84.5
Average household size	6.0±2.5	

*Missing data for 54 women ** Missing data for 2 women

Almost 6 out of 10 women in reproductive ages were married before the age of 18. The proportion of child marriages was common in age groups and the difference is statistically significant (Table 2).

Table 2. Distribution of Ages of Syrian women by their age at first marriage

	Age at first marriage					
	Under age 18		Over age 18		Total	
Age	n	%	n	%*	n	%
15-19	22	88.0	3	12.0	25	100.0
20-24	32	54.2	27	45.8	59	100.0
25-29	44	53.7	38	46.3	82	100.0
30-44	83	56.8	63	43.2	146	100.0
45+	54	60.7	35	39.3	89	100.0
Total	235	58.6	166	41.4	401	100.0

*12 women did not answer the question

$\chi 2$=10.538, df=4, p<0.05

Reproductive health status of Syrian women

According to data cases of stillbirth, spontaneous or self-induced abortion were among most important factors affecting reproductive health (RH) status of women. Evaluating information about Syrian women's fertility pattern and RH together, it was found that large majority of women experiencing spontaneous, self-induced abortions or stillbirths were 45 years or older (49.4%, 32.6% and 20.2% respectively). Women with first level primary education were more likely to have spontaneous, self-induced abortions or stillbirths (46%, 19.4% and 10.8%, respectively). There is statistically significant difference between all groups. (Table 3)

Table 3. Distribution of cases of spontaneous and induced abortion and stillbirth among Syrian women by their basic characteristics

Basic characteristics	Spontaneous abortion				Self-induced abortion				Stillbirth			
	Yes		No		Yes		No		Yes		No	
	n	%*	n	%*	n	%*	n	%*	n	%*	n	%*
Age												
15-29	43	24.7	131	75.3	4	2.3	170	97.7	3	1.7	171	98.3
30-44	66	44.0	84	56.0	32	21.3	118	78.7	14	9.3	136	90.7
45+	44	49.4	45	50.6	29	32.6	60	67.4	18	20.2	71	79.8
Total	153	37.0	260	63.0	65	15.7	348	84.3	35	8.5	378	91.5
	χ^2=20.319, df=2, p<0.001[a]				χ^2=46.285, df=2, p<0.001[a]				χ^2=26.207, df=2, p<0.001[a]			
Education												
No education/primary incomplete	17	34.7	32	65.3	11	22.4	38	77.6	1	2.0	48	98.0
Primary education first level	64	46.0	75	54.0	27	19.4	112	80.6	15	10.8	124	89.2
Primary education second level	35	30.4	80	69.6	9	7.8	106	92.2	8	7.0	107	93.0
High school and higher	15	26.8	41	73.2	4	7.1	52	92.9	3	5.4	53	94.6
Total	131	36.5	228	63.5	51	14.2	308	85.8	27	7.5	332	92.5
	χ^2=9.637, df=3, p=0.022[a]				χ^2=11.970, df=3, p=0.007[a]				χ^2=4.683, df=3, p=0.197[a]			
Number of children living												
0	1	50.0	1	50.0	1	50.0	1	50.0	---		---	
1-2	44	31.4	96	68.6	22	15.7	118	84.3	12	8.6	128	91.4
3-4	69	40.4	102	59.6	26	15.2	145	84.8	14	8.2	157	91.8
5+	31	56.4	24	43.6	14	25.5	41	74.5	8.	14.5	47	85.5
Total	145	39.4	223	60.6	63	17.1	305	82.9	34	9.2	334	90.8
	χ^2=9.637, df=3, p=0.010[b]				χ^2=4.854, df=3, p=0.163[b]				χ^2=2.351, df=3, p=0.498[b]			

* row percentage; [a]Pearson chi-square test; [b]Exact chi-square test

Pregnancies in Türkiye

Twenty-eight percent of women experienced pregnancies in Türkiye and 36 women (9%) were pregnant at the time of the research. 28% of women had their pregnancies after arriving at Türkiye. The vast majority of births of participants occured in public hospitals (95%) and are attended by doctors (93%) in Türkiye. Among deliveries without the attendance of a doctor (7%), 4% were assisted by relatives, and only 1% of deliveries were attended by nurses and 1% were attended by a Syrian doctor. (Figure 1) These findings can be interpreted as indicating that the women participating in the research had high levels of access to vital antenatal care services.

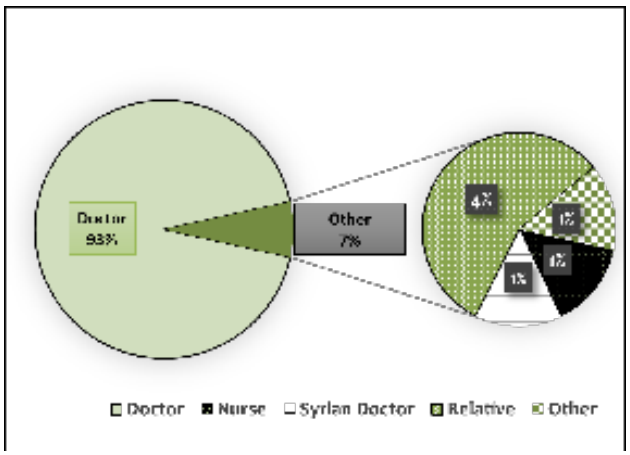

Figure 1. Percentage distribution of Syrian women by their birth attendants

Contraceptive method use

When asked about the contraceptive methods they have ever used, 69% of the interviewed women reported having used at least one method. However, only 39.7% of women were currently using a modern contraceptive method, indicating a lower percentage compared to those who have ever used contraception. Among the current contraceptive users, 23.2% of women were using intra-uterine devices (IUD), 7.7% were using oral contraceptives, 6.1% were using condoms while 6.3% of women were using the withdrawal method. (Figure 2)

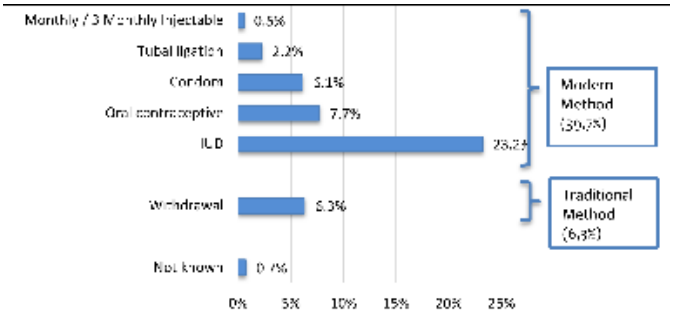

Figure 2. Percentage distribution of Syrian women by method of contraception they currently use

The findings demonstrate that both modern and traditional contraceptive methods were more preferred by those in the midst of their years of fertility. Younger age groups showed a wider usage of modern methods, while the withdrawal method was relatively more common among older age groups. No statistically significant difference was found between the level of education (p=0.436), age groups (p=0.758) and how many alive children they have (p=0.052) in terms of contraceptive method use (Table 4).

Among women using any contraceptive method, 87% expressed no desire to change their current method, while 13% wanted to switch to a different one. The primary reasons cited for not using any contraceptive method were the absence of their spouses or infrequent sexual intercourse (23%). The second most common reason was pregnancy or being in the postnatal period (24%). Additionally, 10% of women stated they chose not to use contraceptives because they wanted to become pregnant, while 12% mentioned their menopausal status or having undergone a hysterectomy as reasons for not using any contraceptive method.

Table 4. Distribution of contraceptive method use by Syrian women by their basic characteristics

Age (n=190)	Modern methods		Traditional methods		Total		p
	n	%[a]	n	%[a]	n	%[b]	
15-29	64	87.7	9	12.3	73	38.4	0.758 [1]
30-44	83	87.4	12	12.6	95	50.0	
45+	18	81.8	4	18.2	22	11.6	
Education (n=169)							
No education/primary incomplete	19	79.2	5	20.8	24	14.2	0.436 [1]
Primary education first level	66	89.2	8	10.8	74	43.8	
Secondary education and higher	60	84.5	11	15.5	71	42.0	
Number of children alive (n=188)							
1-2	37	78.7	10	21.3	47	25.0	
3-4	92	86.8	14	13.2	106	56.4	0.052 [1]
5+	34	97.1	1	2.9	35	18.6	

[a] row percentage, [b] column percentage, [1] Chi-Square was used.

DISCUSSION

During war, Syrian people were forced to migrate to other countries and two thirds of them settled in neighbouring countries such as Türkiye, Lebanon and Jordan[14]. As of April 2024, this population reached 3,116,713 people, with women and girls accounting for 47.8% of the Syrian population[15]. In humanitarian crisis situations refugee women face numerous obstacles accessing SRH services and are confronted with the violation of sexual and reproductive rights[16], therefore planning and accessibility of SRH services are crucial. It was mentioned in the Sustainable Development Goals (SDGs) to guarantee the universal access to SRH without leaving anyone behind[17]. Nairobi Summit -the 25th anniversary of the ICPD (ICPD+25)- was held in 2019 with an agenda that set forths ensuring high-quality SRH services to populations in most difficult environments in line with the MISP approach and meeting the SDGs. These standards are expected to be implemented through national plans that safeguard and uphold everyone's right to bodily autonomy, integrity, and reproductive rights, while also ensuring access to services that support these rights[18]. This study, along with the established WHCU mechanism, serves as a response to aforementioned universal standards.

Although further research is needed to establish the direct impact of receiving services from WHCU, the research findings indicate a high utilization rate of SRH services and rights among applicants. This observation also extends to the use of contraceptive methods. It was revealed that, in the period 2007-2014, the prevalence in use of contraceptives was 54% in Syria[19]. However, in this research, it was found that 69% had ever used any contraceptive method and 46% (39.7% modern method, 6.3% traditional method) were currently using one. When reasons for not using any method were examined, participants cited the absence of sexual partners, not currently engaging in sexual intercourse, being in the postnatal period or menopause, rather than inaccessibility of services or cultural restraints. These findings can be considered positive regarding health service delivery in

relation to the implementation of the MISP approach.

In terms of contraceptive use, in the 2018 Türkiye Demographic and Health Survey (2018 TDHS-Syrian sample), which provide information about population, fertility and use of health care services regarding Syrian women aged 15-49 living in Türkiye[20], 21% of women were found to have an unmet need for contraception. Further, 54% of the Syrian sample was found to be using any modern method, while only 24% were still using a modern method. However, in this study 39.7% of the participants were using modern contraceptive methods. In both studies, the preference order of the most commonly used contraceptive methods was the same, namely IUDs, oral contraceptives and condoms (first 2018 TDHS Syrian sample and in the current study respectively; 13%-23.2%, 6%-7.7% and 2%-6.1%). Furthermore, the withdrawal method was found to be widely used in both studies, with a rate of 19% in the 2018 TDHS Syrian sample and 6.3% in the current study. The difference in modern contraceptive use between the findings of the two studies could be attributed to the counseling and awareness-raising activities conducted at the WHCU. Women have the opportunity to learn more about contraceptive methods, SRH services, their availability and SRH rights, which may account for the variation in results. Additionally, the health mediator mechanism can be considered effective in expanding the reach of WHCU to a larger Syrian population. As a significant finding, this explanation was further supported by the statistics from WHCU, which revealed that 65% of the women who sought services at the centers were referred to WHCU through the guidance of health mediators.[21] The existence of WHCU within MoH's Migration Health Centers is thought to promote higher applications to the centers as well. According to Cankurtaran and Albayrak[22], spouses of women do not object to their wives' visits to WHCU, which allows women to access SRH services as part of primary health care. Hence, it can be interfered that, WHCU model has some unique aspects regarding implementation of the MISP during humanitarian crises including a mechanism that integrates complementary components into primary health care services provided by public institutions, eliminating language barriers by providing services in women's native languages and employing health mediators in service provision who act as a bridge between the Syrian population and the center thus ensuring a culturally sensitive environment.

In a study that reviewed 24 researches conducted in Türkiye, researchers found that the percentage of child and consanguineous marriages among Syrian women was 56%[23]. According to the results of the 2018 TDHS Syrian sample, adolescent marriages were very high, accounting for 49% of cases. Additionally, 39% of Syrian women between the ages of 15 and 19 were already mothers or pregnant with their first child. In another study, conducted among women who gave birth at Mardin Maternity Hospital in 2018, where early pregnancies were reported to be a common problem among Syrian women; adolescent pregnancies were found to be 2.2 times higher among Syrian women than the resident adolescents[24]. In line with those findings, the fundamental findings of this research indicate that the prevalence of child and forced marriages emphasize the need for consideration in the planning of SRH programs targeting the Syrian population.

Marriage under age 18 was found to be 59% in the current study. This result, together with the previously mentioned studies's results, points to the fact that child marriages could be defined as an important social, right-based and health problem for Syrian population that needs to be taken into consideration in health policy and practices.

Çöl et. al. demonstrated that, SRH issues still need improvement for Syrian women in areas such as child marriages, adolescent pregnancies, inadequate antenatal care, access to modern contraception and sexual violence[23]. In the aforementioned literature review, the extent of the need for RH services, the specific risks and needs of being refugee women, language and cultural barriers as well as difficulties in accessing services have been stated as crucial SRH challenges faced by Syrian women in Türkiye. In their research, Kahsay and his colleagues[25] assessed RH service utilization at a refugee camp in Ethiopia and attributed the positive difference compared to some other studies to the availability of facility supply, health education provided about MISP RH and the absence of language barriers. Considering all these issues along with the findings of the current study, the need for incorporating MISP for SRH service delivery in native language, by personnel who have received pre-service and in-service trainings on gender equality arises.

Revisiting lessons learned and illuminating the path for future policy, program, practice and research

Given that the MISP is specifically designed to be implemented in the early stages of humanitarian crises, providing guidance to health care providers on prioritizing SRH services, facilitating the transition to comprehensive SRH services[26], it becomes essential to integrate this approach into primary health care policies and practices from the outset of such crises. An effective coordination program, designed with the active participation of the migrant population, prioritizing the needs of disadvantaged individuals and incorporating basic SRH services are crucial. The program should also take into account the unique needs of the region affected by the crisis and match the necessary resources and materials accordingly with those needs.

During crisis, continuous information gathering is essential to assess the evolving needs of the affected population. It is vital to identify a dedicated service unit to implement MISP requirements and provide essential SRH services. Moreover, the program should offer training to service providers and users to ensure proper utilization and sustainability of services. In line with aforementioned issues, shedding light on to needs and best practices, is expected to have positive impact on the MISP's wider recognition as a critical component of the humanitarian response to crisis and to encourage its inclusion in global programmes, plans and standards. This could also be guiding for the responsible institutions to initiate necessary training, support and legislative actions in the context of SRH services as part of the MISP for women in situations of forced displacement.

Although in this research, data obtained only from women who have previously received services from WHCU, there is a need for a comprehensive research that also examines the needs and barriers of those who have not accessed service units and services.

Addressing gender inequalities is central

to effective SRH responses. Indeed, gender-based stereotyping and harmful traditional practices are some of the key elements leading to SRH problems especially for migrant women including child and forced marriages. Therefore, when addressing SRH services within the scope of MISP during humanitarian crises situations, it is considered important for research to have a gender equality perspective.

While the study does not represent the entire Syrian female population and is limited to a specific group, it offers insights into the SRH services provided within the framework of MISP in humanitarian crisis situations. Revising and updating the MISP in response to different situations experienced in different regions, new researches, emerging best practices and changing global health priorities is a beneficial strategy. In this context, conducting researches those consider diverse situations and sharing the findings at the international level would be beneficial for building upon the experiences and knowledge of one another.

CONCLUSION

As a conclusion, this descriptive study, demonstrated the SRH service utilization of Syrian women who have previously received services from WHCU. While the study is limited to a specific group of Syrian women in Türkiye, it offers valuable descriptive data supporting the enhancement of women's access to high-quality SRH services in line with the MISP approach. The findings are believed to serve as a guiding framework for the development of more comprehensive SRH service provision. It is also considered that the outcomes could be inspiring for international programs during humanitarian crisis situations.

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Ethical Declaration: Ethical Committee approvals were obtained from the Hacettepe University Clinical Research Ethics Board (Decision No: GO 17/243-30) and the MoH. Written informed consents were received from all participants.

Author Contrubition: Design of the study and overall supervision: ŞB-Ö, İY-K, Questionnaire

development: ŞB-Ö, İY-K, Coordination of the fieldwork and supervision during analysis process: İY-K, Data cleaning, statistical analysis and analysis result writing: HK-Ü, Analysis result interpretation: İY-K, Obtaining Ethical Comittee approvals: TE, Reporting of the research, literature search and preparation of the manuscript: TE, Critical review of the manuscript: ŞB-Ö, İY-K, HK-Ü, TE.

REFERENCES

1. Samari G. Syrian Refugee Women's health in Lebanon, Türkiye and Jordan and recommendations for improved practice. World Med Health Policy. 2017;9:255–274.
2. Centre for Transnational Development and Collaboration (CTDC). Syrian refugees in Türkiye: Gender analysis [online]. Available at: https://data2.unhcr.org/en/documents/download/54509. Accessed May 3, 2023.
3. United Nations (UN). Feminization of migration, remittances, migrants' rights, brain drain among issues, as population commission concludes debate [online]. Available at: https://www.un.org/press/en/2006/pop945.doc.htm. Accessed April 27, 2023.
4. Çaman-Karadağ Ö, Bahar-Özvarış Ş. Uluslararası göç ve kadın sağlığı. Sağlık ve Toplum. 2010;4(3):13.
5. Adomako EB, Darkwa-Baffour F. Suffering in the hands of a loved one: The endemic to intimate partner violence and consequences on migrant female head-load carriers in Ghana. J Interpers Violence. 2019 Nov 7:0886260519888547.
6. Al-Maharma D, Safadi R, Ahmad M, Halasa S, Nabolsi M, Dohrn J. Knowledge, attitudes and practices of Syrian refugee mothers towards sexually transmitted infections. Int J Womens Health. 2019;11:607-615.
7. Inter-Agency Working Group on Reproductive Health in Crises (IAGW). Minimum initial service package (MISP) [online]. Available at: https://iawg.net/resources/misp-process-evaluation-tools-2017. Accessed May 4, 2023.
8. Lisam S. Minimum initial service package (MISP) for sexual and reproductive health in disasters. J Evid Based Med. 2014;7(4):245-248.
9. Inter-Agency Working Group on Reproductive Health in Crises (IAGW). Emergencies. Venezuela/Colombia [online]. Available at: https://iawg.net/emergencies/venezuela-colombia. Accessed June 6, 2023.
10. CARE. CARE Rapid Gender Analysis Latin America & Caribbean: Venezuelan Migrants & Refugees in Colombia [online]. Available at: https://reliefweb.int/sites/reliefweb.int/files/resources/CARERapidGenderAnalysis_Colombia_May2019.pdf. Accessed June 6, 2023.
11. Balinska MA, Nesbitt R, Ghantous Z, Ciglenecki I, Staderini N. Reproductive health in humanitarian settings in Lebanon and Iraq: results from four cross-sectional studies, 2014–2015. Conflict Health. 2019;13:1-10.
12. Heslehurst N, Brown H, Pemu A, Coleman H, Rankin J. Perinatal health outcomes and care among asylum seekers and refugees: a systematic review of systematic reviews. BMC Med. 2018;16(1):1-25.
13. Singh NS, Aryasinghe S, Smith J, Khosla R, Say L, Blanchet K. A long way to go: a systematic review to assess the utilization of sexual and reproductive health services during humanitarian crises. BMJ Global Health. 2018;3(2):e000682.
14. United Nations (UN) Department of Economic and Social Affairs, Population Division. International Migration 2020 Highlights (ST/ESA/SER.A/452) [online]. Available at: https://www.un.org/en/desa/international-migration-2020-highlights. Accessed June 6, 2023.
15. Ministry of Interior, Directorate General of Migration Management (MoI, DGMM). Migration statistics. Temporary protection [online]. Available at: https://www.goc.gov.tr/gecici-koruma5638 [Accessed May 3, 2024].
16. Austin J, Guy S, Lee-Jones L, McGinn T, Schlecht J. Reproductive health: A right for refugees and internally displaced persons. Reprod Health Matters. 2008;16(31):10-21.
17. United Nations (UN) Department of Economic and Social Affairs, Sustainable Development. Sustainable Development Goals [online]. Available at: https://sdgs.un.org/goals/goal3. Accessed May 4, 2023.
18. United Nations Population Fund - UNFPA. Accelerating the Promise: The report on the Nairobi Summit on ICPD25 [online]. Available at: https://www.unfpa.org/publications/accelerating-promise-report-nairobi-summit-icpd25. Accessed May 4, 2023.
19. World Health Organization (WHO). World health statistics 2015. World health statistics report [online]. Available at: https://apps.who.int/iris/bitstream/handle/10665/170250/9789240694439_eng.pdf?sequence=1. Accessed May 4, 2023.
20. Hacettepe University Institute of Population Studies (HUIPS). 2018 Türkiye demographic and health survey Syrian migrant sample. Ankara: Elma Teknik Basım Matbaacılık Ltd. Şti, 2019 [online]. Available at: http://www.hips.hacettepe.edu.tr/tnsa2018/rapor/2018_TDHS_SR.pdf. Accessed May 4, 2023.

21. Hacettepe University Women's Research and Implementation Center, HUWRIC. Unpublished final report of 'Strengthening access to sexual and reproductive health, and sexual and gender-based violence services for Syrian and other refugees through Women and Girl Safe Spaces (WGSS)/ Women Health Counselling Units project'. 2019.

22. Cankurtaran Ö, Albayrak H. Suriye'den Türkiye'ye kadın olmak (Being a woman from Syria to Türkiye). Ankara: Elma Teknik Basım Matbaacılık Ltd. Şti., 2019 [online]. Available at: https://huksam.hacettepe.edu.tr/Turkce/suriyedenTürkiyeye_TR_210519.pdf. Accessed May 5, 2023.

23. Çöl M, Bilgili Aykut N, Usturalı Mut AN, Koçak C, Uzun SU, Akın A, Say L, Kobeissi L. Sexual and reproductive health of Syrian refugee women in Türkiye: A scoping review within the framework of the MISP. Reproductive Health. 2020;17:99.

24. Çifçi S, Bayram Değer V, Ertem M. Suriyeli göçmenler ve önemli bir üreme sağlığı sorunu: erken yaş gebelikleri. Göç Dergisi (Journal of Migration). 2018;5(1):33-42.

25. Kahsay AB, Haftu AT, Nigusse AT. Factors affecting the implementation of the Minimum Initial Service Package (MISP) r reproductive health during crisis: the case of Eritrean refugees in northern Ethiopia. Research Square. 2020.

26. Inter-Agency Working Group on Reproductive Health in Crises (IAGW). (May 5, 2021). Unit 1: What Is the MISP for SRH? [online]. Available at: https://iawg.net/resources/minimum-initial-service-package-distance-learning-module/unit-one-misp-srh. Accessed July 21, 2023.

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ORIGINAL ARTICLE

Mediators and predictors of peritraumatic dissociation after devastating consecutive earthquakes: the role of social support

Burak Mete [1], Hakan Demirhindi [2], Ceren Kanat Şahin[3], Pakize İrem Kahramanoğlu[3], Mehmet Emin Demirkol [4]

[1]Spec. MD., Cukurova University, Faculty of Medicine, Department of Public Health, Adana, Türkiye
[2]MD. PhD, Cukurova University, Faculty of Medicine, Department of Public Health, Adana, Türkiye
[3]MD, Cukurova University, Faculty of Medicine, Department of Public Health, Adana, Türkiye
[4]Spec. MD, Cukurova University, Faculty of Medicine, Department of Psychiatry, Adana, Türkiye

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Abstract

Objective: Dissociation involves the tendency to detach from one's environment, own body and mental states. This study aimed to evaluate the frequency of psychiatric symptoms, coping strategies with earthquake stress and the relationship between peritraumatic dissociation one month after two earthquakes that occurred 9 hours apart on 6th February 2023 in Türkiye.

Methods: In this cross-sectional study, an online questionnaire distributed through social media groups was filled by 786 university students studying in Adana, including Peritraumatic Dissociative Experiences Questionnaire (PDEQ), Coping Strategies with Earthquake Stress Scale, and Brief Symptom Inventory.

Results: The peritraumatic dissociation showed a weak negative relationship with religious coping strategy and a very weak positive relationship with seeking social support. Obsessive-compulsivity (β=0.650), anxiety (β=0.572), depression (β=-0.316, i.e., negatively), phobic anxiety (β=0.390), positive symptom distress index (β=-1.888), social support (β=0.597) sub-dimensions were found to be important predictors of peritraumatic dissociation in the linear regression model (explanatory power R^2=0.379) with obsessive-compulsivity (30.9%) being the most contributing factor. Peritraumatic dissociation scores were significantly higher in females and in those with damage or destruction in their homes. Mediation analysis revealed that depression indirectly increased the dissociation score, i.e., by decreasing the seeking social support scores, the latter being found to mediate peritraumatic dissociation.

Conclusion: The most important predictor of peritraumatic dissociation was obsessive-compulsivity symptoms, with the highest risk in those with more anxiety symptoms and who sought more social support. Therefore, social support is suggested to accompany early symptom screening after the earthquake to reduce outcomes like post-traumatic stress disorders.

Keywords: Earthquake, Post-Traumatic Stress Disorder, Peritraumatic Dissociative Experiences Questionnaire, Coping Strategies with Earthquake Stress Scale, Brief Symptom Inventory

Correspondence: MD, Ceren Kanat Şahin, Cukurova University, Faculty of Medicine, Department of Public Health, Adana, Türkiye. **E-mail:** cerenkanat33@gmail.com **Phone**: +90 506 537 45 87

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INTRODUCTION

While stress reactions after trauma are initially adaptive, in some people the psychological response may become negative with prolonged dysfunction. While most people with stress symptoms recover, it is important to recognise individuals at risk of persistent problems. Research in this area has generally focused on trauma based on personal relations or post-war issues, with very limited research on disasters triggered by natural hazards. Earthquakes cause widespread psychological consequences as well as physical and material damage. Earthquake-related psychological distress may occur following even a mild earthquake and may continue for years [1]. The most common psychological reactions to earthquakes are post-traumatic stress disorder (PTSD)[2] and other accompanying conditions including depression and anxiety [3].

Personal characteristics are important in the development of PTSD; however, it has been shown that psychological distress such as dissociation, hyper-arousal and helplessness occurring after the earthquake also contribute to the development of this disorder [4,5]. One of the main features of PTSD is the phenomenon of dissociation associated with trauma. Dissociation includes the tendency to detach from one's environment, own body and mental states. Those with severe dissociative symptoms experience fragmentation in mental states such as consciousness, memory, identity, emotion, perception and body representations [6]. Dissociative reactions that occur especially during a traumatic event are called peritraumatic dissociation and include decreased awareness of the environment, memory disorders, altered perceptions, emotional numbness, depersonalisation and amnesia [7]. Peritraumatic dissociation is the strongest predictor of PTSD [8]. The explanation for this is that dissociation occurring during a traumatic event may affect the encoding, processing and integration of traumatic memories and consequently may cause memory fragmentation, which plays an important role in the development of PTSD and dissociative disorders [9]. On 6 February 2023, Türkiye experienced two major consecutive earthquakes (with a magnitude of Mw 7.7 in Pazarcık and Mw 7.6 in Elbistan) and tens of thousands of aftershocks that caused destruction and damage in 10 provinces (Kahramanmaraş, Adana, Malatya, Hatay, Osmaniye, Gaziantep, Adıyaman, Diyarbakır, Kilis, Şanlıurfa) with a 9-hour interval, resulting in the death of approximately 51 thousand people. In Adana province, dozens of buildings collapsed and about 500 people died (Figure 1) [10].

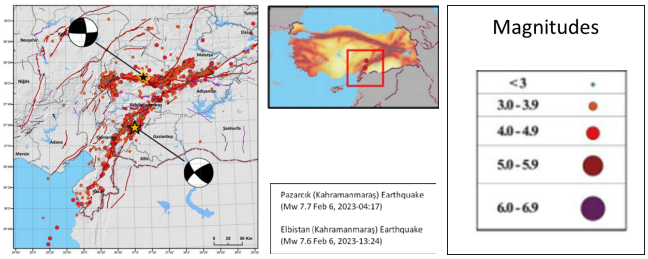

Figure 1. Pazarcık (Kahramanmaraş) Mw 7.7 and Elbistan (Kahramanmaraş) Mw 7.6 earthquakes and aftershock activities (Source: The Republic of Türkiye Presidency - Department of Strategy and Budget, 2023).

The aim of this study was to evaluate the relationship between the frequency of psychiatric symptoms, coping strategies with earthquake stress and peritraumatic dissociation among students studying at Cukurova University in Adana.

METHODS

This cross-sectional study was conducted one month after the earthquake (in March) in Adana, one of the cities affected by the two

major consecutive earthquakes that occurred in Kahramanmaraş on 6 February 2023. Approval was received from the Cukurova University Faculty of Medicine Non-Invasive Clinical Research Ethics Committee (decision no: 39). The population of the study consisted of university students living in Adana. In the sample analysis, the minimum number to be reached was calculated as 135 based on a power of 99%, a confidence interval of 95%. (G*Power 3.1.9.4., reference β=0.315 and number of predictors=9) [11]. The individuals were reached through online social media groups (like WhatsApp, Microsoft Teams) by convenience sampling method. Responding was permitted for three days and resubmission was blocked. The research population consists of approximately 880 people studying in the 4th and 6th grades of the faculty of medicine. A total of 786 people gave consent to participate and responded to the questionnaire consisting of four sections:

1-Sociodemographic form

Age, sex, faculty attended, household of residence, being affected by the earthquake, loss of life, damage of buildings, physical injury, and previous earthquake experience were questioned.

2-Peritraumatic Dissociative Experiences Questionnaire (PDEQ) Scale

The PDEQ is a 10-question self-report scale that retrospectively measures dissociation during or immediately after trauma. The scale developed by Marmar et al. in 1997 is widely used to determine the degree of dissociation during trauma [12]. The Turkish validity and reliability evaluation of the scale was conducted by Geyran et al. in 2005. Each item is measured on a five-point Likert-type scale between 0 (never) and 4 (always). It assesses dissociative symptoms including "confusion", "depersonalisation", "impaired perception of reality", "impaired temporal perception" and "out-of-body affect". The internal consistency coefficient Cronbach-α of the scale was calculated as 0.853. High scores obtained from the scale reflect a high level of dissociation during trauma [13].

3-Coping Strategies with Earthquake Stress (CSES) Scale

The scale was developed and its Turkish validity and reliability study was conducted by Yöndem and Eren in 2016. It includes three sub-dimensions "religious coping", "positive reappraisal" and "seeking social support", which are most frequently used in the face of earthquake stress. The first one "*Positive Reappraisal*" aims to determine if the individual tries to build up coping strategies like being optimistic, thinking positively, not magnifying negativities, accepting what was lived as an experience, and giving himself/herself time for thinking about the future. The strategies examined in the "*Seeking Social Support*" sub-dimension include sharing the experiences, feelings and/or fears with friends or someone who can cope better with the problem. The sub-dimension "*Religious Coping*" include strategies like entrusting him/herself to God, relaxing in prayer, believing that destiny cannot be changed and fulfilling religious duties more faithfully. Each item is scored between 1 and 4 points. Scores between 5-20 points are obtained from the sub-dimension evaluating religious coping, 6-20 points from the sub-dimension questioning positive reappraisal, and 5-20 points from the sub-dimension evaluating seeking social support. Higher scores reflect

more appeal to the coping strategy in question. In the validity and reliability study of the scale, the internal consistency coefficient Cronbach-α was found to be 0.85 for religious coping, 0.69 for positive reappraisal and 0.74 for seeking social support [14].

4-Brief symptom inventory (BSI)

Brief Symptom Inventory is a self-report inventory developed by Derogatis (1992) in response to the need for a short but valid and reliable scale to assess general psychopathology [15]. The scale was adapted for Türkiye by Şahin et al.[16]. BSI is the short form of SCL-90-R. It is a multidimensional symptom screening scale developed to capture some psychological symptoms that may occur in various psychiatric and medical patients as well as in normal individuals. The BSI consists of 9 subscales (Somatisation, Obsessive-Compulsivity, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Phobic Anxiety, Paranoid Ideation, and Psychoticism). In addition to the nine subscales, three global indices assess general psychological distress. These include General Severity Index (GSI), Positive Symptom Total (PST), and Positive Symptom Distress Index (PSDI). There are additional items like eating and drinking disorders, sleep disorders, thoughts about death and dying, and feelings of guilt. The BSI is a Likert-type scale. The participants are asked to rate each of the 53 items on a 5-point Likert scale of distress ranging from "not at all (0)" to "extremely (4)" considering the relevance of each item to their experience in the past seven days including today. The higher the total scores obtained from the scale, the higher the mental symptoms of the individual. An individual can get a maximum of 4 points and a minimum of 0 points in each subscale, additional items and two of three global indices (i.e. GSI and PSDI), while in the PST the maximum score can be 53 and the minimum score 0. An increase in the GSI, which represents the overall mean score of the scale, indicates an increase in distress due to psychiatric symptoms of the individual and is the best index of the scale. The PST increase shows how various psychiatric symptoms the individual perceives in himself/herself. The increase in the PSDI indicates the weighted average of the distress of the symptoms that the individual perceives to be present in himself/herself. The three global indices of the scale are calculated as follows:

-*General Severity Index (GSI):* It is obtained by dividing the sum of the subscales by 53.

-*Positive Symptom Total (PST):* First all items that are not marked as 0 (zero) are re-coded as 1 (one) and their sum gives PST.

-*Positive Symptom Distress Index (PSDI):* It is obtained by dividing the sum of subscales by the sum of symptoms.

Statistical analysis

The data were analysed with SPSS 20 ® (IBM-U.S.A.) software. Qualitative data were presented as frequency and percentage; while quantitative data as arithmetic mean, standard deviation, and median. Kolmogorov-Smirnov Test was used to test the normality. In the analyses Student's t-test, Mann Whitney U test, Spearman correlation analysis, Kruskal Wallis test, and multiple linear regression analysis were used. A < 0.05 value was considered statistically significant. The effect size was evaluated using Rank Biserial Correlation coefficient (with 0.10 indicating a small, 0.30 a medium, and 0.50 or greater a large effect size) and eta-squared values (with

0.01 indicating a small, 0.06 a medium, and 0.14 or greater a large effect size).

RESULTS

The mean age of 786 university students included in our study was 20.36±2.70 years (min=18-max=55). The most frequently observed psychiatric symptoms in the participants were eating and drinking disorders, sleep disorders, thoughts about death and dying, feelings of guilt (86.9%), anxiety (85.8%), interpersonal sensitivity (82.6%) and obsessive-compulsivity (82.4%). The sociodemographic characteristics of the individuals and information about earthquake effects were given in Table 1.

Table 1. Distribution of sociodemographic characteristics and psychiatric symptoms among participating university students

Features	n	%
Gender Male/Female	223/563	28.4/71.6
Age (mean± SD)	20.36±2.0	
Family living in one of the 10 provinces affected by the earthquake (yes/no)	675/111	85.9/14.1
Loss of a relative in the earthquake (yes/no)	0/786	0/100
Receiving a physical injury in the earthquake (yes/no)	13/773	1.7/98.3
Have experienced a destructive earthquake (6.0 and above) before (yes/no)	112 /674	14.2/85.8
BSI-Phobic anxiety (present/absent)	632/154	80.4/19.6
BSI-Psychoticism (present/absent)	615/171	78.2/21.8
BSI-Anxiety (present/absent)	674/112	85.8/14.2
BSI-Obsessive-compulsivity (present/absent)	648/138	82.4/17.6
BSI-Somatisation (present/absent)	598/188	76.1/23.9
BSI-Interpersonal sensitivity (present/absent)	649/137	82.6/17.4
BSI-Depression (present/absent)	702/84	82.3/10.7
BSI-Hostility (present/absent)	647/139	82.3/17.7
BSI-Paranoid ideation (present/absent)	599/187	76.2/23.8
BSI-Additional items (present/absent)	683/103	86.9/13.1
BSI-General severity index (GSI) (high/low)	470/316	59.8/40.2
BSI-Positive symptom total (PST) (high/low)	465/321	59.2/40.8
BSI-Positive symptom distress index (PSDI) (high/low)	462/286	61.8/38,2
Total	**786**	**100.0**

BSI=Brief symptom inventory

When the correlations between the scores obtained from scales were examined, it was found that there was a weak negative correlation between PDEQ scores and the *religious coping strategy* sub-dimension scores of CSES and a very weak positive correlation between PDEQ scores and the social support sub-dimension scores of CSES. When the correlations between CSES sub-dimensions and PDEQ were analysed, it was found that there was a weak positive and mostly moderate correlation between all sub-dimensions (Table 2).

Table 2. Correlations between PDEQ scale scores and CSES scale or BSI scores in participating university students

		PDEQ score
Religious Coping (CSES)	r	-0.117
	p	0.001*
Positive Reappraisal (CSES)	r	0.024
	p	0.500
Seeking Social Support (CSES)	r	0.077
	p	0.031*
Phobic anxiety (BSI)	r	0.552
	p	<0.001*
Psychoticism (BSI)	r	0.448
	p	<0.001*
Anxiety (BSI)	r	0.585
	p	<0.001*
Obsessive-compulsivity (BSI)	r	0.577
	p	<0.001*
Somatisation (BSI)	r	0.510
	p	<0.001*
Interpersonal sensitivity (BSI)	r	0.486
	p	<0.001*
Depression (BSI)	r	0.454
	p	<0.001*
Hostility (BSI)	r	0.448
	p	<0.001*
Paranoid ideation (BSI)	r	0.420
	p	<0.001*
Additional items (BSI)	r	0.491
	p	<0.001*
General severity index (BSI)	r	0.560
	p	<0.001*
Positive symptom total (BSI)	r	0.538
	p	<0.001*
Positive Symptom Distress Index (BSI)	r	0.349
	p	<0.001*

** Significant correlation*
CSES: Coping Strategies with Earthquake Stress Scale scores
BSI: Brief Symptom Inventory scores

The linear regression model created to predict the total score obtained from the PDEQ scale was found to be significant (stepwise model, p<0.001). The dependent variable of the model was the total score of the PDEQ scale, and the independent variables were scores from the subdimensions of the CSES scale and from the subscales of BSI. It was found that obsessive-compulsivity (BSI), anxiety (BSI), depression (BSI), phobic anxiety (BSI), positive symptom distress index (BSI), and seeking social support sub-dimension (CSES) scores made significant contributions to the model. The independent variables in the model explained 37.9% of the change in the dependent variable, i.e., the PDEQ total score. The variable that contributed the most to the explanatory power of the model was the obsessive-compulsivity subscale of BSI. Each unit increase in the obsessive-compulsivity subscale score of BSI led to a 0.650 unit increase in the PDEQ score, each unit increase in the anxiety subscale score of BSI led to a 0.572 unit increase, each unit increase in the phobic anxiety subscale score of BSI led to a 0.390 unit increase, and each unit increase in seeking social support subdimension score of CSES led to a 0.597 unit increase in the PDEQ scale score. Each unit increase in the depression subscale score of BSI led to a decrease of 0.316 units in the PDEQ scale score, and each unit increase in the Positive Symptom Distress Index of BSI led to a decrease of 1.888 units in the PDEQ scale score (Table 3).

When PDEQ scale scores were compared according to experiences during the earthquake and sex, PDEQ scores were found to be significantly higher in females and in those with moderate or severe damage and destruction in their homes. It was found that sex and damage to the house had a moderate effect on peritraumatic dissociation (PDEQ) (Table 4).

Table 3. Linear regression analysis to estimate PDEQ scale score

Model R^2 =0.379	Unstandardised Coefficients			p	Collinearity Statistics	
	R^2 Change	β	S.E.		Tolerance	VIF
(Constant)	0.379	4.367	2.918	0.135		
Obsessive-Compulsivity (BSI)	0.309	0.650	0.096	<0.001	0.247	4.049
Anxiety (BSI)	0.029	0.572	0.100	<0.001	0.231	4.330
Depression (BSI)	0.021	-0.316	0.096	0.001	0.256	3.911
Phobic anxiety (BSI)	0.010	0.390	0.116	0.001	0.296	3.377
Positive Symptom Distress Index (BSI)	0.008	-1.888	0.645	0.004	0.359	2.783
Seeking social support (CSES)	0.006	0.597	0.214	0.005	0.963	1.039

CSES: Coping Strategies with Earthquake Stress Scale scores BSI: Brief Symptom Inventory scores

Table 4. Comparison of PDEQ scores according to gender or earthquake experiences

	PDEQ score			
	Mean± SD	**Median**	**p**	**Effect size**
Sex				
Male	13.43±11.38	10.0	**<0.001**	**0.282****
Female	18.59±10.62	18.0		
The family lives in one of the provinces affected by the earthquake				
Yes	17.22±11.13	16.0	0.603	0.038
No	16.50±10.80	16.0		
Suffered any physical injury in the earthquake				
Yes	20.23±8.45	18.0	0.232	0.193
No	17.07±11.12	16.0		
Home damaged in the earthquake				
No damage	15.75 ± 10.62	15.0	**<0.001**	**0.048***
Slightly damaged	17.06 ±11.26	16.0		
Moderately damage	23.67 ±10.46	24.5		
Heavily damage	23.87 ±10.45	25.0		
Destructed	25.25±8.65	23.5		
Previously exposed to a destructive earthquake (6.0 and above)				
Yes	16.16±11.23	16.0	0.312	0.059
No	17.28±11.06	16.0		

**Eta square **Rank biserial correlation*

The mediating effects of earthquake stress coping strategies (with *religious coping*, *social support*, *positive reappraisal* subdimensions) on the relationship between psychiatric symptoms and peritraumatic dissociation were summarised in Table 5. Seeking social support that is a subdimension of coping strategies, was found to be a partial mediator for the relationship between depression that is a subscale of BSI and peritraumatic dissociation. Seeking social support was found to be a partial mediator for the relationship between depression and peritraumatic dissociation. Depression decreased seeking social support and increased peritraumatic dissociation (Fig.2).

Table 5. Mediation analysis of psychiatric symptoms (from BSI), PDEQ and CSES scores

Mediators	Dependent variable	Path a	Path b	Path c (Direct effect)	Path a x b (Indirect effect)
X=Anxiety (BSI)		Estimates (S.E.)	Estimates (S.E.)	Estimates (S.E.)	Estimates (95% CI)
Religious coping[a]	PDEQ	-0.0852 (0.015)***	0.0636 (0.118)	0.9607(0.050)***	-0.005 (-0.025 to 0.015)
Social support[a]	PDEQ	-0.002(0.008)	0.665(0.0218)**	0.956(0.049)***	-0.001 (-0.011 to 0.009)
Positive reappraisal[a]	PDEQ	-0.0013(0.015)	0.139(0.116)	0.957(0.049)***	-0.0019 (-0.007 to 0.003)
X=Depression (BSI)	PDEQ				
Religious coping[a]	PDEQ	-0.081(0.014)***	-0.057(0.129)	0.737(0.054)***	0.004 (-0.015 to 0.025)
Social support[a]	PDEQ	-0.002(0.007)**	0.976(0.237)***	0.736(0.005)***	-0.022 (-0.040 to -0.003)*
Positive reappraisal[a]	PDEQ	-0.47(0.015)**	0.269(0.127)*	0.754(0.053)***	-0.0129 (-0.027 to 0.0014)
X=Obsessive-compulsivity (BSI)	PDEQ				
Religious coping[a]	PDEQ	-0.0075(0.014)***	0.022(0.117)	0.959(0.049)***	-0.001(-0.01 to 0.015))
Social support[a]	PDEQ	-0.0122(0.007)	0.869(0.215)***	0.968(0.047)***	-0.001(-0.025 to 0.003)
Positive reappraisal[a]	PDEQ	-0.03(0.014)*	0.027(0.115)*	0.968(0.04)***	-0.009(0.005)
X=General severity index (BSI)	PDEQ				
Religious coping[a]	PDEQ	-0.53(0.104)***	0.009(0.119)	6.54(0.354)***	-0.005(-0.131 to 0.121)
Social support[a]	PDEQ	-0.074(0.05)	0.828(0.219)***	6.60(0.345)***	-0.613(-0.158 to 0.035)
Positive reappraisal[a]	PDEQ	-0.164(0.105)	0.191(0.118)	6.57(0.348)***	-0.031(-0.08 to 0.02)
X=Positive symptom total (BSI)	PDEQ				
Religious coping[a]	PDEQ	-0.040(0.006)***	0.088(0.122)	0.376(0.021)***	-0.003(-0.013 to 0.006)
Social support[a]	PDEQ	-0.001(0.003)	0.710(0.224)**	0.374(0.021)***	-0.001(-0.006 to 0.003)
Positive reappraisal[a]	PDEQ	-0.003(0.006)	0.112(0.119)	0.373(0.021)***	-4.22 (-0.002-0.001)
X=Positive symptom distress index (BSI)	PDEQ				
Religious coping[a]	PDEQ	-0.281(0.125)	-0.152(0.134)	4.69(0.460)***	0.042(-0.003 to 0.125)
Social support[a]	PDEQ	-0.162(0.067)*	0.884(0.241)***	4.885(0.456)***	-0.143(-0.283 to -0.002)
Positive reappraisal[a]	PDEQ	-0.350(0.121)**	0.317(0.138)*	4.853(0.459)***	-0.111(-0.232 to 0.009)

X=Predictors (BSI); *p<0.05; **p<0.01; ***p<0.001; S.E.=Standard error of estimate; CI=Confidence interval of estimates; BSI= Brief Symptom Inventory scores; PDEQ=Peritraumatic Dissociative Experiences Questionnaire Scale scores; [a]Subdimension scores of Coping Strategies with Earthquake Stress (CSES) Scale

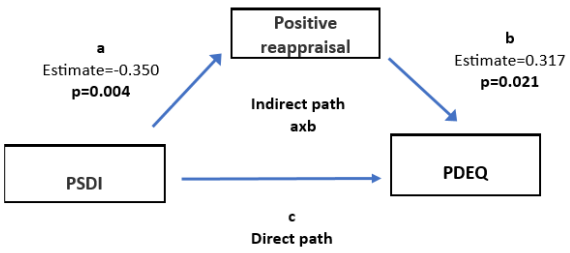

Figure 2. Mediation model diagram between PSDI, positive reappraisal subdimension of CSES and PDEQ (Positive reappraisal was found to be a complete mediator for the relationship between PSDI and peritraumatic dissociation. The increase in the distress of symptoms that the individual perceives to be present in themselves reduces positive thinking and increases dissociation.Depression decreased seeking social support and increased peritraumatic dissociation) ***p < 0.001, **p < 0.01, *p < 0.05.

NOTE: In each model, two equations were used: (1) the effect of the independent variable (PDEQ) on the mediator (path a), and (2) the effects of the mediator on the outcome variable (path b) and the independent variable on the outcome variable (path c). The direct effect of the independent variable on outcomes is given by c and the mediated or indirect effect of the independent variable is given by the product a x b to aid the reader's interpretation of mediation results; data for all other models described in the manuscript can be found in Table 5.

DISCUSSION

Dissociation is characterised by the alteration or disruption of the normally integrative functions of memory, identity and consciousness. Besides causing distress to the individual, the phenomenon of dissociation provides some benefits and gains in order

to prevent the experience of pain, terror, sadness, and the feeling of the possibility of death during the trauma, to contribute to finding solutions to some conflicts, in short, to isolate catastrophic experiences. However, the drawback of this process is observed when this mechanism is automatically activated instead of adaptations that will affect the functionality of the individual to a lesser degree even when the life of the person is not in danger in the real field. [17]

In this study, the relationship between peritraumatic dissociation and psychiatric symptoms and coping strategies with earthquake stress were evaluated in a group of university students one month after the Mw7.7 Pazarcık and Mw7.6 Elbistan earthquakes which occurred nine hours apart. It was found that obsessive-compulsivity, anxiety, phobic anxiety, and depression were the psychiatric symptoms that predicted peritraumatic dissociation, although depression was a negative predictor, and using social support strategy, one of the coping strategies with earthquake stress was the predictor of dissociation. There was a weak negative correlation between peritraumatic dissociation and religious coping strategy, a very weak positive correlation with seeking social support strategy, and a moderate positive correlation between all subscales of the CSES. Peritraumatic dissociation scores were significantly higher in females and in those with moderate or severe damage or destruction in their homes. The most common psychiatric symptoms after the earthquake were found to be eating and drinking disorders, sleep disorders, thoughts about death and dying and feelings of guilt, anxiety, interpersonal sensitivity and obsessive-compulsivity.

In the study conducted by Uğur et al. (after Mw6.8 Elazığ-Sivrice earthquake), it was found that the cognitive sub-dimension of anxiety sensitivity made the most contribution to peritraumatic dissociation, and anxiety and perceived stress were important predictors. A moderate positive relationship was found between peritraumatic dissociation and anxiety and a weak positive relationship between peritraumatic dissociation and perceived stress. A weak positive relationship was found between peritraumatic dissociation and positive reappraisal, while a very weak negative relationship was found between peritraumatic dissociation and seeking social support. The most important finding in the study was that the highest contribution to the development of peritraumatic dissociation was due to the cognitive sub-dimension of anxiety sensitivity. It was emphasised that individuals with high anxiety sensitivity might experience higher peritraumatic dissociation with a higher risk of developing PTSD in the future. [11] In the study conducted by Nobakht et al. after the 2017 Iran earthquake (Mw7.3), it was emphasised that earthquake victims who reported a higher degree of peritraumatic dissociation during or immediately after the earthquake were more vulnerable to developing PTSD and should be prioritised in terms of psychological interventions [18].

Duncan et al. evaluated peritraumatic dissociation, post-traumatic stress symptoms, anxiety, depression and emotional support in 101 adults exposed to the earthquake. Peritraumatic dissociation was found to predict post-traumatic stress symptoms and anxiety. Post-traumatic stress symptoms then predicted anxiety and depression. These findings supported the provision of psychological support following disasters

triggered by natural hazards and suggested that assessment of peritraumatic dissociation and post-traumatic stress symptoms immediately after the event might be useful to identify people in need of monitoring and intervention. [3] In the study conducted by Blanc et al. after the Haiti earthquake, significantly higher PDEQ scores were observed in terms of peritraumatic stress, PTSD symptoms and resilience measures between those who thought that the earthquake had a divine origin or was a punishment and those who did not. Peritraumatic reactions were reported as the best predictor for PTSD and depression symptoms [19]. In our study, a negative correlation was found between religious coping strategy scores, which is one of the sub-dimensions of the CSES scale, and dissociation scores (PDEQ). Cénat and Derivois in their study conducted 30 days after the Haiti earthquake, found the prevalence rates of PTSD and depressive symptoms as 36.75% and 25.98%, respectively. The best predictive variables for PTSD and depressive symptoms were reported as peritraumatic stress . [20] The American Psychiatric Association (APA) evaluated the relationship between pre-traumatic measurements and the PTSD symptom cluster and identified five peri-traumatic response factors. Dissociation was determined as an important predictor of all PTSD symptoms. Due to the fundamental role of such reactions in the development of PTSD, it will be useful to examine the etiological mechanisms to predict those at the highest risk and to design preventive interventions . [21,22] In a meta-analysis study examining the relationship between peritraumatic dissociation and post-traumatic stress, a significant positive relationship was found between peritraumatic dissociation and PTSD. [23]

Our study is one of the few studies that examined the effects of multiple disasters triggered by natural hazards that rarely occur in the world –two destructive earthquakes on the same day– which is the strength of our study, while the fact that it was conducted in a place that was relatively less affected by the earthquake is our limitation. The fact that Çukurova University Faculty of Medicine was damaged in an aftershock that occurred approximately two weeks after two major earthquakes, and the hospital suspended education and continued to shrink is another strength of ours in terms of showing the impact on students. Our students studying in clinical classes actively worked in the management of this process. Our limitation is that we used a non-probability sampling method to reach students, but the fact that we reached 89% of the population strengthens our results.

CONCLUSION

In our study, the predictors of peritraumatic dissociation were evaluated in the first month after the earthquake, and it was found that the most important predictor was the obsessive-compulsivity symptom, and the risk of peritraumatic dissociation was higher in those with high anxiety symptoms and those who sought more social support. A review of the literature showed that peritraumatic dissociation is an important factor in predicting the development of PTSD. In the early phase of disasters of natural origin such as earthquakes symptom screening will be important in terms of reducing the risk of developing PTSD by identifying individuals at risk for peritraumatic dissociation. Disasters are a significant problem affecting public health, and this also impacts the mental health of society. Intense emotional reactions

following a disaster are expected to diminish over time. However, due to the severity of the disaster, lack of social and psychological support, and the influence of risk factors, these reactions can turn into mental health issues. To mitigate the negative effects of disasters on mental health, at-risk groups should be identified, and effective psychosocial interventions that are relevant before, during, and after the disaster should be planned.

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REFERENCES

1. Wachinger G, Renn O, Begg C, Kuhlicke C. The risk perception paradox-implications for governance and communication of natural hazards. Risk Analysis. 2013;33(6): 1049–1065.
2. Dai W, Chen L, Lai Z, Li Y, Wang J, Liu A. The incidence of post-traumatic stress disorder among survivors after earthquakes: A systematic review and meta-analysis. BMC Psychiatry. 2016;16(1): 1–11.
3. Duncan E, Dorahy MJ, Hanna D, Bagshaw S, Blampied N. Psychological Responses After a Major, Fatal Earthquake: The Effect of Peritraumatic Dissociation and Posttraumatic Stress Symptoms on Anxiety and Depression. J Trauma & Dissociation. 2013;14(5): 501–518.
4. Başoğlu M, Kiliç C, Şalcioğlu E, Livanou M. Prevalence of posttraumatic stress disorder and comorbid depression in earthquake survivors in Türkiye: An epidemiological study. J Traumatic Stress. 2004;17(2): 133–141.
5. Priebe S, Grappasonni I, Mari M, Dewey M, Petrelli F, Costa A. Posttraumatic stress disorder six months after an earthquake. Soc Psychiatry Psychiatric Epidemiology. 2009;44(5): 393–397.
6. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5).. 5th Edition. Ar-lington, VA: Psychiatr Res Clin Pract; 2013.
7. Cardeña E, Spiegel D. Dissociative reactions to the San Francisco Bay Area earthquake of 1989. American Journal of Psychiatry. 1993;150(3): 474–478.
8. Rosendal S, Şalcıoğlu E, Andersen HS, Mortensen EL. Exposure characteristics and peri-trauma emotional reactions during the 2004 tsunami in Southeast Asia—what predicts posttraumatic stress and depressive symptoms? Compr Psychiatry. 2011;52(6): 630–637.
9. Bedard-Gilligan M, Zoellner LA. Dissociation and memory fragmentation in post-traumatic stress disorder: An eval-uation of the dissociative encoding hypothesis. Memory. 2012;20(3): 277–299.
10. The Republic of Türkiye Presidency - Department of Strategy and Budget. 2023 Kahramanmaraş and Hatay Earth-quakes Report. p. 36. https://www.sbb.gov.tr/wp-content/uploads/2023/03/2023-Kahramanmaras-ve-Hatay-Depremleri-Raporu.pdf (Accessed 30th May 2023).
11. Uğur K, Kartal F, Mete B, Tamam L, Demirkol ME. The Relationship Between Peritraumatic Dissociation and Anxiety Level, Perceived Stress, Anxiety Sensitivity and Coping with Earthquake Stress in Post-Earthquake Acute Stress Disorder Patients. Turk Psikiyatri Derg. 2021;23(4): 253–260.

12. Marmar CR, Metzler TJ, Otte C. The Peritraumatic Dissociative Experiences Questionnaire. In: Wilson JP, Tang CS kum (eds.) Assessing Psychological Trauma and PTSD. 2nd Edition. New York: Guilford Press; 2004. p. 144–167.

13. Geyran P, Kocabaşoğlu N, Özdemir AÇ, Yargıç İ. Validity and Reliability of Turkish Version of Peritravmatic Dissocia-tive Experiences Questionnaire (PDEQ). Yeni Symposium. 2005;43(2): 79–84.

14. Yondem ZD, Eren A. Validity and Reliability Studies of the Strategies of Coping with Earthquake Stress Scale. Turkish Psychological Counseling and Guidance Journal. 2008;3(30): 60–67. https://www.researchgate.net/publication/323202617_Deprem_Stresi_ile_Basetme_Stratejileri_Olceginin_Gecerlik_ve_Guvenirlik_Calismalari_Validity_and_Reliability_Studies_of_the_Strategies_of_Coping_with_Earthquake_Stress_Scale

15. Derogatis LR. The Brief Symptom Inventory-BSI administration, scoring and procedures manual-II. Clinical Pscyhometric Research Inc. 1992.

16. Sahin NH, Durak Batigün A, Uğurtaş S. [The validity, reliability and factor structure of the Brief Symptom Inventory (BSI)]. Turk Psikiyatri Derg. 2002;13(2): 125–135.

17. Gabbard GO. Trauma and Stressor-related Disorders and Dissociative Disorders. In: Gabbard GO (ed.) Psychodynam-ic Psychiatry in Clinical Practice. 5th Edition. Whashington DC, London: American Psychiatric Publishing; 2014. p. 281–310.

18. Nobakht HN, Ojagh FS, Dale KY. Risk factors of post-traumatic stress among survivors of the 2017 Iran earthquake: The importance of peritraumatic dissociation. Psychiatry Research. 2019;271: 702–707.

19. Blanc J, Rahill GJ, Laconi S, Mouchenik Y. Religious Beliefs, PTSD, Depression and Resilience in Survivors of the 2010 Haiti Earthquake. J Mood Anxiety Disord. 2016;190: 697–703.

20. Cénat JM, Derivois D. Assessment of prevalence and determinants of posttraumatic stress disorder and depression symptoms in adults survivors of earthquake in Haiti after 30 months. Journal of Affective Disorders. 2014;159: 111–117.

21. Regier DA. Dimensional approaches to psychiatric classification: refining the research agenda for DSM-V: an intro-duction. International Journal of Methods in Psychiatric Research. 2007;16(S1): S1–S5.

22. Massazza A, Joffe H, Hyland P, Brewin CR. The structure of peritraumatic reactions and their relationship with PTSD among disaster survivors. Journal of Abnormal Psychology. 2021;130(3): 248–259.

23. Lensvelt-Mulders G, van der Hart O, van Ochten JM, van Son MJM, Steele K, Breeman L. Relations among peritrau-matic dissociation and posttraumatic stress: A meta-analysis. Clinical Psychology Review. 2008;28(7): 1138–1151.

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ORIGINAL ARTICLE

Trends in life expectancy and life disparity in Türkiye before and during the COVID-19 period

Zehra Yayla Enfiyeci [1], Alanur Çalvin[2]

[1] MD., Hacettepe University Institute of Population Studies, Demography, Ankara, Türkiye
[2]Prof. Dr., Hacettepe University Institute of Population Studies, Demography, Ankara, Türkiye

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Abstract

Objective: This descriptive study examines Türkiye's life expectancy trends from 2013 to 2022, encompassing the COVID-19 period.

Methods: This study used the Turkish Statistical Institute (TURKSTAT) cause of death data and explored trends in life expectancy and life disparity by using the line-integral decomposition model.

Results: According to results, before the pandemic, increased male life expectancy and reduced disparity resulted from improved outcomes in unintentional injuries and malignant neoplasms during adulthood. Female life expectancy gains were driven by declining cardiovascular diseases in old age. However, during COVID-19, males experienced a greater loss of life expectancy than females in youth and adulthood, while females faced higher mortality rates in old age than males. The pandemic has exacerbated the female-male gap in life expectancy and disparity, with all causes of death increasing except for an improvement in malignant neoplasms among males.

Conclusion: The study suggests prioritizing policies that address the health challenges faced by elderly females and young/adult males to mitigate the pandemic's impact on public health.

Keywords: Causes of Death, Decomposition, Life Disparity, Life Expectancy, Türkiye

Correspondence: MD., Zehra Yayla Enfiyeci, Hacettepe University Institute of Population Studies, Demography, Ankara, Türkiye. **E-mail:** zehrayayla@hacettepe.edu.tr **Phone**: +90 535 486 74 87

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INTRODUCTION

Demographers use "lifespan" to denote the maximum age individuals can reach, while "longevity" refers to survival from one year to the next.[1] Life expectancy calculates the average years a person would live in a year based on age-specific mortality rates [2]. Life expectancy doesn't precisely indicate actual lifespan; it's influenced by current mortality rates. Lifespan variation, indicating lifespan variability or life disparity, reveals uncertainty in age at death. Higher variation suggests more uncertainty.[3] Countries with higher life expectancy tend to have lower life disparity. Although life disparity and life expectancy are inversely related, populations with the same life expectancy can differ in life disparity due to age-specific mortality improvements [3–5]This study analyses the changes in life expectancy and inequality of life in Türkiye between 2013 and 2022 by forming 3 periods: 2013-2019 (pre-COVID-19 period); 2019-2021 (COVID-19 period); and 2021-2022 (post-COVID-19 period). We used decomposition analysis to identify age and cause of death influencing changes in life expectancy and life disparity. This study also examines the contribution of age and cause of death to the female-male gap in life expectancy and life disparity for the 2013-2019 and 2020-2022 periods. This research is the first to evaluate life expectancy and life disparity patterns in Türkiye by age and cause.

The main purpose of this study is to highlight the impact of the pandemic period on mortality trend and pattern and reveal the ages and causes of death contributing to the change in life expectancy and life disparity in the pre-COVID-19 and post-COVID-19 periods. In light of the findings, the study aims to contribute to health policies to further improve mortality rates. To achieve these aims the study has four interrelated objectives: 1) To calculate changes in life expectancy and life disparity by sex for the 2013-2019, 2019-2021, and 2021-2022 periods. 2) To examine the contributions of age and cause of death to changes in these measures. 3) To analyze the sex gap (female-male) in life expectancy and life disparity for the 2013-2019 (pre-COVID-19) and 2020-2022 (during and post-COVID-19) periods. 4) To make policy recommendations based on the findings, considering the role of life disparity in understanding health inequalities and future mortality scenarios.

Importance of life disparity in public health

Life disparity in public health is crucial. It measures the certainty of when people will die and helps to understand health inequalities among subgroups. Higher disparity indicates more uncertainty in expected time of death and greater health inequalities. [6,7] Researchers and policymakers should prioritize understanding life disparity.

Particular characteristic of life disparity measures is that they give a threshold age which separates the "young-age component" from "old age component".[8] This age provides vital insights into the life expectancy- life disparity relationship. As life expectancy rises, the threshold age also increases, allowing more years to save lives at younger ages, which means that mortality is compressed to older ages.[9,10] Conversely, declining mortality at older ages leads to an expansion of mortality among the elderly. [11,12] In general, increasing life expectancy accompanies decreasing life disparity due to improved mortality rates at younger and adult ages.[4] However, some

situations may see simultaneous increases in life disparity and life expectancy due to slower reductions in young and adult age mortality alongside ongoing improvements in older age mortality.[13-14]

METHODS

Data

In this study, causes of death and population dataset were obtained from Turkish Statistical Institute (TURKSTAT) by sex, year, and single age. Causes of death were provided in the ICD-10 coded form for 2013-2022 period. The data on population were obtained from the Address-Based Population System of TURKSTAT for 2013-2022. In the data preparation process, the causes of death with ICD-10 codes were grouped according to Annex Table A of WHO technical paper for Global Health Estimates.[15] Then, garbage codes were determined and distributed to the target codes as proposed by WHO.[15] After the distribution of garbage codes, we selected top 12 causes of death for analysis.

There is a reason for choosing the 2013 as the starting year. In Türkiye, electronic death notification system was put into practice in 2013. This system has provided more complete data on deaths compared to the death registration systems in the previous year's [16,17]

Methods

In this study, we investigated the indicators of life expectancy and lifespan variation since birth. In the literature, several life dispersion indicators have been suggested to analyze the variation in lifespan.[18,19] These studies showed that since there are strong correlations between variation measures, and so used variation measure does not matter for results of the study. [4,9,18] Therefore, we used life disparity ($e^{\dagger}$), average years of life lost, to measure lifespan variation. We decomposed the age and cause of death contributions to life expectancy by using the measure of life expectancy at birth (e_0). R programming (version 4.3.0) was used for data management and further analysis. Decomposition analysis were performed with DemoDecomp package in R [20.]

Decomposition technique

Changes in life-expectancy and lifespan variation were decomposed into selected top 11 causes of death and age groups by using line-integral decomposition model proposed by Horiuchi and colleagues [21]and a general problem (the decomposition problem.

Let be differentiable function of n covariates denoted by by $x=[x_1,x_2,\ldots,x_n]$ Then y can be expressed as function of x. We can express as $y=f(x_1,x_2,\ldots,x_n)$. Any effect of x on y creates a change in . Assume that both y and x depend on time t and x is differentiable vector function of t between t_1 and t2. Then, we define the function as

$y(t)=f(x(t))=f(x_1(t),x_2(t),\ldots,x_n(t))$ and change in y between t_1 and t_2 can be expressed as,

$$y(t_2)-y(t_1)=\int_{t_1}^{t_2}\frac{d}{dt}y(t)dt=\int_{t_1}^{t_2}\left\{\sum_{i=1}^{n}\frac{\partial}{\partial x_i(t)}y(t)\frac{d}{dt}x_i(t)\right\}dt \qquad (1)$$

For simplicity, if we drop the t from equation (1), then we get,

$$y_2-y_1=\sum_{i=1}^{n}c_i \text{ where } c_i=\int_{x_{i1}}^{x_{i2}}\frac{\partial y}{\partial x_{i1}}dx_i.$$

According to this equation, is the total change in y produced by . In other words, c_i is the effect of x_i on y. According to this model life disparity ($e^{\dagger}$) and life-expectancy (e_0) correspond to dependent variable y. Covariates are age and cause specific mortality rates.

RESULTS

According to Table 1, life expectancy of both sexes increased between 2013 and 2019 and it reached to 81.0 and 75.7 for females and males, respectively. However, there was a sharp decline in life expectancy in 2020 and 2021, totaling loss 2.1 years for both females and males. In 2020 and 2021 life disparity stayed almost in the same level for both sexes. In line with life expectancy, the threshold age also decreased by a total of 1.8 and 2.2 years for females and males, respectively between 2019 and 2021.

Table 1. Distribution of life expectancy, life disparity, and threshold ages by sex and years

	Year	Life expectancy (e_0)	Life disparity ($e^\dagger$)	Threshold age
Female	2013	80.5	10.6	78.0
	2014	80.1	10.5	77.8
	2015	80.2	10.4	77.9
	2016	80.0	10.4	77.9
	2017	80.5	10.3	78.4
	2018	80.8	10.2	78.6
	2019	81.0	10.1	78.7
	2020	80.1	10.2	77.8
	2021	78.9	10.3	76.9
	2022	80.4	9.8	78.6
Male	2013	75.1	11.7	72.8
	2014	75.0	11.5	73.0
	2015	75.1	11.4	73.1
	2016	74.8	11.5	72.9
	2017	75.4	11.4	73.4
	2018	75.5	11.4	73.4
	2019	75.7	11.2	73.6
	2020	74.3	11.1	71.7
	2021	73.6	11.2	71.4
	2022	75.1	11.0	73.3

Age and cause-specific contribution

Table 2 and Figure 1 indicate the age and cause contribution to the change in life expectancy among females and males for the 2013-2019, 2019-2021, and 2021-2022 periods. In the 2013-2019 period, except for respiratory tract infections and infectious and parasitic diseases at ages 45 and over and unknown causes, all causes of death declined and enabled 0.46 and 0.65-year gains in life expectancy for females and males, respectively (Figure 1-top and Table 2). In this period, the gain in life expectancy mainly stemmed from the improvement in infant mortality and cardiovascular diseases at ages 60-90 among females. In the period 2019-2021, COVID-19 adversely affected almost all age groups, especially those aged 50-90, leading to a total loss of 1.29 years in life expectancy for females (Figure 1 and Table 2). It is noteworthy that unknown causes decreased significantly at all ages in the 2019-2021 period. In the last period, 2021-2022, the negative impact of COVID-19 was brought under control, and mortality rates decreased significantly. In this period, life expectancy among females increased by 1.51 years. When looking at the gain and loss in life expectancy among males (Figure 1-bottom), a total of 0.65 years gain in life expectancy stemmed from the improvement in infant mortality, unintentional injuries, and malignant neoplasms in the 2013-2019 period. Males have gained more years than females due to a greater improvement in male mortality rates below age 75. However, gains in life expectancy were offset by unknown causes among males. Between 2019 and 2021, males lost 2.13 years, mainly due to COVID-19 (Table 2). Although both males and females experienced similar losses during the pandemic years, the variation between the two sexes arises from the age distribution of mortality. While females faced higher losses in years beyond the age of 80, males experienced higher losses between the ages

of 20 and 70. In the pandemic improvement of malignant neoplasms enabled gain in life expectancy. In the post-COVID period, males gained 1.49 years in life expectancy mainly from the decline of COVID-19 deaths between ages 35 and 85.

Table 2. Total gain/loss in life expectancy by period and cause of death

Female	**2013-2019**	**2019-2021**	**2021-2022**
Cardiovascular diseases	0.62	-0.33	0.28
Malignant neoplasms	0.22	0.06	0.07
Respiratory diseases	0.08	-0.04	0.09
Neurological conditions	-0.02	0.04	0.01
Genitourinary diseases	-0.05	-0.01	0.03
Diabetes mellitus	0.15	-0.05	0.04
Resp.inf. & Inf.and parasitic dis.	-0.42	-0.39	0.09
COVID-19	0.00	-1.29	0.92
Neonatal conditions	0.08	-0.03	0.01
Unintentional injuries	0.13	0.01	0.00
Unknown	-0.55	-0.06	-0.05
Other	0.21	0.00	0.01
Total	**0.46**	**-2.09**	**1.51**
Male	**2013-2019**	**2019-2021**	**2021-2022**
Cardiovascular diseases	0.47	-0.35	0.24
Malignant neoplasms	0.52	0.17	0.11
Respiratory diseases	0.13	-0.03	0.09
Neurological conditions	0.02	0.02	0.01
Genitourinary diseases	-0.01	-0.04	0.05
Diabetes mellitus	0.09	-0.05	0.02
Resp.inf. & Inf.and parasitic dis.	-0.35	-0.44	0.12
COVID-19	0.00	-1.27	0.90
Neonatal conditions	0.10	-0.02	0.00
Unintentional injuries	0.30	-0.01	0.02
Unknown	-0.85	-0.08	-0.11
Other	0.22	-0.03	0.02
Total	**0.65**	**-2.13**	**1.49**

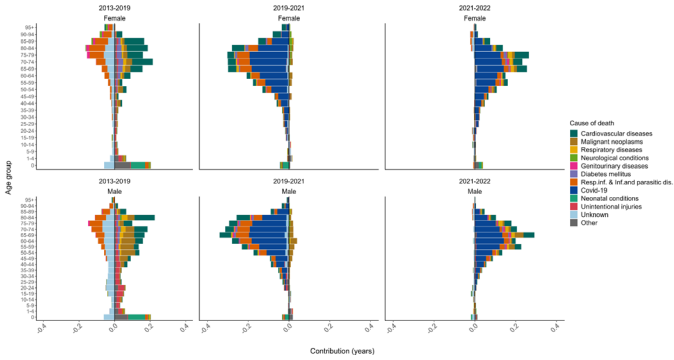

Figure 1. Age and cause-specific contribution to the change in life expectancy among females (top) and males (bottom)

In the 2013-2019 period, female life disparity decreased by 0.55 years mainly due to a decrease in neonatal diseases, and an increase in respiratory infections in aged 75 years and over (Figure 2-top). In this period, unknown causes below the age of 75 increased the life disparity. During the pandemic period, since mortality from all causes increased in all ages, all causes below age 75 increased life disparity, while all causes at age 75 and above decreased the life disparity. In total, life disparity increased 0.23 years in the pandemic period. In the 2021-2022 period, since the mortality rate of almost all causes decreased, the life disparity decreased by 0.50 years (Table 3, Figure 2-top).

Similar to females, life disparity among males decreased in the 2013-2019 period (Figure 2-bottom). The impact of improvement in young and adult mortality on the decreasing life disparity was higher among males than females in this period. This improvement was mainly driven by the improvement of unintentional injuries and malignant neoplasms below threshold age (around 75 years of age). However, in this period male's gain in life expectancy was offset by unknown causes. So, the net gain in life disparity decreased to 0.43 years (Table 3). For the period 2019-2021, males had a similar level

and pattern of life disparity to females. In the last period, since the decline of life disparity below age 75 was higher than rise of life disparity above age 75 and above, males total life disparity decreased in this period.

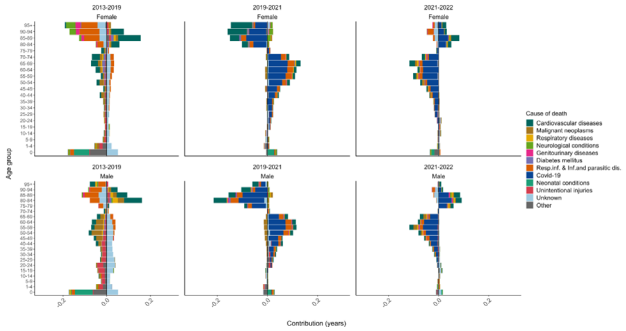

Figure 2. Age and cause-specific contribution to the change in life disparity among females (top) and males (bottom)

Table 3. Total gain/loss in life disparity (e^+) by period and cause of death

Female	**2013-2019**	**2019-2021**	**2021-2022**
Cardiovascular diseases	0.05	-0.15	0.00
Malignant neoplasms	-0.07	-0.02	-0.02
Respiratory diseases	-0.01	0.02	-0.02
Neurological conditions	-0.10	0.04	0.00
Genitourinary diseases	-0.07	0.01	-0.02
Diabetes mellitus	-0.02	-0.02	-0.01
Resp.inf. & Inf.and parasitic dis.	-0.22	0.10	-0.09
COVID-19	0,00	0.20	-0.27
Neonatal conditions	-0.07	0.03	-0.01
Unintentional injuries	-0.05	0.00	0.00
Unknown	0.14	0.04	-0.03
Other	-0.14	-0.02	-0.02
Total	**-0.55**	**0.23**	**0.50**
Male	**2013-2019**	**2019-2021**	**2021-2022**
Cardiovascular diseases	0.04	-0.08	0.01
Malignant neoplasms	-0.15	-0.05	-0.02
Respiratory diseases	0.00	0.01	0.00
Neurological conditions	-0.02	0.02	0.01
Genitourinary diseases	-0.02	0.00	0.00
Diabetes mellitus	-0.01	-0.01	-0.01
Resp.inf. & Inf.and parasitic dis.	-0.19	0.04	-0.07

Table 3. (Countinue) Total gain/loss in life disparity (e^+) by period and cause of death

COVID-19	0.00	0.02	-0.15
Neonatal conditions	-0.08	0.02	0.00
Unintentional injuries	-0.17	0.02	-0.02
Unknown	0.31	0.00	0.02
Other	-0.14	0.01	-0.01
Total	**-0.43**	**0.00**	**-0.24**

Age and cause contribution to sex gap in life expectancy

Figure 3 indicates the contribution of age groups to the female-male gap in life expectancy for each cause in the 2013-2019 and 2020-2022 periods. By this figure, if the line is above 0, it signifies that females exhibit a greater life expectancy in this cause of death, and conversely, if it is below 0, males have a longer life expectancy. As shown, females hold the advantage in all causes. The advantage females enjoy in life expectancy is mainly due to lower mortality rates than males in cardiovascular diseases, malignant neoplasms, and respiratory diseases between the ages of 45 and 80 years. While the gap in cardiovascular diseases remained almost at the same level, it narrowed significantly in malignant neoplasms between 45 and 80 years of age. At the same time, the sex gap for respiratory diseases at older ages and for unintentional injuries between ages 15 and 50 decreased, but this decline was more moderate.

On the other hand, the female-male gap in life expectancy increased due to respiratory infections, COVID-19, and other causes in the 2020-2022 period. The gap is higher between 45 and 85 for respiratory infections and COVID-19. That means respiratory infections and COVID-19 had a worse impact on males than females at these ages.

Gaps in unknown causes also increased between the two periods due to higher male mortality rates at other causes. Since the mortality rate from unknown causes increased among males aged 15-85, the female-male gap widened in advantage of females in the 2020-2022 period (Figure 3 and Table 4).

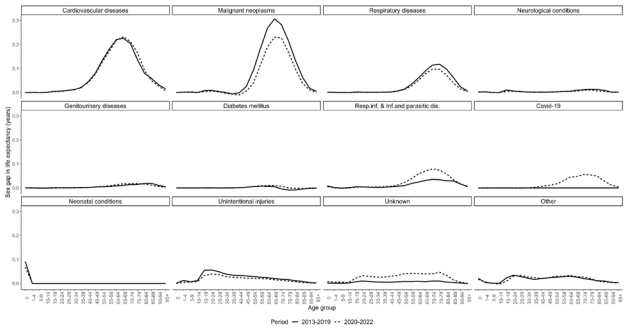

Figure 3. Sex-gap (female-male) in life expectancy by cause of death in the 2013-2019 and the 2020-2022 periods

Table 4. Female-male gap in life expectancy and life disparity by causes of death

	Life expectancy		Life disparity	
Causes of death	**2013-2019**	**2020-2022**	**2013-2019**	**2019-2022**
Cardiovascular diseases	1.47	1.48	-0.30	-0.29
Malignant neoplasms	1.61	1.12	-0.28	-0.13
Respiratory diseases	0.64	0.51	0.09	0.06
Neurological conditions	0.10	0.07	-0.01	-0.01
Genitourinary diseases	0.12	0.13	0.05	0.02
Diabetes mellitus	0.00	0.04	-0.03	-0.03
Resp.inf. & Inf.and parasitic dis.	0.28	0.50	0.04	0.02
COVID-19	0.00	0.35	0.00	0.03
Neonatal conditions	0.09	0.07	-0.08	-0.06
Unintentional injuries	0.49	0.34	-0.29	-0.2
Unknown	0.11	0.53	-0.05	-0.21
Other	0.37	0.38	-0.18	-0.19
Total gap (Female-Male)	**5.28**	**5.51**	**-1.04**	**-0.99**

Age and cause contribution to sex gap in life disparity

In Figure 4, a positive line indicates a higher life disparity for females, and a negative line suggests a higher life disparity for males. Improvements in mortality, regardless of the age at which they occur, lead to increased life expectancy; however, changes in life disparity are closely tied to the age at which mortality changes take place. In Figure 4, a consistent pattern emerges across various diseases. For cardiovascular diseases, malignant neoplasms, respiratory diseases, respiratory infections, COVID-19, and other conditions, males show greater disparity than females in young and adult ages, while females exhibit larger disparity than males at older ages. At young and adult ages, higher disparity indicates elevated mortality among males. Conversely, females' increased disparity beyond age 75 stems primarily from improved mortality in that age group. Simply put, females' mortality rate at and above 75 has consistently improved, surpassing that of elderly males and contributing to the rise in life disparity among females through the impact of 'saving lives at late ages'.

The gap in life disparity stayed almost at the same level in cardiovascular diseases. Female-male disparity gap in malignant neoplasms decreased from 2013-2019 to 2020-2022, but deaths due to malignant neoplasms are still higher among males aged 35-75. In the 2020-2022 period, males showed a higher disparity in respiratory infections and COVID-19 for ages 35-75, indicating that male mortality at those causes and ages surpassed that of females. For unknown causes, except those aged 75 and over, males exhibited higher disparity, attributed to elevated unknown male mortality in those age groups.

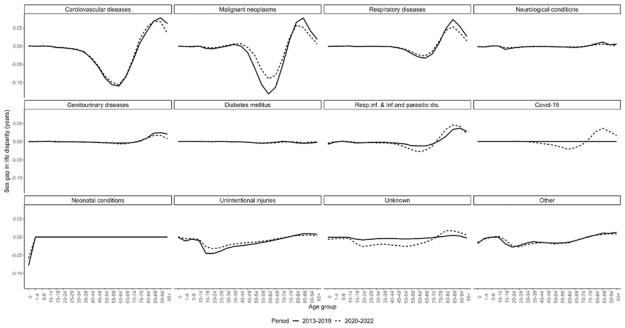

Figure 4. Sex gap (female-male) in life disparity by cause of death in the 2013-2019 and the 2020-2022 periods.

DISCUSSION

In this study, we present the analysis of the 10-year mortality profile of Türkiye by age and cause of death, focusing on sex differences and the impact of COVID-19. This study also allows us to understand the impact of the COVID-19 pandemic period on mortality patterns.

Age and cause of death contributions to changes in e(0) and e†

Life expectancy at birth in Türkiye decreased significantly in the COVID-19 period for both sexes. It should be noted that the life expectancy at birth values in the TURKSTAT life tables are slightly different from the values found in this study [22]. This is because TURKSTAT life tables are computed using the moving average method based on three consecutive years of population and mortality data. In this study, the life expectancies are calculated for each year. A decrease in mortality contributes to increased life expectancy, regardless of the age at which it occurs. However, only a reduction in mortality below a certain threshold age results in a decrease in life disparity. This suggests that factors influencing life expectancy and those influencing life disparity may not align [23]. Our study revealed that causes leading to higher life disparity differ from those contributing to increased life expectancy. Over the 2013-2019 period, improvements in cardiovascular diseases and malignant neoplasms significantly boosted life expectancy for both sexes, while a decrease in infant mortality lowered disparity. Notably, enhancements in neonatal conditions and other diseases (mainly congenital anomalies) made the greatest contributions to both life expectancy and life disparity during this period. Additionally, improvements in male mortality from unintentional injuries between ages 1 and 35 significantly increased life expectancy and reduced life disparity. Between ages 35 and 64, a decline in deaths from malignant neoplasms and cardiovascular diseases among males contributed significantly to both measures. It's important to note that cancers positively influencing life expectancy may differ from those reducing life disparity [24], warranting further analysis of cancer types. On the other hand, the gain in life expectancy for females remained relatively small compared to males, with the most significant impact on life expectancy attributed to improved cardiovascular health in older age groups and a reduction in infant mortality.

Furthermore, due to unknown causes, males lost more than half a year in the 2013-2019 period. The loss of life expectancy due to unknown causes remained relatively low among women. In Türkiye, the death notification form is typically completed by a physician [17]. If a physician is unavailable, such as in cases of out-of-hospital deaths, other authorized individuals like the officer of the burial permit, gendarme, or village head fill out the form, excluding the cause of death section. The results show that although the death registration system is quite developed and effective compared to previous years, it is not effective enough in determining the

causes of death due to inadequacies in the health system such as insufficient personnel or not easy access to health institutions for all places.

A noteworthy discovery in this study is the significant rise in respiratory infections and infectious and parasitic diseases among individuals aged 45 and above, affecting both sexes. This resulted in the highest reduction in life expectancy for both females (0.42 years) and males (0.35 years) during the 2013-2019 period. Conversely, an uptick in mortality from respiratory infections and infectious and parasitic diseases at older ages also led to the most substantial net reductions in life disparity. This finding suggests that life disparity can be lessened in two ways: firstly, by lowering the mortality rate below the threshold age, and secondly, by elevating the mortality rate above the threshold age.[8] In the first scenario, there is an increase in life expectancy and a decrease in life disparity. In the second scenario, there is a decrease in life expectancy and a reduction in life disparity. The overall mortality trend in long-lived societies involves an augmentation of life expectancy and an increase in life disparity, reflecting a pattern of "saving lives at older ages." [5,10,13,25.]

The 2019-2021 period revealed that COVID-19 directly or indirectly heightened the risk of mortality from other causes [26–28] The findings indicate that mortality from all causes, except malignant neoplasms, significantly increased during the pandemic period. The decrease in life expectancy during this time was mainly attributed to heightened mortality rates among individuals aged 50 to 85 for both sexes. Additionally, when comparing sexes, males under 75 years of age and females aged 75 years and over experienced higher mortality rates than their counterparts.

In the 2021-2022 period, COVID-19 mortality showed improvement, resulting in a 1.5-year increase in life expectancy for both sexes. The pandemic's impact on life expectancy and life disparity was nearly eradicated, with improvements in COVID-19 mortality observed across all age groups. The most significant contribution, approximately 1 year for both sexes, stemmed from the betterment of COVID-19 outcomes. Concurrent with the enhancement in COVID-19 conditions, mortality rates from cardiovascular disease and unknown causes of death also decreased during this period. As mortality improvements spanned all age groups, life disparity decreased below the age of 75 and increased above the age of 75. Overall, there was a substantial reduction in life disparity during this timeframe. However, despite the advancements in life expectancy, Türkiye still falls below the 2019 life expectancy levels for both sexes.

The study's findings can be summarized as follows: Persistent advancements in combating infant mortality, malignant neoplasms, and unintentional injuries below the threshold age contributed to the increase in life expectancy for males during the 2013-2019 period. The male population's gains in life expectancy resulted from improved young and adult mortality (compression of mortality). In contrast, females experienced increases in life expectancy due to improvements in older ages (expansion of mortality). Research evidence in the literature suggests that some countries achieved high life expectancy by leveraging advantages in old-age mortality [5,10,13] Moreover, respiratory

infections and infectious and parasitic diseases emerged as the primary factors reducing life expectancy and increasing life disparity during this period which shows that the prevalence of communicable diseases had already risen before the pandemic. The 2013-2019 period also exposed the shortcomings of the health system, as the quality of cause-of-death data significantly declined due to a substantial increase in unknown causes of death, particularly among males. Findings of the study highlighted the substantial impact of COVID-19 on existing mortality differentials in Türkiye. In the 2019-2021 period, mortality rates worsened for both sexes across all age groups, except for malignant neoplasms, all diseases with COVID-19 playing a significant role. On the other hand, in the 2021-2022 period, the pandemic's impact gradually diminished, leading to improvements in both life expectancy and life disparity.

Age and cause of death contributions to the female-male gap in e(0) and e†

The results indicated that females have a survival advantage over males at all ages and for all causes of death in terms of life expectancy. Consistent with our findings, previous research also demonstrated the female advantage in life expectancy across all age groups and causes.[29,30] Over the periods 2013-2019 and 2020-2022, the narrowing gap in life expectancy between females and males was primarily attributed to improvements in malignant neoplasms among males. Respiratory diseases and unintentional injuries also played a role in reducing the female-male gap due to improvements in these causes among males. This finding is consistent with the result of Glei and Horiuchi's study [31], which emphasized that since females' deaths are less evenly distributed across age groups, the reduction in male mortality rates contributes to the narrowing of the female-male gap in life expectancy. On the other hand, during the pandemic period, an increase in mortality from respiratory infections, infectious and parasitic diseases, COVID-19, and unknown causes of death widened the female-male gap in life expectancy. Life disparity was higher among males, driven by elevated mortality rates among males under 75 years of age for respiratory infections, infectious and parasitic diseases, COVID-19, and unknown causes. For females, life disparity was higher among those aged 75 years and older for the same causes of death. Similar to this finding, a comprehensive study that estimated changes in life expectancy during the COVID-19 period across Europe, the United States, and Chile—encompassing a total of 29 countries—also revealed that due to higher excess deaths among males, the female-male gap in life expectancy widened in favor of females. [32]

CONCLUSION

In summary, a comprehensive analysis of mortality in Türkiye from 2013 to 2022 reveals that changes in life expectancy and life disparity were primarily driven by contributions from young and adult ages (below 75) among males and elderly ages (75 and above) among females. The impact of COVID-19 was significant across all ages and both sexes. The rise in respiratory infectious and parasitic diseases during the 2013-2019 period added an extra burden during the pandemic.

The critical question now is whether Türkiye will be able to regain the life expectancy levels seen in 2019. Presently, females and males

in Türkiye are trailing behind the 2019 life expectancy by 0.6 year. Therefore, addressing mortality rates, particularly for males below 75 and females above 75, may contribute to recovering the loss in life expectancy.

Limitations of the study

The study has three main limitations. Firstly, it lacks data on the migrant population, particularly the substantial Syrian migrant community in Türkiye, which has distinct age and sex distributions compared to the native population. This absence of information hampers our ability to offer a definitive assessment of mortality patterns in Türkiye. Secondly, the cause of death data provided only includes age and sex breakdowns. As a result, this study focuses on analyzing life expectancy and life disparity for the overall population without delving into mortality patterns among different socioeconomic groups, such as educational or occupational classes. Other studies have explored variations in life expectancy and life disparity across different socioeconomic groups [6,14,27,33] The last limitation is that probability of misclassification and underreporting of COVID-19 deaths. Some COVID-19 deaths may be attributed to other causes of death like cardiovascular diseases or infectious diseases. Furthermore, dying outside of the hospital may cause the underreporting of COVID-19 deaths.[34,35]

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Author Contributions: Concept: YEZ, ÇA, Design: YEZ, Supervising: ÇA, Analysis and interpretation: YEZ, Literature search: YEZ, Writing: YEZ, Critical review: ÇA

REFERENCES

1. Weeks JR. Population: An Introduction to Concepts and Issues , Tenth Edition. 10th ed. Wadsworth Publishing; 2007.
2. Preston SH, Heuveline P, Guillot M. Demography: Measuring and Modeling Population Processes. Blackwell Publishing; 2001.
3. Aburto JM, van Raalte A. Lifespan Dispersion in Times of Life Expectancy Fluctuation: The Case of Central and Eastern Europe. Demography. 2018;55(6):2071–96.
4. Colchero F, Rau R, Jones OR, Barthold JA, Conde DA, Lenart A, et al. The emergence of longevous populations. Proc Natl Acad Sci. 2016;113(48).
5. Smits J, Monden C. Length of life inequality around the globe. Soc Sci Med. 2009;68(6):1114–23.
6. van Raalte AA, Myrskylä M, Martikainen P. The role of smoking on mortality compression: An analysis of finnish occupational social classes, 1971-2010. Demogr Res. 2015;32(1):589–620.
7. Edwards RD, Tuljapurkar S. Inequality in Life Spans and a New Perspective on Mortality Convergence Across Industrialized Countries. Popul Dev Rev. 2005;31(4):645–74.
8. Zhang Z, Vaupel JW. The age separating early deaths from late deaths. Demogr Res. 2009;20:721–30.
9. Vaupel JW, Zhang Z, van Raalte AA. Life expectancy and disparity: an international comparison of life table data. BMJ Open. 2011;1(1):e000128–e000128.
10. Shkolnikov VM, Andreev EM, Zhang Z, Oeppen J, Vaupel JW. Losses of expected lifetime in the United States and other developed countries: Methods and empirical analyses. Demography. 2011;48(1):211–39.

11. Keyfitz N. Improving life expectancy: an uphill road ahead. Am J Public Health. 1978;68(10):654–6.
12. Fries JF. The Compression of Morbidity. Milbank Mem Fund Q Health Soc. 1983;61(3):397–419.
13. Seaman R, Leyland AH, Popham F. Increasing inequality in age of death at shared levels of life expectancy: A comparative study of Scotland and England and Wales. SSM - Popul Heal. 2016;2:724–31.
14. Sasson I. Trends in Life Expectancy and Lifespan Variation by Educational Attainment: United States, 1990–2010. Demography. 2016;53(2):269–93.
15. WHO. WHO methods and data sources for country-level causes of death 2000-2016. Geneva; 2018.
16. Özdemir R, Rao C, Öcek Z, Dinç Horasan G. Reliable mortality statistics for Turkey: Are we there yet? BMC Public Health. 2015;15(1):545. Available from: http://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-015-1904-1
17. Yayla Z. Assessment of the completeness and timeliness of death registration in Turkey: 2009-2015. [Ankara]: Master thesis, Hacettepe University; 2016.
18. van Raalte AA, Caswell H. Perturbation Analysis of Indices of Lifespan Variability. Demography. 2013;50(5):1615–40.
19. Kannisto V. Mode and dispersion of the length of life. Popul English Sel. 2001;13(1):159–72.
20. Riffe T. DemoDecomp: Decompose Demographic Functions. R package version 1.0.1. 2018.
21. Horiuchi S, Wilmoth JR, Pletcher SD. A decomposition method based on a model of continuous change. Demography. 2008;45(4):785–801.
22. TURKSTAT. Single age life table for Turkey by sex, 2013-2022. 2023.
23. Aburto JM, Wensink M, van Raalte A, Lindahl-Jacobsen R. Potential gains in life expectancy by reducing inequality of lifespans in Denmark: an international comparison and cause-of-death analysis. BMC Public Health. 2018;18(1):831.
24. Seligman B, Greenberg G, Tuljapurkar S. Equity and length of lifespan are not the same. Proc Natl Acad Sci U S A. 2016;113(30):8420–3.
25. Zheng Y, Chen M, Yip PS. A Decomposition of Life Expectancy and Life Disparity: Comparison Between Hong Kong and Japan. Int J Heal Policy Manag. 2020;
26. Iadecola C, Anrather J, Kamel H. Effects of COVID-19 on the Nervous System. Cell. 2020;183(1):16-27.e1.
27. Aburto JM, Tilstra AM, Floridi G, Dowd JB. Significant impacts of the COVID-19 pandemic on race/ethnic differences in US mortality. Proc Natl Acad Sci. 2022;119(35).
28. Brown MJ, Adkins-Jackson PB, Sayed L, Wang F, Leggett A, Ryan LH. The Worst of Times: Depressive Symptoms Among Racialized Groups Living With Dementia and Cognitive Impairment During the COVID-19 Pandemic. J Aging Health. 2023;
29. Austad SN. Why women live longer than men: Sex differences in longevity. Gend Med. 2006;3(2):79–92.
30. Beltrán-Sánchez H, Finch CE, Crimmins EM. Twentieth century surge of excess adult male mortality. Proc Natl Acad Sci. 2015;112(29):8993–8.
31. Glei DA, Horiuchi S. The narrowing sex differential in life expectancy in high-income populations: Effects of differences in the age pattern of mortality. Popul Stud (NY). 2007;61(2):141–59.
32. Schöley J, Aburto JM, Kashnitsky I, Kniffka MS, Zhang L, Jaadla H, et al. Life expectancy changes since COVID-19. Nat Hum Behav. 2022;6(12):1649–59.
33. van Raalte AA, Kunst AE, Deboosere P, Leinsalu M, Lundberg O, Martikainen P, et al. More variation in lifespan in lower educated groups: Evidence from 10 European countries. Int J Epidemiol. 2011;40(6):1703–14.
34. Kisa A. Turkey's COVID-19 strategy: "the West is jealous of us." J Public Health Policy. 2021;42(4):612–21.
35. Kisa S, Kisa A. Under-reporting of COVID-19 cases in Turkey. Int J Health Plann Manage. 2020;35(5):1009–13.

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ORIGINAL ARTICLE

Community based peer supported weight loss intervention on women with overweight and obesity

Berna Bilgin Şahin [1], Erhan Eser[2]

[1]Asisst. Prof., Manisa Celal Bayar University, Faculty of Medicine, Department of Public Health, Manisa, Türkiye
[2]Prof. Dr., Manisa Celal Bayar University, Faculty of Medicine, Department of Public Health, Manisa, Türkiye

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Abstract

Objective: The purpose of this study was to assess the success of the new peer-led weight loss community intervention model in women aged 18-64.

Methods: Women leaders in the community (n = 11) were identified to supervise and monitor their target group of women during the intervention which included a balanced diet and regular physical activity program. Initially, all women aged 18–64 in the district (n = 655) were screened and 396 were found to have a BMI > 25.0. Of these, 137 volunteered to participate in the program. 86.9% of the women completed the 3rd month, and 78.1% completed the 6th month of the intervention. Univariate (Paired t-test and Wilcoxon signed rank test for dependent groups; Student's t test, Mann–Whitney U test, Kruskal–Wallis, Chi-square, and Fisher's exact test for independent groups) and Multiple Linear Regression analyses were conducted in the study. Type 1 error limit was accepted as 0.05 in the analyses.

Results: Significant improvements were observed in the body weight of the participants in the 3rd (-1.1±2.5 kg) month of the intervention ($p<0.05$). At 3rd and 6th months of the intervention, 10.9% and 13.1% of women lost at least 5% of their weight, while 8.4% and 11.2% of women jumped to a better BMI category, respectively.

Conclusion: The exercise program implemented (regardless of covariate variables) was effective on the weight loss. Community-based peer-led obesity interventions are challenging but promising.

Keywords: Obesity, Prevention And Control, Women's Health, Residence Characterictics

Correspondence: Assist. Prof., Berna Bilgin Şahin, Manisa Celal Bayar University, Faculty of Medicine, Department of Public Health, Manisa, Türkiye. **E-mail:** drbernabilgin@gmail.com **Phone**: +90 2362338586-127

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INTRODUCTION

Obesity is the second most common cause of preventable deaths globally following smoking.[1] In 2016, 13.1% of adults globally were obese, increased from 8.7% in 2000. Unlike many other health risks, the prevalence of obesity were higher among adult women than men.[2] The obesity prevalence among Turkish women is quite high[3] and Turkey is ranking first among European countries in women obesity.[4] Lifelong multidisciplinary treatment, including behavioral therapy, is required for the successful treatment of obesity.[5] Oxford dictionary defines "peer" as a person who is the same age or who has the same social status.[6]

Peer-support approaches have increasingly been used throughout the world as a health promotion strategy to bring people to address their health and social problems.[7,8]

Behavioral change therapy cannot be successful unless adequate social support is provided by relatives and close friends/ peers. Community based peer-led obesity interventions are scarcer in the literature than peer-led interventions that have been carried out in a clinical context.[9-12] Peer-led education is another non-didactic approach to learning that has been used in training health care professionals and students in a number of areas.[13,14]

Community interventions to address risk factors for Noncommunicable Diseases (NCD) are of particular importance within public health policies. While the participants in clinical intervention studies who have already reached health services and have more intention to control their weight, field interventions on the other hand, have mostly been conducted on people who are less eager to control their weight and who may have difficulties to accessing to health services. Therefore, the main difference between community based and clinic-based trials is the target populations' accessibility to the health services which affects the success of the intervention. In addition, field interventions should be simple and community-focused enough to be integrated into routine primary health care (PHC) in all regions of a country .[15]

This study aimed to demonstrate the effectiveness of the peer-led obesity intervention model in women. The applicability of this model in the primary health care setting at the community level was also demonstrated. Therefore, the purpose of our research was to reduce Body Mass Index (BMI), fat ratio, and fat amount of the targeted women through the support of their peers (leading women) by modifying nutrition intake and increasing physical activity in a rural community.

METHODS

Study design, study district and Subjects

This quasi-experimental community-based field intervention was conducted in a rural district (Karaağaçlı) of Manisa province in Turkey between April 2018 and April 2019. Manisa province, where agricultural activities are common, located in the west of Turkey which is more developed than rest of the country. The Karaağaçlı population consists of the local indigenous farmers and the population that emigrated from the Bulgaria with two separate waves of migration (1945 and 1989). The entire population living in this district receives Primary Care service from a single Family Health Center (FHC).

We named the peer-led training intervention model used in this study as "Leading Woman Model (LWM)". The study consisted of two consecutive steps: 1- Body weight screening and 2- Peer-led Field intervention.

In the first stage, all women (n=655) between the ages of 18-64 registered in the Family Health Center for were screened for height and weight. Eighteen women who were pregnant at the time were excluded from screening. 396 women who were screened as overweight or obese were invited to participate in the intervention study and 137 (38.4%) of them (BMI range of 25.00 to 39.99) volunteered in the study. The flow diagram of the study sample is presented in Figure 1.

Inclusion and exclusion criteria

The inclusion criteria were: 1-Having a BMI in the range of 25.00–39.99 kg/sqm 2- accepting to participate in the study 3- cognitive competence.

Exclusion criteria were pregnancy, breastfeeding, physical (including cancer, post-myocardial infarct, multiple sclerosis, and chronic neurologic diseases etc.) or intellectual (cognitive incompetence and having a psychotic disorder etc.) disability, morbid obesity (BMI ≥40.00 kg/sqm), and tachycardia.

Leading women

Leading Women (peer leaders) (n=12) were chosen from the community to act as trustworthy mentors and guides for the women. They were identified by a panel of community professionals including local teachers, PHC physician, nurses, and the local pharmacists. During the selection of peer leaders, characteristics such as being able to establish good interpersonal relationships, including listening skills, being someone who is accepted and respected by the target women, being able to exhibit a non-judgmental attitude, having the self-confidence and potential required for leadership, having the time, energy and desire to volunteer, and having the potential to be an exemplary individual for their peers were taken into consideration. Of the 12 women who were identified as peer leaders, 11 were overweight or obese and included in the intervention group as well. The mean age of the peer leaders was 43.5±9.6; 50.0% of this group were primary, 33.3% secondary, and 16.7% high-school graduates.

Assigning the volunteer women to the peer-leader groups

Each of the 12 peer leaders were asked to select women with whom they had good communication and social contact in daily life, among volunteers. It was ensured that the volunteer women were also willing to participate in the leader women's intervention group which they were assigned to. The range of the number of volunteer women assigned to a leading woman was 5 to 17.

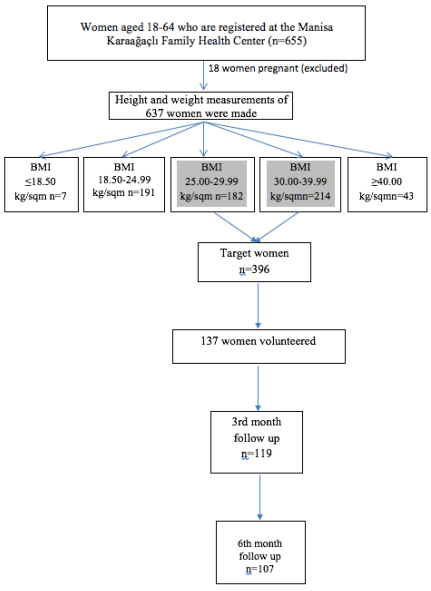

Figure 1. Sampling flow diagram

Training of the peer-leaders

Initially, the leading women were given hands-on training for 3 days on nutrition, obesity (nutrition facts, obesity as a risk factor and accompanying health problems and prevention of obesity), and physical activity (ideal duration, methods, indoor and outdoor models etc.) by the professional health staff of public health authority (a dietitian, the PHC physician and the nurse) and public health and sports medicine specialists of the Manisa Celal Bayar University (MCBU).

Baseline assessments of the volunteers

Baseline measurements of weight and height, waist and hip circumference, biometric body analyses (body fat mass, body fat ratio, trunk fat mass, trunk fat ratio, body muscle mass) were registered and International Physical Activity Questionnaire (IPAQ), Attitudes Towards Obese People scale (ATOP) and Hospital Anxiety and Depression Scale (HADS) were applied to each women.

Intervention

The intervention that underpins this study is the motivation created by peer leaders on women. The two main tasks of the leading women throughout the intervention were: 1) the communications (face to face and/or via Whats-App groups) between the leading women and the intervention group focused on their diets and, 2) organizing regular (at least once a week) exercise sessions (daily outdoor walks and physical exercises) in the neighborhood exercise and physical activity area held by the municipality. In addition, during the research, monthly motivation meetings were held with the leading women by the researchers and suggestions were made when necessary.

Assessment of the outcomes of the intervention

At the 3rd month of intervention, we measured the waist and hip circumference and weight of the volunteer women and applied the IPAQ and HADS. At the 6th month of intervention we repeated the 3rd month assessments added by biometric body analyses.

The outcomes (dependent variables) of the intervention were classified into two groups:

Weight and BMI differences

Mean body weight, waist and hip circumference differences (between baseline–3rd month–6th month of the intervention)

5% weight loss (between baseline weight loss and 6th month weight loss)

BMI category reduction: from BMI ≥25.00 (overweight/obese) to BMI <25.00 or from BMI ≥30.00 (obese) to BMI = 25.00–29.99 (between baseline–6th month of the intervention)

*Mean difference in biometric body assessments (*between *baseline and 6th month of the intervention)*

Body fat mass (trunk plus extremities)

Body fat ratio (trunk plus extremities)

Trunk fat mass

Trunk fat ratio

Body muscle mass (trunk plus extremities)

Assessment tools

Anthropometric and biometric assessments

The measurements were done in the PHC center by the researchers between June 2018 and November 2018. Body weight, body fat mass, body fat ratio, trunk fat mass, trunk fat ratio, body muscle mass, and body fat-free

mass, were recorded using a bioelectrical impedance analyzer (InBody 230). A pedometer was distributed to each participant by province health directorate during the intervention period just for motivation of the volunteer women to exercise. No valid pedometer data could be obtained or recorded.

Questionnaires

The baseline sociodemographic questionnaire includes characteristics such as age, level of education, marital status, working status, family type, health insurance, migration status and medical conditions. Baseline questionnaire battery also included Attitudes Towards Obese People scale (ATOP), International Physical Activity Questionnaire (IPAQ) and Hospital Anxiety and Depression Scale (HADS).

ATOP was used in order to measure the attitudes of women towards obesity before the onset of intervention. ATOP score was treated as a continuous variable in the analyses. No cut off score value was suggested for ATOP, the higher the score, the better the attitude towards people having obesity.[16,17]

IPAQ was included to assess the women's level of physical activity. An increase in IPAQ score indicates an increase in physical activity. IPAQ classifies respondents into three Metabolic Equivalent of Task (MET) score categories (high, moderate, and low).[18,19]

HADS was developed to evaluate the depressive mood of the women. We used only the "depression subscale" of the HADS which has a cut-off value of >7.0 indicating depressive mood.[20]

The HADS and IPAQ forms were filled in at baseline and at the 3rd and 6th month follow-up period, whereas ATOP was only tested at baseline.

Statistical analysis

The dependent variables of this study were weight loss (average weight loss, at least 5% weight loss, and BMI category decrease) and biometric variables (body muscle mass, body fat mass, body fat ratio, trunk fat mass, trunk fat ratio).The main independent variable of the study is "physical activity", whereas sociodemographic variables, attitude to obesity, baseline depressive mood; health and body image perception, family history of obesity, previous weight loss attempts, previous physical activity practices, fertility history, and having any chronic illness were treated as covariates.

Paired t-test, Wilcoxon signed rank and Friedman test were conducted for comparisons of dependent groups analyses; Student's t test, Mann–Whitney U test, Kruskal–Wallis test were used for comparisons of independent groups, where appropriate in the univariate analyses. Cochrane's Q analyses were employed for repeated measures -more than two – in dichotomous variables. Bonferroni test was used in post hoc comparisons and Bonferroni correction has been made (*critical limit: p <0.017)*. A Multiple Linear Regression model was applied to address the multiple predictive variables on weight loss. Normality analysis was performed with Shapiro-wilk test and when the data did not show a normal distribution, median comparisons were used in numerical data. The analyses were performed by SPSS 23.0 statistical package and type 1 error limit was accepted as 0.05.

Ethical issues and funding

Written informed consents were obtained

from the volunteer women in this intervention. This study was approved by the MCBU Ethics Committee, dated 21.06.2017, issue no 25160. It was granted by the MCBU Project Grant Number 2018-013. The authors declare no conflicts of interest. It is written in accordance with the Declaration of Helsinki. The full text of the article was published online at Research Square platform, without peer review.[21]

RESULTS

The mean age of the intervention group was 42.91±12.00 (IQR= 33.00-54.00) and 41.6% was primary school, and 56.2% was secondary and higher school graduates. The other sociodemographic and health characteristics of the study group are shown in Table 1.

Table 1. Sociodemographic characteristics of the participants

Variables		n	(%)
Age (years, mean ± sd)		42.91 ± 12.00	
Marital status	Married	125	91.3
	Single	4	2.9
	Widowed	8	5.8
Educational status	Illiterate	3	2.2
	Primary school	57	41.6
	Secondary school	44	32.1
	High school and further	33	24.1
Work status	Housewife	80	58.4
	Working	45	32.8
	Retired	12	8,8
Family type	Nuclear family	102	74.5
	Immediate family	35	25.5
Having any health insurance coverage?	Yes	122	89.1
	No	15	10.9
Migration status	Immigrant	46	33,6
	Native	91	66,4
Having any chronic illness?	Yes	82	59.9
	No	55	40.1
BMI index category at baseline	25.0-29.99 (overweight)	72	52.6
	30.0-34.99 (grade I obese)	40	29.2
	35.0-39.99 (grade II obese)	25	18.2
Total		137	100.0

Of the study group, 72.2% perceived themselves to be overweight/obese and just 18.3% were satisfied about their body weight before the intervention. Half of the women (49.6%) had at least one attempt to lose weight previously. Of the women, 86.9% (n=119) continued the intervention for 3 months and 78.1% (n=107) for 6 months.

When compared to the baseline measurements, 71.0% and 58.9% of the women have lost weight at the 3rd and 6th months of the intervention, respectively. Compared to baseline measurements, the mean weight loss was 1.25kg. and median weight loss was 1.0 kg at the 3rd month of intervention ($p < 0.001$), whereas mean and median weight loss at the 6th month of intervention was 1.13kg. and 0.50 kg respectively ($p = 0.037$). Statistically significant weight loss was found between baseline and third month and between baseline and sixth month, but weight loss between 3rd and 6th months was not found significant (table 2).

According to the results of biometric body analysis, at the end of the 6-month of intervention, there was a statistically significant decrease in all body fat indicators compared to the baseline, whereas a significant increase in body muscle mass was measured ($p<0.05$). The mean body muscle mass increase was 0.1 ± 4.5 kg ($p = 0.021$), and the mean body fat mass decrease was 1.7 ± 4.0 kg ($p < 0.001$) after 6 month of intervention (Table 2).

Physical activity of the participants significantly increased during the first three month of the intervention and decreased between 3rd and 6th month. While the mean MET score was 867.2±798.5 at the beginning of the intervention, it increased

to 1445.4±1444.6 at the 3rd month of the intervention and, decreased to 660.1±749.1 at the 6th month of intervention (p<0.001) (Table 2).

Table 2. Changes in Anthropometric, Biometric and MET score Measurements of the Study Group throughout the Intervention

	Baseline[1] (mean±sd)	3rd month[2] (mean±sd)	6th month[3] (mean±sd)	p	Post hoc***
Anthropometric outcomes					
Body weight	79.0±11.1	77.8±10.5	77.9±10.7	**0.001***	1>(2=3)
Waist circumference	94.6±9.2	93.6±9.4	93.3±10.3	**<0.001***	1>(2=3)
Hip circumference (median,min-max)	114.0±8.7 (114.0, 96.0-133.0)	112.7±8.4 (113.0, 96.0-128.0)	112.0±8.7 (112.0, 96.0-132.0)	**<0.001****	1>(2=3)
Biometric outcomes (mean differences)					
Body muscle mass (kg)	25.7 ± 3.2	-	26.1 ± 3.4	**<0.05****	
Body fat mass (kg)	32.4 ± 8.5	-	30.6 ± 8.4	**<0.001** *****	
Body fat ratio (%)	40.5 ± 5.9	-	38.8 ± 6.6	**<0.001** *****	
Trunk fat mass (kg)	16.7 ± 3.9	-	16.0 ± 4.1	**<0.05****	
Trunk fat ratio (%)	41.3 ± 4.9	-	39.8 ± 5.7	**<0.001** *****	
MET score**** **(mean±sd)**	867.2±798.5	1445.4±1444.6	660.1±749.1	<0.001*	2>(1=3)

* Analysis of variance was used for repeated measurements (Greenhouse-Geisser p-value taken) , **Friedman test was used , *** Post hoc; Bonferroni correction has been made; critical limit: p <0.017, **** Wilcoxon signed rank test was used, ***** Paired t test was used, ******Calculated (weekly) according to the International Physical Activity Assessment Questionnaire (IPAQ).

As a secondary outcome, the frequency of depressive mood (measured by the HADS) decreased significantly during the intervention periods especially in the first three months. The rate of depressive mood were %37.4 at baseline; %18.7 at the 3rd month and %15.9 at the 6th month of intervention (p<0.001).

Among the participants, the proportion of those who lost at least 5% of their weight was 10.9% in the first 3rd month period and 9.3% in the second 3rd month period. At the end of the whole intervention (6th month of intervention), 13.1% of the participants have lost 5% of their body weight. Additionally, the percentage of the women having reduction of their BMI category –was 8.4% in the first 3 months and 11.2% during the whole intervention period (Table 3).

Table 3. Improvements in weight loss in 3rd and 6th month of the intervention among women

	Baseline to 3rd month of the intervention (n = 119)	Baseline to 6th month of the intervention (n = 107)
Weight loss of at least 5%	10.9%	13.1%
BMI category reduction*	8.4%	11.2%

*BMI category reduction: from BMI ≥25.00 (overweight/obese) to BMI <25.00 or from BMI ≥30.00 (obese) to BMI = 25.00–29.99 (between baseline–6th month of the intervention

According to the 3rd month results of the intervention; when anthropometric changes and the factors affecting them are evaluated together, the factors that cause average weight loss were employment status, health insurance coverage, residence/immigration status and education level of the spouse. (Table 4).

Table 4. Univariate analyses results for weight difference in the 3rd month of intervention

Variables	Median weight difference (0–3 month) (min, max)		p-value
Age	18–34	-0.7 (3.2, -5.7)	0.987**
	35–49	-0.9 (5.1, -13.0)	
	50–64	-1.2 (1.7, -5.6)	
Educational status	Primary school and below	-8.8 (3.2, -13.0)	0.871*
	Secondary school and above	-1.2 (5.1, -7.9)	
Work status	Employed	-0.4 (5.1, -13.0)	**0.041***
	Unemployed	-1.2 (2.6, -7.9)	
Have any health insurance coverage?	Yes	-1.2 (5.1, -13.0)	**0.012***
	No	0.6 (2.7, -4.0)	
Migration status	Native	-1.3 (5.1, -13.0)	**0.019***
	Bulgarian migrant	-0.40 (3.20, -5.30)	
Spouse's education	Primary school and below	-1.4 (5.1, -5.6)	**0.048***
	Secondary school and above	-0.4 (3.2, -13.0)	
Baseline BMI	Obese	-1.2 (3.2, -13.0)	0.317*
	Overweight	-0.7 (5.1, -5.6)	
Have any another overweight person in the household?	Yes	-1.2 (5.1, -7.9)	0.757*
	No	-0.8 (2.4, -13.0)	
Weight satisfaction	Not satisfied / undecided	-1.0 (5.1, -13.0)	0.817*
	Satisfied	-1.0 (2.6, -5.1)	
Have any weight loss attempt before intervention?	Yes	-0.8 (5.1, -13.0)	0.715*
	No	-1.2 (2.6, -7.9)	
Have any daily TV watching habit?	Yes	-1.2 (5.1, -13.0)	0.383*
	No	-0.4 (3.2, -6.5)	
Have any risk of depression before intervention?	Yes	-1.3 (2.6, -7.9)	0.427*
	No	-0.7 (5.1, -13.0)	
MET Categories* **	Inactive	-0.7 (5.1, -4.5)	0.067**
	Minimally active	-1.2 (3.2, -13.0)	
	Active	-2.4 (0.6, -5.3)	

*Mann Whitney-U; **Kruskal Wallis Anova ;*** IPAQ

The linear regression results showed that weight loss at the 3rd month of the intervention was greater in locals than of those who had migrate, those with health insurance compared to those without health insurance, and those who exercised effectively during this period than those who did not (Table 5).

Table 5. Linear regression results for weight loss between baseline and 3rd month of intervention (backward reduced final model)*

	Standardize beta	t değeri	p değeri	VIF**
Constant		0,993	0.323	
Migration status	-0.177	-2.002	0.048	1.012
Health insurance	0.175	1.985	0.050	1.013
MET score difference (0-3 months)	-0.213	-2.425	0.017	1.002

*Adjusted by: Age, working status, health insurance coverage, Attitudes Towards Obese People scale score, Hospital Anxiety and Depression Scale score, migration status, MET score difference

**Variance Inflating Factor

DISCUSSION

This weight-loss intervention had promising results in the first 3 months of intervention, however the weight loss indicators (either any weight loss or at least 5% weight loss or standard BMI index category reduction) of our study was less than other similar studies.

Mean weight loss during the first three months of the intervention was 1.14 ± 2.51 kg (median= 1.0 kg). Different intervention studies reported different results, such as the mean weight loss was 2.8 kg in a study conducted in an urban district in Turkey[22]; 2.1 kg weight loss in a study in Japan[23] intervention by telephone and mails, known as 'tele-care' and 6.4 lbs (2.9 kg) weight loss in a study in the USA[24] were found, as all were more than the weight loss achieved in our study.

In other studies that have used "losing at least 5% of body weight" as the weight loss criterion, which is a more competent indicator than any weight loss, seem to show more effective results than our study. About more than one in 10 women showed 5% or higher weight loss at the end of the 3rd month of the intervention in our study whereas the rate of individuals who have lost at least 5% their body weight varied between 20.0% and 24.7% in other previous intervention studies, indicating a better success rate than our results.[22,24,25] Additionally, BMI index category reduction is another valuable outcome for the assessment of success in weight loss interventions. The percentage of women whose BMI category reduced in the first 3 months of the intervention was 8.4%, and it was 11.2% for the whole 6 month of intervention period. BMI category reduction rate ranged between 23.6% and 27.9% in other intervention studies [22,26,27] and these are obviously higher than our study findings. On the other hand, the rate of BMI category reduction was found to be about 6.5% in a recent rural field obesity intervention in Turkey based on only a public mass education campaign. This might provide good evidence of the usefulness of our peer-based intervention in a rural district.[28]

In contrary to our study, all these studies were carried out on urban populations, therefore the higher weight loss figures in these studies, compared to our study may be attributed to either higher level of education of the urban women or the higher willingness of the urban women to be involved in the intervention than the women in our study. Also, almost all the previous interventions cited here were all facility-based that are concentrated on obesity control and weight loss, which people had applied on their free will and without secondary propaganda, but the women in our study were asked and invited to participate ~~to~~ in the intervention rather than searching and applying to the PHC centers voluntarily. Our intervention program distinguishes by its specific peer-based support method carried out in a rural district, so cultural codes are highly to be effective and determining for the behaviors of the participated women, especially in rural populations. Indeed, an Australian study reported that, gender norms and expectations, which are more decisive in rural populations are shaping and limiting the exercise behavior.[29]

The higher weight loss figures observed in these studies compared to ours may be attributed to specific difficulties of our field intervention. We can explain this inconsistency, as the women in our study did not have a pre-intervention demand for weight loss, whereas in the majority of the

previous obesity interventions, a person having obesity would deliberately go to a clinic to lose weight. Therefore, the observed success of the intervention—although not as good as an facility-based intervention—is more realistic, and the results can be more generalizable.

The improvements of the anthropometric measurements in the first three months of the intervention were significantly better than the second three months of intervention. The intervention was started in the summer months when people were more physically active in the field work (e.g., vineyard farming activities), and lasted until the end of fall when heavy rains start. Therefore, the decrease in weight loss in the second three month period of the intervention might be attributed to the decrease of physical activity during this period.

Biometric body analyses – as a second group of outcome of this study- were performed at the beginning and repeated at the 6th month of follow-up. The reason why these analyses were not performed at the 3rd month is that significant changes in biometric parameters are expected at earliest at the 6th month of follow-up .

The predictors of weight loss in this study were having higher education, having a low-educated spouse, being a local and being unemployed. It was demonstrated in several obesity interventions that higher educated people would benefit from community-based health promotion programs more than others.[30,31]

There might be several reasons for this difference. First, migration itself is associated with overweight/obesity risk and nutrition transition. This may be explained by the cultural aspects of food consumption and that families of Balkan origin tend to consume more pastry than local families. As previous studies show that it is always more difficult for immigrants to follow health promotion activities than the local population.[32]

Secondly, another demotivating factor is that creating a balance between weight loss program and the family routines, since devoting time to activities of health promotion and physical activity appear to difficult for adults having obesity.[33] On the other hand, pressure by spouses on women to maintain accustomed family eating order might be another reason for loss of motivation. The positive effects of family solidarity and partner support during obesity treatment have also shown to be effective in a previous study.[34]

Finally our multivariate analyses results revealed that one of the main determinants of adherence to a weight-loss regime is the attitude toward obesity. In several studies, conceptually based on Theory of Planned Behavior.[35] on weight loss attempt, showed that attitude towards obesity affects weight loss intention which favors to our study results.[36-39]

Our study has limitations: 1) we did not set a weight-loss a specific target for women at the beginning of the intervention, as it had been done in some other intervention studies.[40] 2) the short duration of this intervention might have been masked its long-term residual effects, and further monitoring of the volunteer women will be required. 3) the fact that no standard method was followed regarding the distribution of women to women's leadership groups could lead to bias. However, if the distribution had been random, the possibility that some women would fall

into groups of leading women with whom they had previous social problems might have led to a greater bias. 4) the other intervention item that was intended to be used at the beginnig of this study, along with physical activity, was balanced diet. For this purpose, diet lists were distributed to all women, in addition to nutrition training provided to the leading women by a dietitian, but no significant feedback was received from the peer leaders regarding the nutritional status of the women in their groups. This made it impossible for us to generate sufficient data on the nutritional aspect of the weight loss intervention program. 5) and finally, the fact that the spouses of the women were not included in the intervention could have been a factor that decreased the success of the intervention since nutritional behavior itself is a commune and cultural behavior that all members of the family usually perform.

CONCLUSION

To reach passive and less voluntary groups in communities, community-based obesity interventions are much more promising than facility-based interventions.

In this intervention study, which aimed to have overweight and women having obesity to lose weight with a peer support at the primary care level. The participants lost a significant amount of weight, however more weight loss was achieved in the first three months of the intervention rather than the second 3 months and the women were not able to sustain the mentioned weight loss in the second three months. Although it is much more difficult to maintain, along with the use of appropriate technology we suggest a very new leading women intervention approach for rural, community-based obesity interventions. Further studies are needed to reveal the factors that play a role in maintaining weight loss in primary care obesity interventions.

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REFERENCES

1. Türkiye Endokrinoloji ve Metabolizma Derneği. Obezite Tanı ve Tedavi Kılavuzu. Ankara; 2019. Available at: https://file.temd.org.tr/Uploads/publications/guides/documents/20190506163904-2019tbl_kilavuz5ccdcb9e5d.pdf?a=1. Accessed August 9,2024
2. WHO. World health statistics 2023: monitoring health for the SDGs, sustainable development

goals [online]. Available at: https://www.who.int/publications/i/item/9789240074323. Accessed August 9,2024

3. WHO. Global Health Observatory (GHO) data-Turkey [online]. 2016. Available at: https://www.who.int/nmh/countries/tur_en.pdf?ua=1. Accessed August 9,2024

4. Timmis A, Townsend N, Gale C et al. European Society of Cardiology: Cardiovascular Disease Statistics 2017. Eur Heart J. 2018;39(7):508-79.

5. Bray GA. Use and Abuse of Appetite-Suppressant Drugs in the Treatment of Obesity. Ann Intern Med. 1993;119(7_Part_2):707-13.

6. Lea D, Bradbery J. Oxford Adavnced Learner's Dictionaries. 10th ed. Oxford University Press.

7. Yaslı G , Horasan G , Batı H . Gençlerde sigaradan korunma konusunda akran eğitimi programının etkinliği. Turk J of Public Health. 2012; 10(2): 59-67. (in Turkish).

8. Bulduk, S, Erdogan S. The effects of peer education on reduction of the HIV/sexually transmitted infection risk behaviors among Turkish university students. JANAC 2012;23(3): 233-243.

9. Hageman PA, Pullen CH, Hertzog M, Pozehl B, Eisenhauer C, Boeckner LS. Web-Based Interventions Alone or Supplemented with Peer-Led Support or Professional Email Counseling for Weight Loss and Weight Maintenance in Women from Rural Communities: Results of a Clinical Trial. J Obes. 2017;(1):1602627

10. Cherrington AL, Willig AL, Agne AA, Fowler MC, Dutton GR, Scarinci IC. Development of a theory-based, peer support intervention to promote weight loss among Latina immigrants. BMC Obesity. 2015;2(7):1-9.

11. Barnes RD, White MA, Martino S, Grilo CM. A randomized controlled trial comparing scalable weight loss treatments in primary care. Obesity. 2014;22(12):2508-16.

12. Barr-Anderson DJ, Laska MN, Veblen-Mortenson S, Farbakhsh K, Dudovitz B, Story M. A School-Based, Peer Leadership Physical Activity Intervention for 6th Graders: Feasibility and Results of a Pilot Study. JPAH 2012;9(4):492-9.

13. Colvin JW. Peer tutoring and social dynamics in higher education. Mentoring & tutoring. 2007;15(2):165–181.

14. Santee J, Garavalia L. Peer tutoring programs in health professions schools. Am J Pharm Educ. 2006;70(3):Article 70.

15. Hohmann, AA, Shear MK. Community-based intervention research: Coping with the "noise" of real life in study design. Am J Psychiat 2002; 159(2), 201-207

16. David BA, Vincent CB, Harold EY. The Measurement of Attitudes Toward and Beliefs About Obese Persons. Int j Eat Disorder 1991; 10(5), 599-607.

17. Dedeli O, Bursalioglu SA, Deveci A. Validity and reliability of the Turkish version of the attitudes toward obese persons scale and the beliefs about obese persons scale. Clinical Nursing Studies. 2014;2(4):105-17.

18. Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) – Short and Long Forms. 2005. Available at: file:///C:/Users/HP/Downloads/ActivityQuestionnaireIPAQShortandLongForms.pdf. Accessed August 9,2024

19. Öztürk M. A research on reliability and validity of international physical activity questionnaire and determination of physical activity level in university students. Master's Thesis. Ankara: T.C. Hacettepe Üniversitesi; 2005.

20. Aydemir Ö. T Guvenir, L Kuey, S Kultur. Validity and Reliability of Turkish Version of Hospital Anxiety and Depression Scale. Turk Psikiyatri Derg. 1997;4(8).

21. Sahin, BB, Eser E. Effectiveness of a Peer Support Intervention Program on Obesity Control Among Women in a Rural Area of Turkey. 2021 (DOI: https://doi.org/10.21203/rs.3.rs-970741/v1)

22. Sevim Yilmaz T, Ergör G. "Effect of behavioral approach on weight loss in overweight and obese women at the primary care" EJPH 25.suppl_3 (2015): ckv175-251.

23. Takada A, Nakamura R, Furukawa M, Takahashi Y, Nishimura S, Kosugi S. The Relatıonshıp Between Weıght Loss And Tıme And Rısk Preference Parameters: A Randomızed Controlled Trıal. J Biosoc Sci,. 2011;43(04):481-503.

24. Bennett GG, Warner ET, Glasgow RE et al. Obesity Treatment for Socioeconomically Disadvantaged Patients in Primary Care Practice. Arch Intern Med. 2012;172(7):565-74.

25. Greaves CJ, Middlebrooke A, O'Loughlin L et al. Motivational interviewing for modifying diabetes risk: a randomised controlled trial. Br J Gen Pract 2008;58(553):535-40.

26. Appel LJ, Clark JM, Yeh HC et al. Comparative Effectiveness of Weight-Loss Interventions in Clinical Practice. N Engl J Med. 2011;365(21):1959-68.

27. Karataş ME, Günay T. The Effect of Behavioral Treatment on Nutritional Behaviors of Obese Women. Bes Diy Derg [Internet]. 2013; 41(3):194-201. Available at: https://beslenmevediyetdergisi.org/index.php/bdd/article/view/228. Accessed

August 9,2024

28. Bayburtluoğlu C, Öztürk S, Yılmaz M, Cerit Ç. Obezite Kaderimiz Değil (Kırklareli Pınarhisar Örneği). 2. International 20. National Public Health Congress Proceedings Book.; 2018. s. 972-3. Available at: https://www.halksagligiokulu.org/Kitap/DownloadEBook/e16c1443-8948-4b54-be93-c64133191bfa. Accessed August 9,2024

29. Kozica SL, Harrison CL, Teede HJ, Ng S, Moran LJ, Lombard CB. Engaging rural women in healthy lifestyle programs: insights from a randomized controlled trial. Trials 2015;16(1):413.

30. Austin JL, Smith JE, Gianini L, Campos-Melady M. Attitudinal familism predicts weight management adherence in Mexican–American women. J Behav Med 2013;36:259-69.

31. Kong A, Beresford SAA, Imayama I et al. Adoption of diet-related self-monitoring behaviors varies by race/ethnicity, education, and baseline binge eating score among overweight-to-obese postmenopausal women in a 12-month dietary weight loss intervention. Nutr Res. 2012;32(4):260-5.

32. Elfhag K, Rössner S. Initial weight loss is the best predictor for success in obesity treatment and sociodemographic liabilities increase risk for drop-out. PEC 2010; (79):361-6.

33. Burgess E, Hassmén P, Pumpa KL. Determinants of adherence to lifestyle intervention in adults with obesity: a systematic review. Clinical Obesity 2017; 7:123-35.

34. Perry B, Ciciurkaite G, Brady CF, Garcia J. Partner Influence in Diet and Exercise Behaviors: Testing Behavior Modeling, Social Control, and Normative Body Size. PLoS One 2016; 11(12), e0169193.

35. Ajzen, I. The theory of planned behavior. Organizational behavior and human decision processes 1991; 50(2), 179-211.

36. Gillison F, Stathi A, Reddy P. et al. Processes of behavior change and weight loss in a theory-based weight loss intervention program: a test of the process model for lifestyle behavior change. Int J Behav Nutr Phys Act 2015; 12,2.

37. Varkevisser RDM, Van Stralen MM, Kroeze W, Ket JCF, Steenhuis IHM. Determinants of weight loss maintenance: a systematic review. Obes Rev. 2019; 20(2):171-211.

38. Chung LM, Fong SS. Predicting actual weight loss: A review of the determinants according to the theory of planned behaviour. Health Psychol Open 2015; 15;2(1)

39. Cheng OY, Yam CLY, Cheung NS, Lee PLP, Ngai MC, Lin CY. Extended Theory of Planned Behavior on Eating and Physical Activity. Am J Health Behav. 2019; 1;43(3):569-581.

40. Dombrowski SU, Knittle K, Avenell A, Araújo-Soares V, Sniehotta FF. Long term maintenance of weight loss with non-surgical interventions in obese adults: systematic review and meta-analyses of randomised controlled trials. BMJ 2014; 348:g2646.

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ORIGINAL ARTICLE

Detection and distribution of residues and additives in meat and meat products in Zenica-Doboj canton, Bosnia and Herzegovina

Dženana Hasanbašić [1], Ćamka Kovač[1], Amir Ibrahimagić[2]

[1]Expert Associate for Chemistry, Institute for Health and Food Safety, Department for Chemical Diagnostics, Zenica, Bosnia and Herzegovina
[2]Prof. Dr., Institute for Health and Food Safety, Department for Chemical Diagnostics, Zenica, Bosnia and Herzegovina

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Abstract

Objective: Many additives are of essential importance for the taste and quality of products, however, many of them pose a danger to human health, and are subject to daily routine quality control of products intended for human consumption. In addition to additives, residues represent a major challenge as possible contaminants of products from the field to the dining table.

Methods: Through the research, 85 samples of meat products (fresh meat, salami, sausages, dried meat products) were processed and all were analyzed for the presence of aflatoxin B1 (AFL B1), as well as for chlorides, nitrites and heavy metals (cadmium and lead).

Results: The average content of AFL B1 in the meat samples was 0.048 µg/kg (0.019 to 0.105 µg/kg) which is significantly lower than the recommended value in some European countries (1 µg/kg). Chloride content was detected in the range from 0.000 to 9.955 %m/m (average concentration 2.377 %m/m). The average nitrite content was 8.330 mg/kg (min. 0.550 – max. 45.705 mg/kg), and maximum permitted levels in meat products is 150 mg/kg. Among the 85 processed samples, lead and cadmium were detected in 79 and 29 products (92.94% and 34.11%), with an average of 0.136 and 0.042 mg/kg, respectively. Lead was detected in the range from 0.000 to 3.474 mg/kg, and cadmium from 0.000 to 2.544 mg/kg. Maximum permitted level for lead si 0.1 mg/kg, and for cadmium is 0.05 mg/kg, so this results are very concerning

Conclusion: The results show the need for continuous monitoring of the amount of additives in meet products on the market, and regular monitoring of residues in products intended for human consumption. It is necessary to stick to proper hygienic practices during the preparation of the product at all stages from the field to the dining table.

Keywords: Aflatoxin B1, Nitrite, Chloride, Lead, Cadmium, Meat Products, Health Riscs

Correspondence: Prof. Dr., Amir Ibrahimagić, Institute for Health and Food Safety, Department for Chemical Diagnostics, Zenica, Bosnia and Herzegovina. **E-mail:** ibrahimagic.amir@gmail.com **Phone**: 038761614147

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INTRODUCTION

Since time immemorial, it has been recognized that food serves as the cornerstone of human health. Dietary habits and human nutritional requirements have evolved in tandem with technological and industrial advancements throughout history. The journey from field to table was considerably shorter, as food was prepared and consumed at home within a shorter time frame. However, this trajectory has substantially elongated, amplifying the number of risks that impact the safety of our food.[1]

One such risk is the potential contamination by various types of toxins, including mycotoxins, heavy metals, pesticides, etc. Such contamination can occur during the production, storage, and distribution of food products, with the source of these toxins emanating from the environment, raw materials, or arising during the food processing itself.[2] Another risk associated with the extension of the field-to-table journey is the use of food additives. In some instances, their use remains unregulated and may have adverse implications for human health.

Mycotoxins are secondary metabolites synthesized by molds during their growth on substrates of both plant and animal origin. According to Food and Agriculture Organization (FAO) statistics, mycotoxin-producing fungal species damage one-fourth (25%) of all agricultural products worldwide.[3] The occurrence of mycotoxins is contingent upon factors such as the specific mold species, climatic conditions, as well as various physicochemical elements including temperature, moisture content in food, gas concentrations in the atmosphere, and others. Among the aflatoxins identified, AFL B1 is the most widely distributed and most harmful substance.[4] This mycotoxin is of significant concern in the field of food safety and public health. AFL B1 is classified by the International Agency of Research on Cancer (IARC) as a Group 1 carcinogen, with high risks for hepatocellular carcinoma (HCC) in individuals exposed to aflatoxins.[5]

Heavy metals are defined as metals with a density greater than 5 g/cm^3. They gradually accumulate in the food chain and have adverse effects on human health. Their toxicity depends on several factors, including dosage, exposure route, chemical species, as well as the age, gender, genetics, and nutritional status of exposed individuals.[6] Due to their high degree of toxicity, cadmium, lead, arsenic, chromium, and mercury are classified as priority metals of public health concern. Several acute and chronic toxic effects of heavy metals affect different body organs. Gastrointestinal and kidney dysfunction, nervous system disorders, skin lesions, vascular damage, immune system dysfunction, birth defects, and cancer are examples of the complications of heavy metals toxic effects. Simultaneous exposure to two or more metals may have cumulative effects .[7] Lead affects the function and structure of the kidneys, bones, the central nervous system, and results in harmful biochemical, histopathological, neuropsychological, fetotoxic, and reproductive effects. Heavy metal cadmium is a Group 1 carcinogen and currently ranked 7th on the 2022 Agency for Toxic Substances and Disease Registry (ATSDR) and EPA list of hazardous substances.[8] Recent epidemiological data indicate that Cd exposure may be associated with prostate cancer, bladder cancer, pancreatic cancer, and kidney cancer[9]

Additives are substances or mixtures of substances added to meat and other food products during production, processing, packaging, storage, or transportation to enhance their qualitative characteristics, including appearance, taste, smell, color, texture, and shelf life.[10] Additives are categorized into various groups, including preservatives, antioxidants and synergists of antioxidants, flavor enhancers, emulsifiers, thickeners, binding agents, gelling agents, colorants, sweeteners, acid regulators, enzyme preparations, and other additives.[11] It's important to distinguish additives from spices, such as common table salt (NaCl) and herbs, which are not considered additives. In the meat industry, nitrites have found widespread application as additives, while salt is utilized as a seasoning or an ingredient in brine mixtures for curing. Nitritesin meat and meat products belong to the group of preservatives. They improve the quality, shelf life, and safety of products, primarily by inhibiting the growth and reproduction of bacteria like *Staphylococcus aureus* and *Clostridium botulinum.* Nitrites also influence the color, smell, taste, and texture of meat products. Despite their beneficial characteristics as preservatives, their use has a detrimental impact on human health, and efforts are made to minimize their usage.[12] Additionally, kitchen salt, aside from enhancing meat flavor, inhibits the growth and reproduction of bacteria, reduces water activity in meat, and affects water-binding capacity.[13]

The aim of the research is to examine the quality of meat in terms of mycotoxins, nitrites, chlorides, lead, and cadmium, and compare it with existing regulatory limits. Since there are no regulatory limits for mycotoxins or salts, the objective of the study is also to emphasize the importance of establishing regulatory limits for all parameters, thereby reducing the potential for manipulation by producers. In Bosnia and Herzegovina, producers are not legally required to undergo mandatory testing of meat and meat products for these parameters. Inspection officials at all levels of administration conduct official product controls; however, their numbers are limited and often do not include the mentioned parameters.

METHODS

The research was conducted at the Chemical department in Institute for Health and Food Safety in Zenica, under the auspices of the Ministry of Agriculture, Water Management, and Forestry of the Zenica-Doboj Canton. The study encompassed 85 different samples of meat and meat products available in the largest retail chain in Bosnia and Herzegovina, aiming to assess the market status accessible to every consumer. The study included products from a large number of manufacturers, both domestic and imported. After collecting the products, they were sorted in the laboratory, homogenized, and prepared for analysis. Nitrite analysis was conducted first due to methodological requirements, and then followed by the other analyses. All samples were stored in plastic packaging, frozen, and kept until the end of the testing.

Aflatoxin B1

Determination of aflatoxin B1 was performed using the immunoenzymatic method on an ELISA device (LABTRONE LMPR-A20) in accordance with the manufacturer's specification. The homogenized meat sample (2±0.05 g) was put into a 50 ml centrifuge

tube, then added 8 ml of ethyl acetate, oscilated for 5 min, centrifuged at room temperature (4000xg, 10 min). After that 2 ml supernatant was taken, dried with water bath at 50° C. The residual was dissolved with 2 ml of N-hexane, oscilated for 1 min, added 1 ml of Sample Diluent A, and centrifuged at room temperature (4000xg, 5 min). After that 50µl of the lower liquid was taken, and the content of AFL B1 was determined by ELISA kit (Art. No. E-TO-E017, Elabscience Biotechnology).

Lead and Cadmium

The determination of lead and cadmium was carried out using a standard method.[14] The homogenized meat sample (0.5 g) was put into a 70 ml vessel, then added 1 ml of deionized water, 8 ml of nitric acid (not less than 65 % mass fraction) and 1 ml of hydrochloric acid. The vesseles were sealed and samles were digested as prescribed by manufacturer (Anton Paar Multiwave ECO). The graphite technique method was used for determination, and examples of wavelength, gas mixture/temperature programmes and other instrumental parameters appropriate for each metal are found in manuals provided with the instrument (GBC SavantAA Z enduro).

Nitrite

The nitrite content determined according to the procedure described in International standard[15] and expressed as milligrams of sodium nitrite per kilogram. The method's principle is extraction of test portion with hot water, precipitation of the proteins and filtration, in the presence of nitrite development of a red colour by addition of sulphanilamide and N-1- naphthyl ethylenediamine dihydrochloride to the filtrate and photometric measurement at wavelength of 538 nm. For the photometric measurement was used Shimadzu spectrofotometer UV-2600.

Chloride

Determination of chloride content was according to standard procedure based on Volhard method.[16] The method's principle is extraction of test portion with hot water and precipitation of the proteins, after filtration and acidification, addition of an exces of silver nitrate solution to the extract, and titration of this excess with potassium thiocyanate solutin.

RESULTS

The average content of AFL B1 in the samples was 0.048 µg/kg (with a range of 0.019 to 0.105 µg/kg). Results of AFL B1 residue levels ranged from 0.019 to 0.105 with an average value of 0.051 µg/kg for beef products; 0.019 to 0.090 with an average value of 0.047 µg/kg for chicken products; 0.032 to 0.105 with an average value of 0.048 µg/kg for Türkiye products; and 0.034 to 0.042 with an average value of 0.038 µg/kg for pork product (Table 1).

Table 1. Concentration of AFL B1 in different kinds of meat product

Meat products	Mean value	Highest value	Lowest value	Maximum permitted levels
Aflatoxin B1 (µg/kg)				
Beef products	0.051	0.105	0.019	*
Chicken products	0.047	0.090	0.019	*
Türkiye products	0.048	0.105	0.032	*
Pork products	0.038	0.042	0.034	*

* The Regulation does not define the content of aflatoxin B1 in meat products

The legislative framework in the EU establishes maximum levels (MLs) for mycotoxins in various types of food through Commission Regulation No. 1881/2006 and additionally through Commission Regulation No. 165/2010, specifically for AFB1. However, these regulations do not prescribe MLs for these mycotoxins in meat and meat products. Nonetheless, some EU countries such as Italy and Denmark have set MLs of 1 μg/kg for this group of products (meat, meat products, and offal) under their national legislation. In Bosnia and Herzegovina, national legislation in this area has not been established, but producers should be aware of the potential for contamination and should implement systematic mycotoxin control measures.

Among the 85 processed samples, lead was detected in 79 and cadmium was detected in 29 products (92.94% and 34.11%), with an average of 0.136 and 0.042 mg/kg. Lead was detected in the range from 0.000 to 3.474 mg/kg, and cadmium from 0.000 to 2.544 mg/kg. According to all results, the lead content exceeded the maximum permitted limit (MPL) for meat (0.1 mg/kg) in 24% of samples,while the cadmium content exceeded the MPL for meat (0.05 mg/kg) in 6% of samples. Concentracions of lead and cadmium in different kinds of meat products are shown in Table 2.

Table 2. Concentracions of lead and cadmium in different kinds of meat products

Meat products	Mean value	Highest value	Lowest value	Maximum permitted level
Lead (mg/kg)				
Beef products	0.234	3.474	0.000	0.10
Chicken products	0.089	1.416	0.000	0.10
Türkiye products	0.023	0.117	0.000	0.10
Pork products	0.068	0.088	0.049	0.10
Cadmium (mg/kg)				
Beef products	0.09585	2.544	0.000	0.050
Chicken products	0.00705	0.091	0.000	0.050
Türkiye products	0.00756	0.037	0.000	0.050
Pork products	0.00000	0.000	0.000	0.050

The average nitrite content was 8.330 mg/kg (min. 0.550 – max. 45.705 mg/kg). Table 3. shows average concentracion of nitrites in different meat categories, depending on their thermal proccesing. The average nitrite concentrations were 11.396 mg/kg in smoked meat, 10.721 mg/kg in sausages, 6.145 mg/kg in bacon, 4.712 mg/kg in dried meat, and 8.861 mg/kg in fresh meat.

According to the Regulation on Food Additives (Official Gazette of BiH, No. 33/18), the maximum permitted level of nitrites in the tested types of meat products is set at 150 mg/kg, and therefore, all samples are below the prescribed limit. However, this Regulation does not regulate the content of nitrites in fresh meat. The Regulation on Minced Meat, Semi-Processed, and Meat Products (Official Gazette of BiH, No. 82/13) defines fresh meat as all edible parts of the animal that have not undergone any preservation process except chilling or freezing. Based on this definition, it can be concluded that none of the tested samples of fresh meat meet the specified criteria.

Table 3. Concentracion of nitrites in different meat categories

Meat categories	Mean value	Highest value	Lowest value	Maximum permitted level
			Nitrite (mg/kg)	
Smoked meat	11.396	23.290	1.320	150
Sausages	10.721	45.705	0.985	150
Bacon	6.145	11.184	2.413	150
Dried meat	4.712	12.110	1.180	150
Fresh meat	8.861	24.205	1.085	0

Chloride content was detected in the range from 0.000 to 9.955%m/m (average concentration 2.377%m/m). The average chloride concentrations were 1.85% in smoked meat, 2.04% in sausages, 9.96% in bacon, 3.92% in dried meat, and 1.04% in fresh meat. Bacon have the highest concentracion of chlorides (Table 4).

Table 4. Concentracion of chloride in different meat categories

Meat categories	Mean value	Highest value	Lowest value	Maximum permitted level
			Chloride (%)	
Smoked meat	1.854	2.975	1.330	*
Sausages	2.038	3.970	1.220	*
Bacon	9.955	13.654	4.781	*
Dried meat	3.917	5.950	3.090	*
Fresh meat	1.043	2.260	0.000	*

* The Regulation does not define the content of chloride in meats

The Regulation on Minced Meat, Semi-Processed, and Meat Products (Official Gazette of BiH, No. 82/13) does not define the chloride or salt content in any category. Through the discussion, we will reflect on the recommended values from previous studies in the region.

DISCUSSION

The highest concentration of AFL B1 is present in beef products (0.105 µg/kg) , while the lowest concentracion is in pork products (0.034 µg/kg), with very little difference between them.

Similar research was obtained by Algahtani from Egypt. Their results of Aflatoxin B1 residue levels ranged from ND to 13 µg/kg,[17] and are much higher than results in our study, which may be due to the use of meat additives previously contaminated with aflatoxins.

Although meat products in this study have lower concentationcs of Aflatoxin B1, long-term consumption may lead to public health hazard. The reason for this is the accumulation of mycotoxins in the organism and their resistance. Considering that a lifetime intake of 28 mg of AFB1 can lead to cancer, even extremely low concentrations (1 ppb) pose a significant health risk to the public.

To ensure hygienic conditions during processing, preparation, and handling, a concentrated effort is essential. This can be achieved by implementing hygienic procedures during the slaughtering of animals and meat preparation, selecting appropriate species and additives, properly packaging and cooling raw meat products, applying correct heat treatment to heat-treated products, and training meat factory workers effectively. Given that animal feed is one of the main sources of mycotoxins, more

frequent inspections of their contamination by mycotoxins should be conducted. The results for heavy metals show a large variability of lead and cadmium concentrations in some of the meat and meat products groups. However, this variability in biological samples is considered to be normal since the sources of this metal are numerous. The main sources of heavy metal contamination are growing and are represented, especially, by pesticides, fertilizers, industrial processes and exhaust gases from automobiles, and they are deposited as residues in food, during processing.

Regarding the analysed meat product samples, both the lead and cadmium concentrations measured in this study were well above the values found in simmilar report from Spain.[18] Their average concetrations for lead and cadmium were: around 3 μg/kg and 4 μg/kg for ckicken products, 7 μg/kg and 5 μg/kg for beef products, 9 μg/kg and 6 μg/kg for Türkiye products, and 5 and 7 for pork products. Regarding the analysed pork meat product samples, lead concentrations measured in this study were similar with the values found in Romania, 58-96 μg/kg.[19]The results of heavy metal testing are alarming considering their impact on human health.

High lead concentrations can have adverse effects on humans. In adults, elevated lead levels can cause heart diseases, cancer, and infertility. In children, lead exposure can result in antisocial behavior, low intelligence, and hyperactivity.

Chronic exposure to Cadmium could cause nephrotoxicity in humans, mainly due to abnormalities of tubular re-absorption. The biological half life of Cadmium in the human kidney is long and has been estimated to be10 to 30 years. According to data from the World Health Organization, the permissible limit of cadmium intake for humans is 1 μg/kg/day, or 7 μg/kg/week.

According to reports from the Food Safety Agency of Bosnia and Herzegovina, the status regarding the contamination of meat and meat products by heavy metals has remained stable over the period from 2016 to 2023. Approximately 400 samples have been tested annually, with only about 0.5% of samples exceeding the maximum allowable limits. This suggests that a larger number of samples provides a more accurate representation of the situation and underscores the importance of continuing this monitoring practice with an even greater number of samples. Regarding the testing of nitrites, smoked meat samples have the highest average concentracion of nitrites (11.396 mg/kg), however, a surprisingly high concentration of nitrites was found in fresh meat (8.861 mg/kg). The higher concentration of nitrites in fresh meat can be explained by their effect on the characteristic color of the meat, inhibition of bacterial growth, and preservation of specific aroma. A similar study in Türkiye showed concentrations for nitrites in sausages around 103 mg/kg, and that is much higher than our study resullts.[20] In the fresh meat, Gozdecka from Poland measured nitrite content ranging from 1 to 5 mg/kg.[21] Simmilar repor from UK showed that the mean nitrite content in bacon was 24.0 mg/kg.[22] Thus, differences are more likely to be due to the manufacturing processes and different meat products.

To avoid indiscriminate use of nitrite and nitrate in meat or meat products, the scope for their addition is rigorously restricted in most

countries, including Bosnia and Herzegovina. However data from the literature, as well as the results of this study, indicate that nitrites have been added to raw meat materials. As ingredient or hazardous compound levels are not monitored by regulation in raw meat materials in some countries, and considering that nitrite overuse in processed meat products has occurred the application of nitrite in raw meat materials may be a supervisory blind spot that increases the risk of overuse. Therefore, it is vital to strengthen the sampling regime for meat and meat products, especially raw meat where it is not currently included. In support of this, reports from the Food Safety Agency of Bosnia and Herzegovina covering the period from 2016 to 2023 indicate that only 317 analyses of meat and meat products for additives were conducted over eight years. This number is notably low, especially considering the significant risks associated with nitrites, including the development of various types of cancers, diabetes, neurological disorders, and overall poisoning of the body.

Nitrites and chlorides are often used together in meat preparation or processing procedures, hence it has been beneficial to monitor the concentration of both.

Average concentracion of chloride was 2.377% in the range from 0-9.955. Simmilar reports from Denmark[23] showed the salt content in crushed meat products such as sausage and cooked hams of 2.19 % and 2.28 %, respectively and from Netherland[24] average salt content of 1.93 to 2.66%. All of these results are quite similar, likely due to the use of identical or comparable technological production processes.

The quantity of salt in meat products can be said to be defined through organoleptic properties, particularly taste. It is prescribed for meat products to have a distinctive taste. A meat product containing too little salt may be bland or insufficiently salty, while if it contains too much salt, it can be overly salty, extremely salty, or even bitter. In such cases, the product lacks its characteristic taste, which is a quality flaw. Based on experimental data and a review of literature, it can be observed that the quantity and method of adding table salt are specific to each group of meat products.

However, they cannot be justified in terms of the harmful effects of salt on raising blood pressure in humans and its impact on the kidneys. Excessive salt consumption is also not justified because there are technological processing methods to avoid this. The World Health Organization recommends a daily intake of sodium chloride less than 5 g for adults but this amount is exceeded in some European countries by more than twice.[25]

CONCLUSION

The results of a study conducted in the Zenica-Doboj Canton on the contamination of meat and meat products with mycotoxins, heavy metals, and additives have revealed several important findings. The content of aflatoxin B1 in all tested samples was quite low, with an average value of 0.048 μg/kg, which is significantly lower than the recommended value in some European countries (1 μg/kg). However, due to the very limited number of such studies in our country, continuous monitoring of aflatoxin B1 contamination in both meat and animal feed is necessary. It is also crucial to establish maximum allowable limits for aflatoxin B1 in meat and meat products to prevent potential manipulation by producers.

The results also indicated significant contamination of samples with heavy metals, cadmium and lead, which can have dangerous effects on human health. In this regard, it is essential to continue similar studies and to develop a long-term action plan, considering that heavy metals accumulate in the body and their effects may become evident over the next decade or more.

Regarding the testing of nitrites in meat products, the results were significantly below the prescribed maximum limits (150 mg/kg). However, a notable amount of nitrites was also found in raw meat (8.86 mg/kg), which is a concerning finding since raw meat should not contain any additives. Accordingly, more extensive testing of raw meat for nitrite content is necessary.

Testing for chlorides in meat and meat products yielded results similar to those obtained in numerous other studies conducted in different countries.

In the course of meat processing, it is paramount to take into account the prevailing conditions and potential sources of contamination. Vigilant and frequent monitoring of meat and meat products is indispensable to ensure their safety and quality. Animal feed, constituting a pivotal link within the food chain, necessitates meticulous scrutiny to prevent contamination. Regulatory frameworks, which oversee the quality of meat and the presence of contaminants, ought to define precise limit values for all pertinent parameters.

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Author Contrubition: Conceived the analysis: DžH, ĆK, AI; Collected the data: DžH, ĆK, AI; Performed the analysis: DžH, ĆK, AI; Wrote manuscript: DžH, ĆK, AI.

REFERENCES

1. Barnes J, Whiley H, Ross K, Smith J. Defining Food Safety Inspection. International Journal of Environmental Research and Public Health. 2022;1:19(2):789. doi: 10.3390/ijerph19020789
2. Sabuncuoğlu S, editor. Mycotoxins and Food Safety. IntechOpen. 2020.: doi.org/10.5772/intechopen.77743
3. Deepa N, Sreenivasa MY. Sustainable approaches for biological control of mycotoxigenic fungi and mycotoxins in cereals. In New and Future Developments in Microbial Biotechnology and Bioengineering. 2019; 149-161. .
4. Dai Y, Huang K, Zhang B, Zhu L, Xu W. Aflatoxin B1-induced epigenetic alterations: An overview. *Food Chem Toxicol*. 2017;109 (Pt 1): 683-689. doi:10.1016/j.fct.2017.06.034
5. Ostry V, Malir F, Toman J, *et al.* Mycotoxins as human carcinogens—the *IARC Monographs* classification. *Mycotoxin Res*earch 2017 (33) ;65-73 https://doi.org/10.1007/s12550-016-0265-
6. Fu Z, Xi S. The effects of heavy metals on human metabolism. *Toxicol Mech Methods*. 2020;30(3):167-176. doi:10.1080/15376516.2019.1701594

7. Balali-Mood M, Naseri K, Tahergorabi Z, Khazdair MR, Sadeghi M. Toxic Mechanisms of Five Heavy Metals: Mercury, Lead, Chromium, Cadmium, and Arsenic. *Front Pharmacol*. 2021;12:643972. Published 2021 Apr 13. doi:10.3389/fphar.2021.643972

8. ATSDR's Substance Priority List. Available online: https://www.atsdr.cdc.gov/spl/index.html#2022spl

9. Charkiewicz AE, Omeljaniuk WJ, Nowak K, Garley M, Nikliński J. Cadmium Toxicity and Health Effects—A Brief Summary. *Molecules*. 2023; 28(18):6620. https://doi.org/10.3390/molecules28186620

10. Sambu S, Hemaram U, Murugan R, Alsofi AA. Toxicological and Teratogenic Effect of Various Food Additives: An Updated Review [retracted in: Biomed Res Int. 2024 Jan 9;2024:9792751]. *Biomed Res Int*. 2022;2022:6829409. Published 2022 Jun 24. doi:10.1155/2022/6829409

11. Wu L, Zhang C, Long Y, Chen Q, Zhang W, & Liu G. Food additives: From functions to analytical methods. *Critical Reviews in Food Science and Nutrition*. 2021;*62*(30), 8497–8517. https://doi.org/10.1080/10408398.2021.1929823

12. Shakil MH, Trisha AT, Rahman M, et al. Nitrites in Cured Meats, Health Risk Issues, Alternatives to Nitrites: A Review. *Foods*. 2022;11(21):3355. Published 2022 Oct 25. doi:10.3390/foods11213355

13. Tobin BD, O'Sullivan MG, Hamill RM, Kerry JP. Effect of varying salt and fat levels on the sensory and physiochemical quality of frankfurters. *Meat Sci*. 2012;92(4):659-666. doi:10.1016/j.meatsci.2012.06.017

14. EN 14084:203 IDT, Foodstuffs-Determination of trace elements-Determination of lead, cadmium, zinc, copper and iron by atomic absortion spectrometry (AAS) after microwave digestion.

15. ISO 2918-1975 Meat and meat products Determination of nitrite content (Reference method)

16. ISO 1841-1:1996 Meat and meat products Determination of chloride content Part 1: Volhard method

17. Algahtani FD, Morshdy AE, Hussein MA, et al. Biogenic Amines and Aflatoxins in Some Imported Meat Products: Incidence, Occurrence, and Public Health Impacts. Journal of Food Quality, 2020, doi.org/10.1155/2020/8718179

18. González-Weller D, Karlsson L, Caballero A, et al. Lead and cadmium in meat and meat products consumed by the population in Tenerife Island, Spain. *Food Addit Contam*. 2006;23(8):757-763. doi:10.1080/02652030600758142

19. Hoha GV, Costăchescu E, Leahu A , & Păsărin, B. Heavy metals contamination levels in processed meat marketed in Romania. Environmental Engineering and Management Journal, 2014;13(9): 2411-2415.

20. Yalçin S, Yalçin SS. Nitrate and nitrite content of meat products. *Arch Dis Child*. 1998;79(2):198. doi:10.1136/adc.79.2.198a

21. Gozdecka G, Błaszak B, Cierach M. Content of nitrates and nitrites in unprocessed raw beef. Czech J. Food Sci.. 2021;39(2):95-99. doi: 10.17221/37/2020-CJFS.

22. Al-Kaseem M, Al-Assaf Z, Karabet F. Rapid and Simple Extraction Method for Volatile N-Nitrosamines in Meat Products. Pharmacology & Pharmacy 2013;4(8): 611-618. doi: 10.4236/pp.2013.48087.

23. Aaslyng MD, Vestergaard C, Koch AG. The effect of salt reduction on sensory quality and microbial growth in hotdog sausages, bacon, ham and salami. *Meat Sci*. 2014;96(1):47-55. doi:10.1016/j.meatsci.2013.06.004.

24. Capuano E, Van Der Veer G, Verheijen PJJ, et al. Comparison of a sodium-based and chloride-based approach for the determination of sodium chloride content of processed foods in the Netherlands, Journal of Food Composition and Analysis. 2013; 31: 129–136. doi.org/10.1016/j.jfca.2013.04.004

25. Perez-Palacios T, Salas A, Muñoz A, et al. Sodium chloride determination in meat products: Comparison of the official titration-based method with atomic absorption spectrometry in Journal of Food Composition and Analysis. 2022; 108

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ORIGINAL ARTICLE

Relationship of working arrangements and getting COVID-19 in the outpatients: "in the same storm but different boats"

Hakan Tüzün [1], Merve Atik Şahin [2], Cansu Özbaş[3], Fatma Nur Baran Aksakal[3]

[1]Assoc. Prof., Gazi University Faculty of Medicine Department of Public Health, Ankara, Türkiye
[2]Research Assistant, Dr., Gazi University Faculty of Medicine Department of Public Health, Ankara, Türkiye
[3]Asisst. Prof., Gazi University Faculty of Medicine Department of Public Health, Ankara, Türkiye
[4]Prof. Dr., Gazi University Faculty of Medicine Department of Public Health, Ankara, Türkiye

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Abstract

Objective: It was aimed to examine the relationship between a getting COVID-19 and socioeconomic variables, employment status, and working arrangements including remote working and alternate working status.

Methods: The study was conducted between 1-8 June 2021 on 1090 people. It was conducted face-to-face interviews with patients who applied to tertiary outpatients in Ankara/Türkiye. A convenient sampling method was used for determining people. Except for emergency services, all outpatient clinics were included in the study. The self-reported information was used to determine the history of getting COVID-19.

Results: The regression model including all participants shows that getting COVID-19 risk higher in workers (OR: 1.719 95% CI:1.142-2.587) according to non-workers and 30-39 age group according to 18-30 (OR: 1.669 95% CI: 1.032-2.701). Bivariate analysis, including current workers, there was a statistically significant difference between income groups in terms of getting COVID-19 ($p<0.05$). The prevalence of COVID-19 is higher in people who attend workplace throughout the pandemic (31.3%) than in people who work remotely for a period of time (21.8%)($p<0.05$); additionally, it is higher in people who have never worked alternately (33.5%) than in people who work alternately for a period of time (22.2%) during the pandemic ($p<0.05$). Regression model only including currently workers shows that getting COVID-19 risk higher in those who had never worked alternately during the pandemic period (OR: 1.749 95% CI: 1.091-2.804).

Conclusion: Working arrangements are among the nonpharmaceutical interventions (NPIs) effective in combating the pandemic. More lives could be saved in future epidemics by implementing work arrangements to include more workers.

Keywords: Working Arrangement, Remote Working, Alternate Working, COVID-19, Nonpharmaceutical Interventions, Pandemic

Correspondence: Research Assistant, Dr., Merve Atik Şahin, Gazi University Faculty of Medicine Department of Public Health, Ankara, Türkiye. **E-mail:** drmerveatik@outlook.com **Phone**: +0555 616 19 39

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INTRODUCTION

It can be mentioned that there is a two-way causality relationship between COVID-19 and health inequalities. The COVID-19 epidemic has brought to light long-standing structural factors that contribute to health disparities, including unfavorable employment situations and widening economic inequality.[1] On the other hand differences in social determinants of health has led to variations in viral exposure, and variation in illness outcomes.[2] Studies have showed that COVID-19 more frequently seen and has higher mortality rates in disadvantaged socioeconomic groups and/or regions.[3-7] It is said that variables associated to the workplace may be partially to blame for the disproportionate COVID-19 infection and mortality rates.[8] Studies have been conducted to estimate the risk of contamination that employees will be exposed to according to their sectors.[9-11]

Public health interventions or non-pharmaceutical interventions (NPIs) implemented during COVID-19 pandemic includes, population based measures such as lockdowns, social distancing; case based measures such as contact tracing, isolation; and border control measures such as travel restrictions.[12] As noted in a systematic reviews NPIs were found effective for infection control.[13,14] Within the context of NPIs, various work arrangements such as remote working and alternate schedule working have been widely implemented worldwide during the pandemic.[15-17] In the lockdown periods, workers who working remote have increased to 47% in the UK, and France. Remote working rose from 10% to 28% in Japan, which did not implement a statewide lockdown.[18] Otherwise, according to Eurostat, working from home was less common in many eastern and southern regions of the EU in 2020, below 5%, and this ratio is lower than 2,5% in Türkiye.[19]

Some developed countries have used extensive national cohorts to investigate determinant factors of COVID-19 including employment status. A nationwide register-based cohort, including employed was used in Denmark, and a national population-based cohort was used in Germany[20,21.] There is a lack of sufficient information regarding this issue in developing countries that face limitations in terms of national health and/or occupational registrations.

As indicated by a systematic review, most of the studies regarding health inequalities during the COVID-19 pandemic were ecological studies; few were conducted at the individual level. It is said that there is a need for more studies at an individual level to understand the underlying pathways.[22]Furthermore, the impact of occupational arrangements such as remote working or alternate working on the frequency of getting COVID-19 has been relatively understudied during the pandemic.

COVID-19 has been qualified as an occupational disease on a case-by-case basis in many developed and developing countries such as Australia, Canada, Denmark, Germany, France, South Africa, Slovakia. It has been qualified as a work-related disease in some countries such as Brazil. It has been qualified as an occupational accident in some countries such as Italy and China. In Türkiye, on the other hand, it is not accepted as an occupational accident, work-related disease, or occupational disease legally.[23] It was only accepted as an occupational disease in the health care workers, on by cases. This has

been a limiting factor in obtaining information regarding the relationship between employment status or work arrangements and getting COVID-19, through occupational health records in Türkiye. Therefore, we wanted to investigate this relationship through a population-based study involving outpatient applicants. Establishing a clear relationship between work arrangements and the risk of infection, based on concrete experiences during the COVID-19 pandemic, can aid in better outbreak management in the future.

In this study, it was aimed to examine the relationship between getting COVID-19 and socioeconomic variables, employment status, and working arrangements, including remote working status and alternate working status in patients who applied to tertiary outpatient clinics.

METHOD

Sampling

The study is a cross-sectional study conducted on outpatients aged 18 and over who applied to the Gazi University hospital. The hospital in question is a tertiary healthcare institution and is located in Ankara the capital city of Türkiye.

While calculating the sample size, 16.650 people, the total number of outpatient visits during one week, were taken as a reference for the study population. By taking 50% unknown frequency, 3% margin of error, 95% confidence level, and 1.0 design effect, we achieved a sample size of 1003. The OpenEpi program was used in the sampling calculation.

Study participants were selected from those who applied to the outpatient clinics using the convenient sampling method. Outpatient clinics involved in the study include all outpatient clinics of university hospital. On the other hand, persons attending emergency services were not included in the study. At the end of the study, 1090 people were reached.

Implementation

Data was collected by applying a face-to-face interview method to the people who agreed to participate in the study on June 1 and 8, 2021. Before starting the survey, the participants were informed about the study, and their verbal consent was obtained. The Gazi University Ethics Commission's approval with research code 2021 - 689 was obtained for the study.

Variables

The dependent variable of the study is the getting COVID-19. The history of getting COVID-19 before the study was ascertained based on the self-reported declarations of the individuals. The history of getting COVID-19 has been inquired about based on the medical history, regardless of whether their current complaints are related to COVID-19 or not. Independent variables are gender, age groups, educational levels, income groups, employment status, perceived health, and presence of chronic disease.

Independent variables related working arrangements for currently workers are remote working status, alternate working status, and occupational groups. Alternate working was one of the restriction methods that was implemented during the pandemic. It was implemented by employees working alternately, going to work on certain days of the week, and not going to work on certain days. With the alternate working status, it was

questioned whether they had ever worked alternately during the pandemic. Remote working was another restriction method that was implemented during the pandemic. It refers to work that takes place within the worker's own residence. With the remote working status variable, it was questioned whether they had ever worked remotely during the pandemic.

Statistical Analyses

While forming the income group, categorization was made according to quartile values. The first quartile for income is 4000 TL, the median is 6000 TL, and the third quartile value is 10000 TL. Income status groups are categorized as those whose income is up to 4000 TL, 4001-6000 TL, 6001-10000 TL, and more than 10000 TL, respectively. Since the exchange rate for 1 US $ is 8.52 TL on June 1, 2021, the income groups are as follows: The lowest group is below 469,4 $, the medium-low group is between 469,5-704,1 $, the medium-high group is between 704,2-1103,6 $, and the highest group is the above 1103,7 $.

Descriptive variables are expressed as numbers and percentages. The chi-square test was used for bivariate analyses. We have created a logistic regression model of factors associated with getting COVID-19. To determine the factors associated with the getting COVID-19 in those who were employed, we analyzed only currently workers.

The statistical significance level was accepted as $p<0.05$ in the bivariate analysis. Independent variables with $p<0.25$ in the bivariate analysis were included in the multivariate model. "Backward LR" was used as the "variable selection method" while creating logistic regression models. Statistical analyses were performed using Statistical Package for the Social Science (SPSS) version 23.

RESULTS

The frequency of those who stated that they had COVID-19 in all participants (n=1090) was 19.9%. Table 1 shows the status of having had COVID-19 according to some descriptive characteristics of the participants. There is a statistically significant difference between age groups in terms of getting COVID-19 ($p<0.001$). The prevalence of getting COVID-19 is 24% in the 30-39 age group and 7.8% in those aged 70 and over. The frequency of those who had COVID-19 was 26.7% in those who were employed, while it was 14.3% in those who were non-employed ($p<0.001$). According to the results of the bivariate analysis, the variables that did not meet the inclusion criteria in the multivariate model are gender, perceived health status, presence of chronic disease ($p>0.25$).

Table 1. Changes in the status of getting COVID-19 according to some descriptive characteristics in participants

	%*	n	Getting COVID-19 (%)**	p
Gender n=1090				
Female	53.6	584	18.8	0.341
Male	46.4	506	21.1	
Age Groups (n=1090)				
18-29	25.2	275	18.2	**<0.001**
30-39	19.3	210	29.0	
40-49	18.5	202	27.7	
50-59	20.2	220	12.3	
60-69	12.1	132	14.4	
≥70	4.7	51	7.8	
Educational Levels (n=1090)				
Didn't go to school	2.6	28	21.4	0.064
Primary education graduate	21.1	230	20.4	
High school graduate	31.7	346	15.3	
University and higher degree	44.6	486	22.8	
Income Group (n= 912)				
Highest	15.6	142	26.8	0.118
Medium/High	30.9	282	20.6	
Medium/Low	26.6	243	16.5	
Lowest	26.9	245	20.4	
Employmnet Status (n=1090)				
Worker	45.4	495	26.7	**<0.001**
Nonworker	54.6	595	14.3	
Perceived Health (n=1089)				
Excellent	12.0	131	22.9	0.410
Good	46.3	504	18.7	
Fair	26.9	293	21.8	
Poor	12.9	140	16.4	
Bad	1.9	21	28.6	
Chronic Disease (n=1090)				
Yes	43.3	472	19.1	0.544
No	56.7	618	20.6	

*: column percentage , **:row percentage

The variables included in the multivariate model for the getting COVID-19 were age groups, education levels, employment status and income groups. Table 2 shows the logistic regression model of factors associated with getting COVID-19. While the risk increases in the 30-39 age group (aOR: 1.669 95%CI: 1.032-2.701) compared to the 18-29 age group, the risk decreases in the 70 and older age group (aOR: 0.100 95%CI: 0.013- 0.773). Risk of the getting COVID-19 in the workers is higher than non-workers according to regression model (aOR:1.719 95%CI: 1.142-2.587).

Table 2. Logistic regression model of factors associated with getting COVID-19*

	Bivariate model cOR (95%CI)	Multivariate model aOR (95%CI)
Age Groups		
18-29	1	1
30-39	1.842 (1.202-2.825)	1.669 (1.032-2.701)
40-49	1.726 (1.118-2.665)	1.606 (0.979-2.635)
50-59	0.630 (0.380-1.044)	0.601 (0.344-1.052)
60-69	0.757 (0.426-1.344)	0.892 (0.458-1.736)
≥70	0.383 (0.132-1.112)	0.100 (0.013-0.773)
Educational Levels		
Didn't go to school	1	1
Primary education graduate	0.942 (0.361-2.454)	0.589 (0.189-1.835)
High school graduate	0.663 (0.257-1.713)	0.327 (0.104-1.026)
University and higher degree	1.085 (0.429-2.743)	0.444 (0.141-1.401)
Employment Status		
Nonworker	1	1
Worker	2.182 (1.610-2.957)	1.719 (1.142-2.587)

*: The variable income groups, whose effect on the last step of the model is not statistically significant. cOR: crude Odds Ratio, aOR: adjusted Odds Ratio

Among the individuals interviewed, 495 people (45.4%) reported being currently employed. Table 3 shows the changing of getting COVID-19 in current workers according to some descriptive characteristics and variables related to work arrangements. The prevalence of getting COVID-19 in persons who went to the workplace during

the entire pandemic (31.3%) is higher than in persons who worked remotely for a period (21.8%) (p<0.05). The prevalence of getting COVID-19 in those who have never worked alternately (33.5%) is higher than in those who worked alternately for a period (22.2%) during the pandemic (p<0.05). There is no significant difference between occupational groups (p>0.05).

Income group, alternate working status, remote working status, age and education level are the variables examined in the logistic regression model. Table 4 shows the logistic regression model of factors associated with getting COVID-19 in currently workers. Those who never worked alternately were at higher risk (aOR: 1.749 – 95%CI: 1.091-2.804).

Table 3. Changing of getting COVID-19 in current workers according to descriptive characteristics and working status

	%*	n	Getting COVID-19 (%)**	p
Gender (n=495)				0.387
Female	38.0	188	24.5	
Male	62.0	307	28.0	
Age Groups (n=495)				
18-29	24.4	121	27.3	0.246
30-39	29.1	144	30.6	
40-49	23.6	117	29.9	
50-59	19.8	98	17.3	
60-69	2.8	14	21.4	
≥70	0.2	1	0	
Educational Levels (n=495)				
Didn't go to school	0.2	1	0	0.225
Primary education graduate	9.3	46	39.1	
High school graduate	19.8	98	25.5	
University and higher degree	70.7	350	24.9	
Income Group (n= 418)				
Highest	26.3	110	30.9	**0.017**
Medium/High	36.4	152	27.0	
Medium/Low	24.4	102	16.7	
Lowest	12.9	54	38.9	
Perceived Health (n=494)				
Excellent	15.0	74	24.3	0.855
Good	52.8	261	25.7	
Fair	23.3	115	28.7	
Poor	7.3	36	30.6	
Bad	1.6	8	37.5	
Chronic Disease (n=495)				
Yes	31.1	154	29.9	0.279
No	69.9	341	25.2	
Remote working status (n=495)				
I worked by going to the workplace during the entire pandemic period.	51.7	256	31.3	**0.019**
I worked remotely for a period during the pandemic	48.3	239	21.8	
Alternate working status (n=437)				
I have never worked alternately during the pandemic period.	44.4	194	33.5	**0.009**
I worked alternately for a period during the pandemic	55.6	243	22.2	
Occupational Group (n=495)				
Blue collar employees	22.4	111	28.8	0.890
White collar employees	65.9	326	25.8	
Self employed	8.3	41	29.3	
Employers	3.4	17	23.5	

*: column percentage , **:row percentage

Table 4. Logistic regression model of factors associated with getting COVID-19 in currently workers

	Bivariate model cOR (95%CI)	Multivariate model aOR (95%CI)
Income Group		
Highest	0.703 (0.356-1.388)	0.679 (0.331-1.390)
Medium/High	0.580 (0.302-1.116)	0.574 (0.288-1.149)
Medium/Low	0.314 (0.148-0.669)	**0.285 (0.129-0.631)**
Lowest	1	1
Alternate working status		
I have never worked alternately during the pandemic period.	**1.764** (1.153-2.697)	**1.749** (1.091-2.804)
I worked alternately for a period during the pandemic	1	1

*Variables whose model effect is not statistically significant in the last step; remote working status, age groups and education levels. cOR: crude Odds Ratio, aOR: adjusted Odds Ratio

DISCUSSION

We have analyzed factors related to getting COVID-19, firstly, all participants and then only for workers. In the 30-39 age group, the prevalence of COVID-19 is highest, and in the 70 and older age group, the prevalence of COVID-19 is lowest. In multivariate analysis, it was determined that the risk increased in the 30-39 age group compared to the 18-29 age group, and decreased in the 70 and over age group. Studies have found that increasing risk with age.[24-26] Measures specified for elderlies were implemented in Türkiye. For example, curfew was declared for those over the age of 65 at 20 March 2020. From 18 November 2020 people over the age of 65 were allowed to go out between 10:00 and 13:00.[27] These interventions may have played a part in decreasing risk among the elderly.

We did not find any statistically significant difference between genders, education levels, and income groups in terms of getting COVID-19. While some studies suggest that the risk is higher in men [25,26], others indicate no significant gender difference in the risk of COVID-19.[28] While some studies identify income level as a risk factor[25,29], others present conflicting findings.[26] Several studies have demonstrated that individuals with lower education levels are at a higher risk of getting COVID-19.[28-30] Health inequalities regarding COVID-19 have also been demonstrated in terms of variables other than those we have considered in our study, as is the case of detecting inequalities between different regions.[5] The lack of difference for some socioeconomic variables in our study may be due to the fact that the data are based on outpatients's and do not fully reflect the socioeconomic differences in the general population. On the other hand, the fact that socioeconomic variables are measured by different methods may also be a factor preventing standardized comparison of study results.

Notably, the only socioeconomic variable found to be effective in the regression model, other than age, is employment status. The multivariate model shows that the risk of getting COVID-19 in workers increased by 72% compared to non-workers. It has been highlighted that workplaces are key areas for NPIs aiming to protect workers and all.[0,31] "Job exposure matrices" have been developed to estimate risk for planning restriction measures.[32,33] There are examples of countries where restriction measures are implemented to include working life. All industries, businesses, and non-essential production were shut down in Italy, and new laws were put in place to protect families, seasonal workers, healthcare professionals, and independent contractors. Furthermore, a protocol has been signed by the government, labor unions, and businesses to control the working environment with regard to occupational health and safety in Italy.[34] Measures implemented in the UK for a period included COVID-19 testing for general practitioners, care home residents and those who had to go to work. For those unable to work due to COVID-19, it was decided that they should pay 60% of their salary up to £2,500.[35] Mitigation measures have been implemented in the USA, but it is stated that they are less applied in small enterprises employing less than 10 workers.[36] The higher risk of infection in workers may be due to the inadequate measures taken in the workplace

during the pandemic period in Türkiye. According to a study aimed at representing the working population in Türkiye (excluding public employees) at the national level, 30% of workers noted that the work was not stopped despite the fact that COVID-19 cases were seen at the workplace, and 12.6% said that the case section was closed but the work continued in other departments.[37] A descriptive study implemented in Türkiye and included the workplace chief has shown that suspending production, implementing alternate work schedules, isolating cases from other workers in a designated room, avoiding face-to-face meetings, and checking the workers' COVID-19 status using contact tracing application of Ministry of Health were not available in more than half of the workplaces.[38] In other studies, it is pointed out that restriction measures are not implemented adequately in workplaces in Türkiye.[39-41] Because our work is done with outpatients, no workplace measures have been questioned, so we can't directly associate our results with workplace measures. However, indirectly, based on studies that express the shortcomings of measures taken at the workplace, we can say that the insufficiency of workplace measures may lead to an increase in the number of cases.

While there were differences between work arrangements in the bivariate analysis involving only workers, there were no differences among occupational groups. The lack of difference between occupational groups in our study may be because the groups were categorized to include only four variables. On the other hand, certain studies have identified specific sectors, including healthcare, social care, logistics, and others, that carry an increased risk of COVID-19 contamination.[2,42] However, our study indicates that work arrangements may be the ultimate determinant of transmission risk. This result implies that a comparison between occupations should be made in terms of the risk of transmission, taking into account the work arrangements.

The multivariate model only includes workers, which shows that the risk of getting COVID-19 is 75% higher for those who don't work alternately. Alternate work schedules (AWS) is an umbrella term that refers to compressed work schedules and flexible work schedules.[43] The alternate working practice during the pandemic period, which is one of the examples of NPIs, was carried out in Türkiye in such a way that employees go to work on certain days and do not go to work on certain days. NPIs including capacity limitation in public spaces, closure of some shopping places, curfew for certain times, full lockdown etc. were implemented in Türkiye as well as worldwide during pandemic.[27,44] NPIs implemented in different countries have been found effective for struggling with the pandemic.[45-47] In ecological studies assessing the combined effectiveness of all restrictive practices in Türkiye, they have been found to be effective in reducing the number of cases and deaths.[48] As in these studies, the effects of different NPIs were evaluated cumulatively in most studies. There are fewer studies evaluating the effectiveness of the intervention singular.[49] Our study shows that alternate working is functional in preventing contamination as one of the implementation of the NPIs.

Studies on the risk estimation of COVID-19 transmission have helped epidemic management, but studies aiming to determine the protection or risk caused by

the working arrangements are not available enough. Similar to our study, there are few studies comparing those with and without COVID-19 in terms of work arrangements. A study conducted in USA compared COVID-19 positive persons and symptomatic persons that have got negative results. Those who attend telework 14 days before the onset of illness are more common in the group with negative results (53.1%) than in the group with positive results (35.0%). (P<0.01).[50] A study conducted in Japan and used the data of 275 thousand respondents, investigated that the percentage of people who reported a fever within one month, among teleworkers and non-teleworkers. It found that higher fever rates in the non-teleworker group, difference is small but have got statistical significance (for the 30- to 59-year age-group, non-teleworkers: 3.46%; teleworkers:3.14%).[51] While the impact of work arrangements on mitigating the epidemic is a relatively understudied topic, current studies are proving that interventions are effective. This result shows that the experience of the pandemic reveals that occupational health-related measures should be taken into account in the management of public health emergencies.

The fact that about half of the employees in our research stated that they never worked remotely during the pandemic, and that about half of them never worked on a alternately, indicates that a significant part of the workers are out of the scope of working arrangements. According to a national study examining all employees except public employees in Türkiye, 25.8% of workers stated that there was no change in their working style during the pandemic period. Those who worked remotely were 5.5%, and those who worked on an alternating were 13.5%. [37] According to a study conducted in the cargo sector, measures such as regulating working hours and keeping the number of employees at a minimum level were not implemented.[52] On the other hand, the exclusion of some sectors from the scope of restriction measures legally in Türkiye may have resulted in a lower number of workers within the scope of remote working or alternately working. Sectors that are exempt from closure have been identified for the full lockdown implemented from 29 April to 17 May 2021. According to estimates made by a Confederation of Revolutionary Trade Unions (DISK) in Türkiye, about 61% of employment worked in sectors exempt from closure, while about 22% of employment worked in partially exempt sectors and about 17% in sectors covered by closure.[53] In our study, the increased risk detected for those who have never worked alternately suggests that the fact that restriction measures are not applicable to all workers may have played an important role in the increase in the number of cases in Türkiye.

Figure 1 shows the change in the number of deaths from COVID-19 in Türkiye between March 2, 2020 and November 14, 2022.[54] As seen in the graph, the peak with the highest number of deaths during the course of the pandemic is the second one. The fact that the number of deaths was lower in the third peak, which is the highest peak of the epidemic in terms of the number of cases, may be due to the vaccination rates reached in this period. Different NPI were implemented in in different times in Türkiye, but the most drastic measure was implemented via partial and full lockdown in the May 2021.[27] Our study was implemented in the June 2021 just after this period. The arrow in this figure corresponds

to the beginning of June and indicates the date of data collection in our study. Since the effect of restriction measures on mortality lasts for about a month after the end of the measure, it is observed in the graph that the number of deaths continues to decrease for a while. Considering the date of our study, it can be said that, deaths that may result from the narrow scope of different working arrangements such as remote working or alternate working, may have a role in the occurrence of the most mortal peak of the pandemic.

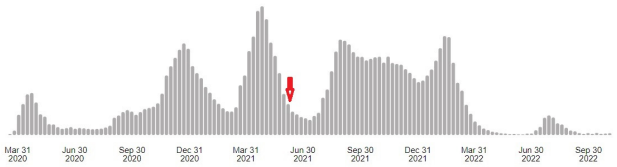

Figure 1. Number of deaths regarding COVID-19 in Türkiye[54]

CONCLUSION

The fact that the risk of getting COVID-19 is 1.7 times higher in those who are currently working in the multivariate model, reveals the disadvantaged position of the workers in the pandemic through a cross-sectional study. In the multivariate model involving employees, the fact that the risk is approximately 1.7 times higher in those who have never worked in alternately shows how effective the working arrangements are in preventing contamination. The experiences gained in the COVID-19 pandemic can guide the planning and implementation of measures to be taken in terms of occupational health and safety in future public health emergencies.

Limitations

Our study type is a cross-sectional study; therefore, determining causality is limited. There was the possibility that some workers may have had a non-occupational relationship with COVID-19. While the status of getting COVID-19 was questioned, it was not asked whether they contracted the disease before or after the working arrangements were implemented. In cross-sectional studies, the simultaneous questioning of risk factor presence and disease status is a disadvantage of this type of study, and this limitation was also present in our study. Another limitation of this study is that the relationship between working arrangements and contracting the disease was not questioned for those who died due to COVID-19.

Another matter regarding limitation is that, since it is a study conducted on patients who applied to tertiary outpatient clinics, the ability to represent the whole society is insufficient.

A limitation of this study is that the history of getting COVID-19 was asked without being specific for any restriction application period in the pandemic. Specific questioning of the history of having COVID-19 in periods when different working arrangements were applied may help to determine the relationship more clearly. The fact that the history of getting COVID-19 is based on the statement is another limitation.

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REFERENCES

1. Paremoer L, Nandi S, Serag H, Baum F. Covid-19 pandemic and the social determinants of health. BMJ. 2021;372
2. Burström B, Tao W. Social determinants of health and inequalities in COVID-19. Eur J Public Health. Aug 1 2020; 30(4):617-618.
3. WHO. Social determinants of health [online]. Available at: https://www.who.int/health-topics/social-determinants-of-health Accessed: January 2, 2023.
4. Di Girolamo C, Bartolini L, Caranci N, Moro ML. Socioeconomic inequalities in overall and COVID-19 mortality during the first outbreak peak in Emilia-Romagna Region (Northern Italy). Epidemiol Prev. Sep-Dec 2020;44(5-6 Suppl 2):288-296.
5. Wachtler B, Michalski N, Nowossadeck E, et al. Socioeconomic inequalities in the risk of SARS-CoV-2 infection - First results from an analysis of surveillance data from Germany. J Health Monit. 2020;5(Suppl 7):18-29.
6. WHO. COVID-19 and the social determinants of health and health equity: evidence brief. October 2021. [online]. Available at: https://www.who.int/publications/i/item/9789240038387 Accessed: January 2, 2023.
7. Blair A, Parnia A, Shahidi FV, Siddiqi A. Social inequalities in protective behaviour uptake at the start of the COVID-19 pandemic: results from a national survey. Canadian Journal of Public Health. 2021;112(5):818-830.
8. Goldman N, Pebley AR, Lee K, Andrasfay T, Pratt B. Racial and ethnic differentials in COVID-19-related job exposures by occupational standing in the US. PLoS One. 2021;16(9):e0256085.
9. Barbieri T, Basso G, Scicchitano S. Italian workers at risk during the COVID-19 epidemic. Italian Economic Journal. 2022;8(1):175-195.
10. Lee J, Kim M. Estimation of the number of working population at high-risk of COVID-19 infection in Korea. Epidemiol Health. 2020;42:e2020051.
11. Baker MG, Peckham TK, Seixas NS. Estimating the burden of United States workers exposed to infection or disease: A key factor in containing risk of COVID-19 infection. PLoS One. 2020;15(4):e0232452.
12. Wu S, Neill R, De Foo C, et al. Aggressive containment, suppression, and mitigation of covid-19: lessons learnt from eight countries. BMJ. 2021;375:e067508.
13. Adams-Prassl A, Boneva T, Golin M, Rauh C. Inequality in the impact of the coronavirus shock: Evidence from Real Time Surveys [online]. Available at: https://www.iza.org/publications/dp/13183/inequality-in-the-impact-of-the-coronavirus-shock-evidence-from-real-time-surveys Accessed: January 2, 2023.
14. Girum T, Lentiro K, Geremew M, Migora B, Shewamare S. Global strategies and effectiveness for COVID-19 prevention through contact tracing, screening, quarantine, and isolation: a systematic review. Tropical medicine and health. 2020; 48:1-15.
15. Meltem A, Küçükoğlu MT. COVID-19 ve iş yaşamına etkileri: Evden çalışma. Journal Of International Management Educational and Economics Perspectives. 2020;8(1):71-81.
16. WHO. Advice for the public: Coronavirus disease (COVID-19) [online]. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public. Accessed: January 16, 2023.
17. Mustafa A, Yavuzdoğan S. Avrupa Birliği'ne üye ülkelerde esnek personel rejimi ve Türkiye uygulamalarının kısmi bir analizi. Türkiye Adalet Akademisi Dergisi. 2016;(28):29-56.
18. OECD. OECD Policy Responses to Coronavirus (COVID-19) Teleworking in the COVID-19 Pandemic: Trends and Prospects. [online]. Available at: https://www.oecd.org/coronavirus/policy-responses/teleworking-in-the-covid-19-pandemic-trends-and-prospects-72a416b6/ Accessed: January 16, 2023.
19. Eurostat. Working from home across EU regions in 2020. [online]. Available at: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210923-1 Accessed: January 16, 2023.
20. Bonde JPE, Begtrup LM, Jensen JH, et al. Occupational risk of SARS-CoV-2 infection: a nationwide register-based study of the Danish workforce during the COVID-19 pandemic, 2020-2021. Occup Environ Med. Apr 2023;80(4):202-208.
21. Reuter M, Rigó M, Formazin M, et al. Occupation and SARS-CoV-2 infection risk among 108 960 workers during the first pandemic wave in Germany. Scand J Work Environ Health. Sep 1 2022;48(6):446-456.

22. Wachtler B, Michalski N, Nowossadeck E, et al. Socioeconomic inequalities and COVID-19 - A review of the current international literature. J Health Monit. Oct 9 2020;5(Suppl 7):3-17.

23. ILO. State practice to address COVID-19 infection as a work-related injury [online]. Available at: https://www.ilo.org/tr/publications/state-practice-address-covid-19-infection-work-related-injury. Accessed June 10, 2024.

24. Mansour S, Al Kindi A, Al-Said A, Al-Said A, Atkinson P. Sociodemographic determinants of COVID-19 incidence rates in Oman: Geospatial modelling using multiscale geographically weighted regression (MGWR). Sustainable cities and society. 2021; 65:102627.

25. Rozenfeld Y, Beam J, Maier H, et al. A model of disparities: risk factors associated with COVID-19 infection. International journal for equity in health. 2020;19(1):1-10.

26. Vahidy FS, Nicolas JC, Meeks JR, et al. Racial and ethnic disparities in SARS-CoV-2 pandemic: analysis of a COVID-19 observational registry for a diverse US metropolitan population. BMJ Open. 2020;10(8):e039849.

27. Ilhan MN, Tüzün H, Kılıç R, Yıldırım N. Nonpharmaceutical interventions in Türkiye and worldwide during COVID-19 pandemic. Turk J Med Sci. 2021;51(Si-1):3207-3214.

28. Consolazio D, Murtas R, Tunesi S, Gervasi F, Benassi D, Russo AG. Assessing the Impact of Individual Characteristics and Neighborhood Socioeconomic Status During the COVID-19 Pandemic in the Provinces of Milan and Lodi. Int J Health Serv. 2021;51(3):311-324.

29. López-Gay A, Spijker J, Cole HV, et al. Sociodemographic determinants of intraurban variations in COVID-19 incidence: the case of Barcelona. J Epidemiol Community Health. 2022;76(1):1-7.

30. Abedi V, Olulana O, Avula V, et al. Racial, economic, and health inequality and COVID-19 infection in the United States. J Racial Ethn Health Disparities. 2021;8(3):732-742.

31. Rind E, Kimpel K, Preiser C, et al. Adjusting working conditions and evaluating the risk of infection during the COVID-19 pandemic in different workplace settings in Germany: a study protocol for an explorative modular mixed methods approach. BMJ Open. 2020;10(11):e043908.

32. Fadel M, Salomon J, Descatha A. COVID-19 Job Exposure Matrix: From the Mat-O-Covid Design to Its Execution. J Occup Environ Med. 2021;63(3):e168.

33. Descatha A, Sembajwe G, Gilbert F, Mat OCIG, Fadel M. Mat-O-Covid: Validation of a SARS-CoV-2 Job Exposure Matrix (JEM) Using Data from a National Compensation System for Occupational COVID-19. Int J Environ Res Public Health. 2022;19(9)

34. Çöl, M. İtalya'da sağlık sistemi ve COVID-19 pandemisi yanıtı. Toplum ve Hekim, 2021; 36(5), 388-400.

35. Mut, A. N. COVID-19 pandemisinde Ingiltere sağlık sistemi. Toplum ve Hekim 2021; 36(5), 350-365.

36. Guerin, R. J., Barile, J. P., Groenewold, M. R., Free, H. L., & Okun, A. H. COVID-19 workplace mitigation strategies and employee leave policies implemented during the height of the pandemic, United States, fall 2020 and 2021. International Journal of Environmental Research and Public Health, 2023; 20(4), 2894.

37. DİSKAR. İkinci yılında pandeminin işçilere etkileri raporu yayımlandı! Türkiye çapında alan araştırması sonuçları. [online]. Available at: https://arastirma.disk.org.tr/?p=8372 Accessed: January 23, 2023.

38. Kalaycı D, Sandal A, Yüksel M, Yıldız AN. Perspective of workers' union representatives on COVID-19 measures in Turkish workplaces in the first year of the pandemic. Balkan Med J. 2023;40(2):124-130.

39. Kirtaş HA, Altundağ H. İtfaiye teşkilatlarında covid-19 salgını tedbirleri. Resilience. 2021;5(2):187-205.

40. Derya İ, Akbalik S. Kamu hastanelerinde temizlik işçilerinin çalışma koşulları ve Covid-19 Pandemi Sürecindeki Deneyimleri: İstanbul örneği. Çalışma ve Toplum. 2022;5(75):2839-2873.

41. Yilmaz ME, Ulusoy H. COVID-19 pandemisinde hekim ve hemşirelerin iş güvenliğine yönelik değerlendirmeleri: bir üniversite hastanesi örneği. Uluslararası Sağlık Yönetimi ve Stratejileri Araştırma Dergisi. 2022;8(3):301-314.

42. Möhner M, Wolik A. Differences in COVID-19 Risk Between Occupational Groups and Employment Sectors in Germany. Dtsch Arztebl Int. 2020;117(38):641-642.

43. OHRM. Alternative Work Schedules. [online]. Available at: https://www.commerce.gov/hr/practitioners/leave-policies/alternative-work-schedules Accessed: January 16, 2023.

44. Barlas, G., Öztürk, H., Pehlivantürk, G., Aydin, S. Turkey's response to COVID-19 pandemic: strategy and key actions. Turkish Journal of Medical Sciences, 2021; 51(7), 3150-3156.

45. Güner, H. R., Hasanoğlu, I., Aktaş, F. Evaluating the efficiency of public policy measures against COVID-19. Turkish journal of medical sciences, 2021; 51(7), 3229-3237.

46. Lin YF, Duan Q, Zhou Y, et al. Spread and impact of COVID-19 in China: A Systematic review and synthesis of predictions from transmission-dynamic models. Front Med (Lausanne). 2020;7:321.

47. İsmet K, Saraç M. Socio-economic, demographic and health determinants of the coronavirus pandemic: Analysis of data from OECD countries. Turkish Journal of Public Health. 2020;18(COVID-19 Special):1-13.

48. Tüzün H. Effects Of Restriction Measures On Morbidity And Mortality Implemented During COVID-19 Pandemic In Türkiye: A Research Through National Data Including One Year. International Journal of Health Services Research and Policy. 2022;7(2):146-156.

49. Bundgaard H, Bundgaard JS, Raaschou-Pedersen DET, et al. Effectiveness of adding a mask recommendation to other public health measures to prevent SARS-CoV-2 infection in Danish mask wearers : A Randomized Controlled Trial. Ann Intern Med. Mar 2021;174(3):335-343.

50. Fisher KA, Olson SM, Tenforde MW, et al. Telework before illness onset among symptomatic adults aged≥ 18 years with and without COVID-19 in 11 outpatient health care facilities—United States, Morbidity and Mortality Weekly Report. 2020;69(44):1648.

51. Kawashima T, Nomura S, Tanoue Y, et al. The relationship between fever rate and telework implementation as a social distancing measure against the COVID-19 pandemic in Japan. Public Health. 2021;192:12-14.

52. Alper M, Tüzün H, Ilhan MN, Saygun M. Covıd-19 Pandemisinde Hizmete Devam Eden Kargo Sektörü Çalışanlarında İşçi Sağlığı ve İş Güvenliği Algısı ve Tutumları. Çalışma ve Toplum. 2023;2(77).

53. DİSKAR. "Tam kapanma" yok, on milyonlar çalışmaya devam ediyor! [online]. Available at: https://arastirma.disk.org.tr/?p=5712 Accessed: January 30, 2023.

54. WHO. Global, Türkiye. [online]. Available at: https://covid19.who.int/region/euro/country/tr Accessed: January 16, 2023.

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ORIGINAL ARTICLE

Investigation of knowledge and attitude levels regarding irrational antibiotic use among students in the faculty of health sciences

Sezer Avcı[1], ;Zerrin Çiğdem[2], Suzan Havlioğlu[3], Funda Demir[4], Tuğba Yılmaz[4]

[1]Asisst Prof., Hasan Kalyoncu University, Faculty of Health Sciences, Department of Nursing, Gaziantep, Türkiye
[2] Asisst Prof., Istanbul Topkapı University, Faculty of Health Sciences, Department of Nursing, Istanbul, Türkiye
[3]Assoc. Prof., Harran University, Faculty of Health Sciences, Department of Public Health Nursing, Sanliurfa, Türkiye
[4]Nurse, SANKO University Hospital, Gaziantep, Türkiye

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Abstract

Objective: This study was conducted to examine the drug use status of students at the Faculty of Health Sciences (FHS) and the factors influencing it, to determine their behavior regarding the use of rational antibiotics, their knowledge and attitude levels regarding antibiotic use, as well as their subjective norms and intentions.

Methods: This cross-sectional descriptive research was conducted between January and March 2020 with students enrolled in the FHS Nursing, Physiotherapy and Rehabilitation, and Nutrition and Dietetics Departments at a foundation university in Gaziantep. The research population is 865 students, and the sample size is 581. A questionnaire consisting of 58 items was used to collect data AUS (Antibiotic Use Scale).

Results: It was determined that 57.8% of students used analgesic without seeking professional help, 64.5% did not take antibiotics without consulting a physician, and 75.6% discontinued taking antibiotics once they felt better. It was discovered that more than half of the students (63.9%) retained their unused medicines at home, and that 66.4% of them continued to do so after they had not taken all of the pills. It was discovered that the students who received antibiotics while they were unwell and used antibiotics without consulting a physician had this mentality, were influenced by the people around them, and were committed to this problem ($p<0.05$).

Conclusion: It was discovered that half of the students lacked awareness regarding rational antibiotic usage and did not demonstrate rational antibiotic usage habits.

Keywords: Usage of Irrational Antibiotic, Knowledge and Attitude, Faculty of Health Sciences, Students

Correspondence: Asisst Prof., Sezer Avcı, Hasan Kalyoncu University, Faculty of Health Sciences, Department of Nursing, Gaziantep, Türkiye. **E-mail:** sezer.2744@gmail.com, **Phone**: +90 506 856 04 46

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INTRODUCTION

As a result of the advancements in 21st-century medicine, the number of medications used to treat patients has increased. When medications misused, it takes on a dimension that can delay healing and endanger human life.[1] When a person notices anything wrong with themselves, he contacts a doctor, who, after a series of examinations or analyses, prescribes a medication that is appropriate for their illness and notifies the patient. Indicated by "Rational Use of Medicines (RUM)" is the procedure of taking the patient-supplied pharmaceuticals at the appropriate time and dose.[2,3] Numerous drug-related blunders (not taking the drugs on time and in the correct dose, discontinuing drugs when patient recover, etc.) have been committed "Inappropriate Medication Use" (IMU). IMU may result in patients not cooperating with therapy, drug interactions, antibiotic resistance owing to incorrect usage, failure to heal and return of illnesses, and an increase in treatment expenses.[1] IMU behaviors in our country include taking drugs without consulting the physician, using the drugs at home without asking the physician and recommending them to others or taking drugs with the advice of others, not using the drugs in the recommended dose, interrupting treatment after recovery, and insisting on prescribing drugs unnecessarily.[4,5] Adults who participated in the study by Artantaş et al. (2015) defined "Rational Antibiotic Use (RAU)" as follows: "It is harmful not to use antibiotics unless necessary, to use antibiotics when necessary, to use them according to the doctor's advice and at the dose and time recommended by the doctor, and to use antibiotics frequently." In the same survey, nearly all participants (91,4%) reported that they had never heard of an RAU-related concept.[6]

Antibiotics are medications that kill bacteria without causing harm to people and also inhibit the growth of microbes. [7] Antibiotic resistance increases as a result of irrational antibiotic use (utilizing without a prescription, utilizing on the advice of friends, discontinuing when healed, etc.). As a result, the treatment process cannot advance in a healthy manner, deaths occur, and treatment expenditures rise excessively.[8,9] The unintentional use of antibiotics by humans has negative effects on both users and society. The Ministry of Health implemented an antibiotic restriction policy in April 2003 to prevent the unnecessary and uncontrolled use of antibiotics; it has been explained that "antibiotics must be sold with a prescription, and they are obtained from pharmacies with prescriptions issued by public/private health institutions and organizations, recorded in printed, e-prescription or electronic media, or by prescriptions written by private doctors."[10] In addition, with the "Rational Use of Medicines National Action Plan 2014-2017" and RUM campaigns, the Ministry of Health has ensured the prohibition of antibiotics as a priority in the sale of the over drugs in pharmacies and raised public awareness that viral diseases cannot be treated with antibiotics.[11]

Despite occasional drops in antibiotic use over the years, our nation remains the OECD (Organization for Economic Co-operation and Development) country with the greatest consumption of antibiotics, as a result of initiatives implemented to restrict antibiotic use.[12] In the systematic review research by Bozdemir and Filiz (2021), it was determined that while there were no studies demonstrating

an adequate degree of knowledge on RUM among the general population, students had a good level of understanding despite having shortcomings.[13] According to research conducted in our country on the use of medications and antibiotics by university students, the rate of antibiotic or drug use varies between 80.2% and 35.2%, depending on the physician's advice.[2,6,7,14–21] As a result of these studies, it is seen that university students' knowledge about drug or antibiotic use is insufficient, wrong or incomplete and irrational medicine/antibiotic use. In similar studies conducted in the world on this subject, it was found that the rate of antibiotic use of students studying in health-related schools ranged between 97.2% and 45.6%.[22–27] As key members of the health sector, faculty of health sciences (FHS) students are expected to pay attention to incorrect, inaccurate, and unnecessary drug usage and serve as role models in this regard. It is believed that the research undertaken to examine the irrational use of medicines and antibiotics and the variables influencing this scenario among university students would serve as the foundation for efforts to prevent these by identifying the reasons of this situation among university students. This study was conducted to assess the drug use status of FHS students and the factors influencing it, as well as to determine their behavior about "Rational Antibiotic Use (RAU)," as well as their knowledge, attitude, subjective norms, and goals towards antibiotic use.

METHOD

Type of Research, Universe and Sample Size

Between January 2020 and March 2020, 865 students from the Nursing, Physiotherapy and Rehabilitation, and Nutrition and Dietetics Departments of a foundation university in Gaziantep participated in this cross-sectional descriptive study. Students who did not want to voluntarily participate in the research, did not take the exam, or did not attend classes were eliminated, leaving a study sample of 581 (67%) students.

Data Collection Tools and Data Collection Method

Students were administered a questionnaire with 58 items and the Antibiotic Use Scale (AUS) under supervision and with authorization from the responsible lecturer/staff during one class hour. It includes general information such as students' age, social security number, family income, antibiotic use without a physician's consultation, drug use in the event of illness, where they store drugs, antibiotic usage information, the type of drug used in general, and the issue to be considered in antibiotic use.

AUS consists of 19 items and was designed by Atik and Dogan (2019) to examine the effect of persons on antibiotic use behavior. Strongly Agree = 5 points, Agree = 4 points, Partially Agree = 3 points, Disagree = 2 points, and Strongly Disagree = 1 point, in the form of a five-point Likert scale. The maximum score on the scale is 95, and the minimum is 19. AUS includes three components: "Attitude," "Subjective Norm," and "Intention". The sub-dimension of "Attitude" for Factor 1 consists of 11 components as follows: 1, 2, 3, 4, 7, 8, 9, 12, 13, 15, 19. The "Subjective norm" sub-dimension of Factor 2 comprises five items: 5, 10, 14, 16, 18. The "Intention" sub-dimension of Factor 3 consists of three items: 6, 11, and 17. The scale's Cronbach Alpha coefficient was discovered to be 0.94. In this investigation, the scale's Cronbach Alpha coefficient was

determined to be 0.95. The average of the sub-dimension 'Attitude' in the AUS can be regarded as a favorable attitude toward antibiotic use. Likewise, the same holds true for various subdimensions.[9]

Attitude; In this dimension, which aims to measure the attitudes of persons regarding antibiotic usage, statements are included in which the participants' evaluations of the outcomes of antibiotic use and their potential implications are expressed. *Subjective norm*; There are statements regarding the impact of the opinions of individuals whom the participants deem to be influential on the usage of antibiotics. High overall scores on this category indicate that their antibiotic use is impacted by their environment. *Intention*; the individuals' intention to use antibiotics is the greatest predictor of their antibiotic usage behavior. In other words, when the intention scores of two persons are compared, the individual with a high average of the overall intention items is more likely to use antibiotics.

Aspects of Research Ethics

The Non-Interventional Research Ethics Committee of the Faculty of Health Sciences at a foundation university in Gaziantep approved the research with the decision number 2019/127, and written approval was acquired from the university where the research was done. The goal of the study was described to the students, and their verbal consent to participate in the research was obtained. By e-mail, permission to use was secured from the writers who created the AUS.

Evaluation and analysis of data

SPSS (Statistical Package for the Social Sciences) 23.0 for Windows was used to create and analyze databases. The results were within the 95% confidence range, and a p-value of less than 0.05 was declared statistically significant. The number-percentage distribution, mean standard deviation, and minimum-maximum values of the data about the students' drug and antibiotic usage, as well as their introductory information, were analyzed. Using the Histogram, Q-Q Plot graph, skewness, and kurtosis values, conformity to normal distribution was determined. The outcome of the Kolmogorov-Smirnov test was not analyzed since it tends to yield significant results for large sample sizes.[28] For categorical variables with a normal distribution, the t-test was utilized for independent groups, one-way analysis of variance for variables with three or more groups, and the Kruskal Wallis H test for other values.

RESULTS

It was revealed that 62.6% of the research participants were between the ages of 21 and 23, with a mean age of 21.59 ± 1.84 years (Minimum 18 - Maximum 39). 72.6% of the students were determined to be female, 30.1% were in the second grade, and 19.6% were in the fourth grade. It was discovered that 40.8% of students were enrolled in the department of Physiotherapy and Rehabilitation. The moms and dads of the students had the greatest rates of primary/secondary school graduation (45.6% and 38.5%, respectively). It was discovered that 61.3% of the students lived with their families, 49.1% claimed that the family's income and costs were equal, 85.0% received social security, and 15.7% had a chronic ailment (Table 1).

Table 1. The sociodemographic characteristics of the students (n=581)

Sociodemographic Variables	Variable Groups	Distributions	
The average age	21.59±1.84 (18-39)	n	%
Age	18-20	158	27.2
	21-23	364	62.6
	24≤	59	10.2
Gender	Female	422	72.6
	Male	159	27.4
Academic year	1st grade	118	20.4
	2nd grade	175	30.1
	3rd grade	174	29.9
	4th grade	114	19.6
Area of study	Nursing	196	33.7
	Nutrition and Dietetics	148	25.5
	Physical therapy and rehabilitation	237	40.8
Mother's education degree	illiterate	46	8.0
	literate	42	7.2
	Primary / Secondary School graduate	265	45.6
	High school graduate	149	25.6
	College/University graduate	79	13.6
Father's education degree	illiterate	8	1.4
	literate	26	4.5
	Primary / Secondary School graduate	224	38.5
	High school graduate	177	30.5
	College/University graduate	146	25.1
Where he/she presently	With family	356	61.3
living	At home with a sibling/friend	47	8.1
	Home by yourself	39	6.7
	In the dormitory	139	23.9
Family's income level	Income less than expenses	70	12.0
	Income equals expense	285	49.1
	Income higher than expenses	226	38.9
Social insurance	Yes	494	85.0
	No	87	15.0
Existence of chronic	Yes	91	15.7
illness*	No	490	84.3

* Asthma, thalassemia, anemia, allergy, migraine, diabetes mellitus, eczema, epilepsy, gastritis/reflux, hashimoto thyroid, hypothyroid, hypertension, sinusitis etc

It was revealed that 57.8% of the students in the research utilized analgesic without consulting a physician, and 19.0% used antibiotics without consulting a physician. It was shown that 73.5% of the students took analgesic on a regular basis, 78.8% declaring that every household should provide medicine, and 41.5% stored their medicines in the refrigerator and 27.0% in the medicine cabinet. It was established that more than half of the students (63.9%) retained their unused medicines at home, and that 66.4% of those students continued to keep the medicines at home after not using them all. It was discovered that 35.5% of students always have antibiotic in reserve at home, and

that 79.3% of students do not let the price of antibiotics impact their use. It was shown that 62.7% of students followed the doctor's advice about the use of antibiotics, whereas 11.5% of students insisted that the doctor prescribe antibiotics (Table 2).

Table 2. The Distribution of Students' Medicine and Antibiotic Use Behaviors

Usage of Antibiotics Variables	Variable Groups	Distributions	
		n	%
Utilized analgesic without consulting a physician	Yes	336	57.8
	No	129	22.2
	Sometimes	116	20.0
Utilized antibiotics without consulting a physician	Yes	110	19.0
	No	375	64.5
	Sometimes	96	16.5
Medicine category regularly used	Analgesic	427	73.5
	Antibiotic	37	6.4
	Cold medicines	103	17.7
	Other*	14	2.4
Declaring that every household should provide medicine.	Yes**	458	78.8
	No	123	21.2
Location for medicine storage	Refrigerator	241	41.5
	Bag	25	4.3
	Drawer	158	27.2
	Medicine cabinet	157	27.0
Keeping unused medicines at home Evaluation when a medicine is not completely consumed.	Yes	371	63.9
	No	210	36.1
	Dispose.	143	24.6
	Home storage.	386	66.4
	Donate to someone	52	9.0
Declaring that bring medicine while traveling	Yes	332	57.1
	No	249	42.9
Always have antibiotic in reserve at home	Yes	206	35.5
	No	375	64.5
The price of antibiotics impacts their utilization	Impact	120	20.7
	Not impact	461	79.3
Consideration in the use of antibiotics	Physician recommendation	364	62.7
	Medicine use conditions	118	20.3
	Allergy/side effect	99	17.0
Insist on the physician to prescribe antibiotics	Yes	67	11.5
	No	514	88.5

* Antihistamines, muscle relaxants, asthma medicines, stomach protectors, antidepressants, iron medicines, and acne medications. ** Analgesics, antipyretics, cold medicines, muscle relaxants, antibiotics, cough syrup, and etc.

It was discovered that 56.8% of the students defined antibiotic as bactericidal and 54.0% were unaware of IAU. It was revealed that 36.7% of students learnt about IAU via health experts, whereas 27.0% learned about it from the internet. It was discovered that 61.6% of students were told about the method, duration, and dosage of medicine by their physician. It was established that 22.2% of students took pharmaceuticals without a physician's suggestion, 22.6% used drugs without a doctor's recommendation on occasion, 33.1% ceased taking the medication before the physician's advised period, and 75.6% stopped using antibiotics when they felt better (Table 3).

Table 3. The Distribution of Students' Attitudes About Rational Antibiotics and Medicines

Usage of Antibiotics Variables	Variable Groups	Distributions	
		n	%
Understanding the adverse effects of the used antibiotic	Yes	383	65.9
	No	198	34.1
Sorce of information about antibiotic usage	Physician	227	39.1
	Pharmacy	107	18.4
	Parent	45	7.7
	Reading prospectus	202	34.8
Defining the antibiotic's meaning	Antipyretic	30	5.2
	Analgesic	100	17.2
	Bactericide	330	56.8
	Virucidal	121	20.8
Status information regarding IAU	Yes	267	46.0
	No	314	54.0
Information source about IAU	Print media	35	13.1
	Television	48	18.0
	Internet	72	27.0
	Health personnel	98	36.7
	University education	14	5.2
Obtaining information from the physician on the dosage, type, and duration of a medicine	Yes	358	61.6
	No	129	22.2
	Sometimes	94	16.2
Using medicine without consulting a physician	Yes	129	22.2
	No	321	55.2
	Sometimes	131	22.6
Stop using the medicine before theperiod prescribed by the physician	Yes	193	33.1
	No	176	30.4
	Sometimes	212	36.5
Stop taking antibiotics after feel better	Yes	439	75.6
	No	142	24.4

Table 4 shows the average scores of students on the AUS and its sub-dimensions.

Table 4. The Antibiotic Use Scale and Its Subdimensions' Mean Scores

Scale and	Distributions of Scores		
Sub-Dimensions	Min.	Max.	Mean±SD
Attitude	11	55	25.15±10.08
Subjective Norm	5	25	11.66±4.71
Intention	3	15	7.70±3.17
AUS Total	19	95	44.52±16.71

Min.: lowest value, Max.: highest value

In Table 5, when the distribution of student behaviors related to their drug use status is compared with the mean scores of AUS and its sub-dimensions, a statistically significant difference was found between the use of drugs without a physician's recommendation and situations of stopping drug use before the time recommended by a physician and AUS and all sub-dimensions of the scale ($p<0.05$). There was a statistically significant difference ($p<0.05$) between the type of substance taken in general and AUS, as well as the subdimensions "Attitude" and "Subjective Norm" of the scale, when compared to AUS (Table 5). There was a statistically significant difference ($p<0.05$) between the use of analgesics without consulting a physician and the evaluation of the medication when not all of it was consumed, as well as the AUS and the "Intention" sub-dimension of the scale. There was a statistically significant difference between the presence of unused medications at home and the "Intention" subfactor of the scale ($p<0.05$) (Table 5).

Table 5. Comparison of the Distribution of Students' Medicine Use Behaviors with the Mean Scores of the AUS and Sub-Dimensions.

Variables	n	Antibiotic Usage Scale			
		Attitude	**Subjective Norm**	**Intention**	**Total**
		Mean±SD	*Mean±SD*	*Mean±SD*	*Mean±SD*
Utilized medicine without consulting a physician					
Yes	129	27.1±9.6	12.5±4.6	8.5±2.9	48.2±15.5
No	321	24.3±10.4	11.3±4.9	7.17±3.19	42.8±17.4
Sometimes	131	25.3±9.7	11.7±4.3	8.19±3.10	45.2±15.6
Test (F)		**3.675**	**3.279**	**10.561**	**5.052**
p		**0.026**	**0.038**	**0.001**	**0.007**
Stop using the medicine before the period prescribed by the physician					
Yes	193	26.0±10.1	12.1±4.8	7.9±3.1	46.0±16.6
No	176	23.2±9.8	10.8±4.6	7.1±3.2	41.2±16.7
Sometimes	212	25.9±10.1	12.0±4.6	8.0±3.2	45.9±16.5
Test (F)		**4.565**	**4.275**	**4.377**	**5.157**
p		**0.011**	**0.014**	**0.013**	**0.006**
Utilized analgesic without consulting a physician					
Yes	336	25.7±10.2	11.9±4.7	8.0±3.20	45.8±16.9
No	129	23.4±10.1	10.8±4.7	6.9±3.1	41.2±16.6
Sometimes	116	25.3±9.6	11.6±4.5	7.6±3.1	44.5±15.9
Test (F)		2.492	2.701	**6.110**	**3.533**
p		0.084	0.068	**0.002**	**0.030**

Table 5. (Countinue) Comparison of the Distribution of Students' Medicine Use Behaviors with the Mean Scores of the AUS and Sub-Dimensions.

Medicine category regularly used					
Analgesic	427	25.2±9.8	11.8±4.7	7.7±3.2	44.6±16.4
Antibiotic	37	28.5±8.7	13.1±3.8	8.4±2.9	50.0±13.5
Cold medicines	103	24.7±11.2	11.2±5.1	7.7±3.3	43.6±18.2
Other*	14	17.9±9.5	8.3±4.2	6.8±3.4	33.1±15.6
Test (F)		**3.863**	**3.969**	0.995	**3.667**
p		**0.009**	**0.008**	0.395	**0.012**
Evaluation when a medicine isn't completely consumed.					
Dispose.	143	24.6±11.4	11.2±5.3	6.7±3.5	42.6±19.3
Home storage.	386	25.1±9.5	11.7±4.5	8.1±3.0	44.9±15.6
Donate to someone	52	27.2±10.1	12.4±4.7	7.4±3.0	47.0±16.9
Test (F, χ2)		1.261	1.129	**11.183**	**6.868***
p		0.284	0.324	**<0.001**	**0.032**
Keeping unused medicines at home					
Yes	371	25.5±9.9	11.8±4.6	8.1±3.1	45.5±16.2
No	210	24.5±10.3	11.3±4.9	6.9±3.1	42.8±17.4
Test (t)		1.127	1.309	**4.220**	1.844
p		0.260	0.191	**<0.001**	0.066

*F: One-Way Anova, t: Independent Samples t-test, χ2: Kruskal Wallis H test

In Table 6, when the distribution of students' antibiotic use behaviors and knowledge about rational antibiotics is compared with the mean scores of AUS and its sub-dimensions (using antibiotics when students get sick, using antibiotics without consulting your doctor, believing that they can get better without using antibiotics, stopping antibiotic use when they feel better), a statistically significant difference was found (p<0.05) between AUS and all sub-dimensions of AUS (Table 6). There was a statistically significant difference (p<0.05) between the subdimensions of AUS and "Attitude" and "Subjective Norm" of the scale and the students' knowledge of the side effects of the antibiotic they used, their ability to define the antibiotic, and their insistence that the physician prescribe antibiotics (Table 6).

Table 6. Comparison of Students' Antibiotic Usage Behaviors and Antibiotic Knowledge Distribution Using AUS and Sub-Dimensional Mean Scores

Variables	**n**	**Antibiotic Usage Scale**			
		Attitude	**Subjective Norm**	**Intention**	**Total**
		Mean±SD	*Mean±SD*	*Mean±SD*	*Mean±SD*
Using antibiotics during illness					
Yes	314	27.02±8.79	12.23±4.28	8.18±2.96	47.43±14.46
No	267	22.95±11.02	10.99±5.11	7.14±3.33	41.09±18.47
Test (t)		**4.859**	**3.127**	**3.923**	**4.548**
p		**<0.001**	**0.002**	**<0.001**	**<0.001**

Table 6.(Countinue) Comparison of Students' Antibiotic Usage Behaviors and Antibiotic Knowledge Distribution Using AUS and Sub-Dimensional Mean Scores

Understanding the adverse effects of the used antibiotic					
Yes	383	24.39±9.50	11.33±4.46	7.57±3.15	43.30±15.91
No	198	26.63±10.98	12.30±5.12	7.95±3.21	46.88±17.97
Test (t)		**2.436**	**2.253**	1.357	**2.462**
p		**0.015**	**0.025**	0.175	**0.018**
Utilized antibiotic without consulting a physician					
Yes	110	27.91±9.80	13.00±4.67	8.47±3.02	49.39±16.28
No	375	23.85±10.57	11.01±4.85	7.19±3.27	42.06±17.43
Sometimes	96	27.05±7.09	12.66±3.66	8.83±2.46	48.55±11.68
Test (χ2)		**25.087**	**25.254**	**31.683**	**31.489**
p		**<0.001**	**<0.001**	**<0.001**	**<0.001**
Considering that recover without antibiotics					
Yes	103	24.09±9.96	11.31±4.67	7.56±3.27	42.97±16.64
No	14	28.91±9.63	12.90±4.69	8.18±2.77	50.00±15.84
Test (t)		**-4.870**	**-3.402**	**-2.132**	**-4.265**
p		**<0.001**	**0.001**	**0.034**	**<0.001**
Stop taking antibiotics after					
feel better					
Yes	439	25.70±10.04	11.96±4.66	7.97±3.12	45.64±16.45
No	142	23.45±23.45	10.73±4.79	6.88±3.21	41.06±17.09
Test (t)		**2.326**	**2.722**	**3.595**	**2.856**
p		**0.020**	**0.007**	**0.001**	**0.004**
Needing antibiotics for every illness					
Yes	56	29.26±10.14	13.19±4.72	8.26±2.93	50.73±16.24
No	525	24.71±9.98	11.50±4.69	7.64±3.20	43.86±16.64
Test (t)		**3.238**	**2.568**	1.393	**2.943**
p		**0.001**	**0.010**	0.164	**0.003**
Always have antibiotic in reserve at home					
Yes	206	27.05±8.91	12.55±4.47	8.48±2.85	48.09±14.93
No	375	24.11±10.53	11.17±4.78	7.27±3.26	42.56±17.32
Test (t)		**3.395**	**3.415**	**4.451**	**3.863**
p		**<0.001**	**<0.001**	**<0.001**	**<0.001**
Defining the antibiotic's meaning					
Antipyretic	30	25.90±7.81	12.56±3.93	7.93±2.62	46.40±13.01
Analgesic	100	28.05±8.85	12.98±4.12	8.10±2.63	49.13±14.59
Bactericide	330	24.33±10.09	11.22±4.72	7.61±3.23	43.16±16.65
Virucidal	121	24.82±11.10	11.54±5.14	7.57±3.56	43.95±18.69
Test (F, χ2)		**15.445**	**3.985**	2.168	**14.266**
p		**0.001**	**0.008**	0.538	**0.003**
Insist on the physician to prescribe antibiotics					
Yes	67	28.74±10.22	13.04±4.62	8.08±2.98	49.88±16.82
No	514	24.68±9.97	11.48±4.70	7.65±3.20	43.82±16.59
Test (t)		**3.123**	**2.557**	1.051	**2.805**
p		**0.002**	**0.011**	0.294	**0.005**
Offer antibiotics to.relatives with similar ailments					
Yes	104	28.32±8.91	13.03±4.20	8.32±2.90	49.69±14.53
No	477	24.46±10.19	11.36±4.77	7.57±3.22	43.39±16.95
Test (t)		**3.577**	**3.305**	**2.206**	**3.513**
p		**<0.001**	**0.001**	**0.028**	**0.001**

*F: One-Way Anova, t: Independent Samples t-test, χ2: Kruskal Wallis H test

DISCUSSION

In our research, 57.8 percent of students utilized analgesic and 19.0 percent used antibiotics without contacting a physician (Table 2). It was revealed that almost half of the students utilized medications without a doctor's approval, and 33.1% of them ceased taking the medicine before the period prescribed by the physician (Table 3). In a number of published research, it was determined that our study's findings were comparable to those of these other investigations.[7,14,16,18–21,29] It was determined that 65.9% of the students knew the side effects of the antibiotics they used, that 55.2% of them did not use medicine without a physician's recommendation, that 39.1% of them obtained information about antibiotic use from a physician and that 34.8% obtained information by reading the prospectus. It was discovered that 61.6% of the students were told about the method, duration, and dosage of medicine by their physician (Table 3). According to the research, there were students who used medications[21,30,31] or antibiotics[7,32] on the doctor's advice, as well as others who did so without a prescription and without seeing a physician.[14,15] According to reports, between 52.4% and 83.6% of students read the medicine prospectus prior to usage.[15,21] In the research carried by Okyay and Erdogan (2017), analgesics (39.5%), antibiotics (36.9%), and flu medications (24%) were the most often used pharmaceuticals without a prescription.[17] In the research conducted by Soysal and Sahin (2020), it was revealed that students mostly acquired medicine-related information from physicians (48.6%) and pharmacies (47.6%).[31] Observably, some of the cited research' conclusions differ from those of our findings. Since they are in the field of health sciences, this finding shows that the students who participated in the study utilized medications and antibiotics in accordance with their education and practical experience.

According to a number of studies, students keep medicines in suitable circumstances.[7,20] Generally, medicines should be kept according to their labels' instructions.[33] When medications are improperly stored, such as at room temperature instead of in the refrigerator, they undergo chemical changes that reduce their therapeutic efficacy.[2] It was established that the results of certain other studies were comparable to those of our experience.[15,29,33] In our research, we concluded that more than two-thirds of the students (63.9%) retained their leftover medications at home, that 66.4% of them continued to keep the pills at home after they had not taken them all, and that 24.6% discarded them. It was found that 35.5% of kids always have an antibiotic at home (Table 2). Similar outcomes were reported in studies that confirmed our study's findings.[15,16] In Pınar's (2017) research, more over half of the students (65.3% of females and 54% of males) reported discarding expired medications.[29] Considered an IMU issue is the rise in the number of medications not used at home due to their concealment.[34] In our research, we discovered that students were determined to keep the medication, even if not all of it was used, and they were also determined to keep the unused medicines at home ($p<0.05$) (Table 5). In our study, we discovered that individuals who usually have extra antibiotics at home and those who offer antibiotics to family members who have similar concerns about their own disease have this attitude, are affected by others around them, and are adamant about this subject ($p<0.05$) (Table 5). This indicates

that when they become unwell again, they will be able to self-medicate or will offer antibiotics to family members with similar complaints.

The results of a survey indicate that 55.2% of midwifery students believe they have enough understanding of antibiotics. In the same research, 66.9% of the students said antibiotics should be prescribed for urinary tract infections, 57.2% for middle ear infections, 42.8% for fever, 39.3% for toothaches, and 37.2% for sore throats.[35] In the study of Okyay and Erdoğan (2017), 45.9% of the students stated that they had knowledge about RAU.[17] In the research conducted by Kocyigit et al. (2020), 53.8% of students in their first year of medical school had never heard of RAU.[14] According to Akman's (2021) report, 75.7% of students are aware that antibiotics are crucial in the fight against bacterial resistance. In the same report, 53.1% of students took antibiotics for colds and flu, 65.1% experienced sore throat, and 47.4% believed it to be useful against fever.[36] Almost half of the students (46%) had knowledge of RAU, which is consistent with the results of the literature and the findings of the research.

In our research, we discovered that students who took medications without a physician 's advice and quit taking the medication before the physician's advised period were affected by their friends and resolute about this matter. ($p<0.05$) (Table 5). We have discovered that individuals who take antibiotics while they are ill and those who use antibiotics without consulting a physician are influenced by others around them and are committed to addressing this issue. ($p<0.05$) (Table 6). Similar to previous research,[2,6,7,14–21] we find that university students have inadequate, inappropriate, and incomplete knowledge about the usage of medicines and antibiotics.

The majority of our students who participated in the research (75.6%) demonstrated IAU behavior when they stopped taking antibiotics when they felt better (Table 3). Similar studies conducted in our country and overseas indicated that fifty percent of university students stopped taking antibiotics because they believed they had healed.[14,15,17,23,27,29,30] It is one of the principles of RAU that students utilize antibiotics at the time and at the dosage prescribed by their physician. In the research evaluated by Bozdemir and Filiz (2021) for their systematic review, it has been noted that people take medications without visiting a physician or on the recommendation of a friend or family, and that they cease taking the medicine when their health concerns improve.[13] Mete and Ünal (2018) found that students of the Vocational School of Health Services who had been informed about RUM exhibited more reasonable behavior than those who had not. Mete and Ünal (2018) found that students of the Vocational School of Health Services who had been informed about RUM exhibited more reasonable behavior than those who had not.[2] According to Sahin et al. (2019), students outside of the faculty of pharmacy acted more in accordance with the RDA's principles.[16] Despite the fact that more than 64.5% of the students in our research (Table 2) believed that antibiotics should not be used without a prescription, they believed they had healed and ceased taking antibiotics, indicating that IAU continues. Antibiotic overuse is a significant risk factor for the development of bacterial resistance.[36] Students should be educated on the need of only taking antibiotics when required, considering the widespread development of antibiotic resistance in our nation and throughout the globe.

In our research, we discovered that antibiotics were the most common kind of medication taken by students, that they were influenced by the people around them, and that they were committed to addressing this issue. ($p<0.05$) (Table 5). In addition, we concluded that persons who believe they cannot recover without antibiotics and who need antibiotics for every ailment are influenced by the opinions of others around them and are committed to this attitude ($p<0.05$) (Table 6). It was also established that the students who demanded that the doctor prescribe antibiotics were influenced by their friend. ($p<0.05$) (Table 6). In the research of Koçyiğit et al. (2020), 89.3% of the students responded that the usage of antibiotics in our country is very intense.[14] Almost all (91.7%) of the college students who participated in Akman's (2021) research stated that people in our country overuse antibiotics. Antibiotic overuse is a significant risk factor for the development of bacterial resistance.[36] Students should be educated on the need of only taking antibiotics when required, considering the widespread development of antibiotic resistance in our country and throughout the globe.

CONCLUSION

It was discovered that fifty percent of students were unaware of IAU. We have observed that students who use antibiotics when they are ill and who use antibiotics without visiting a physician are influenced by their friends and are committed to their decision. We discovered that individuals who discontinued using antibiotics when the students began to feel better were affected by their friends and were committed to their decision. In our study, we discovered that individuals who always have extra antibiotics at home and those who offer antibiotics to family members with comparable concerns about their own ailments are influenced and committed to their decision. We concluded that the students who demanded that the physician prescribe antibiotics were influenced by their friends. Based on these findings, we may conclude that students demonstrate irrational antibiotic usage.

There are three primary pillars of responsible medicine usage. First, physicians, pharmacists, and the pharmaceutical industry serve as the supply pillar. The second demand pillars are customers, therefore society and patients. As the third pillar of regulatory and supervisory systems, the state, non-governmental organizations, and reimbursement institution comprise the third pillar. There are obligations in each of the stated pillar that fall on everyone.[4] It is not only the responsibility of physicians who prescribe medicines and inform patients about medicine use to raise awareness of RUM; it is also recommended that all health professionals be required to take a course on the topic as part of their education and that student symposiums and conferences be held on this topic. In addition, as knowledge in the field of health is always being updated, it is believed that it is essential for health professionals to reinforce these topics through in-service trainings in the institutions where they work after graduation.

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Authorship Contributions: Concept: SA, ZC, Design: SA, ZC, Supervising: SA, ZC, SH, Data collection and entry: SA, ZC, SH, FD, TY, Analysis and interpretation: SA, SH, Literature search: SA, ZC, SH, FD, TY, Writing: SA, ZC, SH, FD, TY, Critical review: SA, ZC, SH.

REFERENCES

1. Gündoğar H, Kartal S. Üniversite öğrencilerinin akılcı ilaç kullanımı hakkındaki görüşleri. Bartın Üniversitesi Eğitim Araştırmaları Derg 2017;1(1):25–34.
2. Mete S, Ünal Z. Akılcı ilaç kullanımı eğitiminin üniversite öğrencilerinde farkındalık etkisi. Sağlık ve Spor Bilim Derg 2018;1183–203.
3. Akıcı A. Akılcı ilaç kullanımının genel ilkeleri ve Türkiye'deki güncel durum. Türkiye Klin J Pharmacol-Special Top 2015;3:1–10.
4. Sürmelioğlu N, Kıroğlu O, Erdoğdu T, Karataş Y. Akılcı olmayan ilaç kullanımını önlemeye yönelik tedbirler. Arşiv Kaynak Tarama Derg 2015;24(4):452–462.
5. Pınar N. Ülkemizde ilaç harcamaları. İnönü Üniversitesi Tıp Fakültesi Derg 2012;19(1):59–65.
6. Artantaş AB, Eray İK, Salmanoğlu G, vd. Bir hastanenin aile hekimliği polikliniklerine başvuran erişkinlerin antibiyotik kullanımı konusundaki bazı alışkanlıkları, görüşleri ve bilgilerinin değerlendirilmesi. Ankara Med J 2015;15(2):38–47.
7. Kukula O. Tıp fakültesi öğrencilerinin antibiyotik kullanımının değerlendirilmesi. Ortadoğu Tıp Derg 2019;11(3):239–243.
8. Yılmaz H, Çıtıl R. Üniversite hastanesine başvuran hastalarda akılcı ilaç kullanımı ve etkileyen faktörler. Sürekli Tıp Eğitimi Derg 2022;31(3):161–171.
9. Atik D, Doğan Y. Antibiyotik Kullanım Ölçeği: Ölçek geliştirme çalışması. Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Derg 2019;16(1):1248–1276.
10. Şencan İ. Antibiyotik kullanımına kamu bakışı. ANKEM Derg 2011;25(Ek-2):123–125.
11. T.C. Sağlık Bakanlığı. Akılcı İlaç Kullanımı Ulusal Eylem Planı 2014-2017. http://www.akilciilac.gov.tr/wp-content/uploads/2014/11/aik-ulusal-eylem-plani.pdf (Erişim tarihi: 13 Eylül 2022).
12. Aydıngöz S, Lux K. Türkiye'de antibiyotik tüketim miktarının ve birinci basamak sağlık hizmetlerinde antibiyotik reçeteleme uygulamalarının OECD ülkeleri ile karşılaştırmalı olarak değerlendirilmesi. 2021;30(1):56–62.
13. Bozdemir E, Filiz M. Türkiye'de akılcı ilaç kullanımı ile ilgili bilgi, tutum ve davranış belirlemeye yönelik yapılan çalışmaların sistematik derlemesi. Dicle Üniversitesi Sos Bilim Enstitüsü Derg 2021;(27):92–105.
14. Koçyiğit H, Akgöz A, Bolat S, Baykan Z. Erciyes Üniversitesi Tıp Fakültesi birinci sınıf öğrencilerinin akılcı antibiyotik kullanımı konusundaki bilgi, tutum ve davranışlarının değerlendirilmesi. Klimik Journal/Klimik Derg 2020;33(1):29–35.
15. Kurt O, Oğuzöncül A, Deveci S, Pirinçci E. Bir Sosyal Bilimler Meslek Yüksekokulu öğrencilerinin akılcı ilaç kullanımı konusunda bilgi ve davranışlarının değerlendirilmesi. ESTÜDAM Halk Sağlığı Derg 2020;5(1):62–72.
16. Şahin E, Dayıoğlu N, Ökmen B, Korkmaz E, Baykara Ş, Baktır G. Sağlık alanı ve sağlık alanı dışında eğitim alan üniversite öğrencilerinde akılcı ilaç kullanımı farkındalığı. Experimed 2019;9(1):32–38.
17. Okyay R, Erdoğan A. Self-medication practices and rational drug use habits among university students: a cross-sectional study from Kahramanmaraş, Turkey. Peer J 2017;(5):e3990.
18. Şantaş F, Demirgil B. Akılcı ilaç kullanımına ilişkin bir araştırma. İşletme Bilim Derg 2017;5(1):35–48.
19. Kaya H, Turan N, Keskin Ö, vd. Üniversite öğrencilerinin akılcı ilaç kullanma davranışları. Hemşirelik ve Sağlık Bilim Derg 2015;18(1):35–42.
20. Özyiğit F, Arıkan İ. Kütahya ilinde üniversite öğrencilerinin akılcı ilaç kullanımı hakkında bilgi, tutum ve davranışları. Bozok Tıp Derg 2015;5(1):47–52.
21. Karakurt P, Hacıhasanoğlu R, Yıldırım A, Sağlam R. Üniversite öğrencilerinde ilaç kullanımı. TAF Prev Med Bull 2010;9(5):505–512.
22. Virmani S, Nandigam M, Kapoor B, Makhija P, Nair S. Antibiotic use among health science students in an Indian university: A cross sectional study. Clin Epidemiol Glob Heal 2017;5(4):176–179.
23. Núñez M, Tresierra-Ayala M, Gil-Olivares F. Antibiotic self-medication in university students from Trujillo, Peru. Med Univ 2016;18(73):205–209.
24. Pal B, Murti K, Gupta A, Choudhury U, Rastogi M, Pandey H. Self medication with antibiotics among medical and pharmacy students in North India. Curr Res Med 2016;7(2):7–12.

25. Harakeh S, Almatrafi M, Ungapen H, vd. Perceptions of medical students towards antibiotic prescribing for upper respiratory tract infections in Saudi Arabia. BMJ Open Respir Res 2015;2(1):e000078.

26. Scaioli G, Gualano M, Gili R, Masucci S, Bert F, Siliquini R. Antibiotic use: a cross-sectional survey assessing the knowledge, attitudes and practices amongst students of a school of medicine in Italy. PLoS One 2015;10(4):e0122476.

27. Suaifan G, Shehadeh M, Darwish D, Al-Ijel H, Yousef A, Darwish R. A cross-sectional study on knowledge, attitude and behavior related to antibiotic use and resistance among medical and non-medical university students in Jordan. African J Pharm Pharmacol 2012;6(10):763–770.

28. Pallant J. Descriptive statistics: assessing normality. İçinde: Survival manuel: A step by step guide to data analysis using IBM SPSS. 7. baskı New York: Routledge, Taylor & Francis Group; 2020. s.90-105

29. Pınar N. Mustafa Kemal Üniversitesi Tıp Fakültesi öğrencilerinin akılcı ilaç kullanım alışkanlıklarının belirlenmesi. Mustafa Kemal Üniversitesi Tıp Derg 2017;8(29):34–40.

30. Taş A. Üniversite öğrencilerinin akılcı ilaç kullanımının istatistiksel değerlendirmesi. Gümüşhane Üniversitesi Sağlık Bilim Derg 2021;10(4):714–723.

31. Soysal A, Şahin E. Akılcı ilaç kullanımı: Üniversite öğrencileri üzerinde bir araştırma. Sağlık Akad Derg 2020;7(3):175–182.

32. Gülbandılar A, Okur M, Öztop N, Dönmez M. Dumlupınar Üniversitesi Altıntaş Meslek Yüksekokulu öğrencilerinin antibiyotiklerle tedavi konusunda bilgi ve tutumlarının belirlenmesi. Celal Bayar Üniversitesi Sağlık Bilim Enstitüsü Derg 2017;4(2):581–585.

33. Göçgeldi E, Uçar M, Açıkel C, Türker T, Hasde M, Ataç A. Artık ilaç bulunma sıklığı ve ilişkili faktörlerin araştırılması. TAF Prev Med Bull 2009;8(2):113–118.

34. İlhan M, Aydemir Ö, Çakır M, Aycan S. Akılcı olmayan ilaç kullanım davranışları: Ankara'da üç ilçe örneği. Türkiye Halk Sağlığı Derg 2014;12(3):188–200.

35. Büyüker S. Sağlık Bilimleri Fakültesi ebelik bölümü öğrencilerinin akılcı antibiyotik kullanımı ile ilgili bilgi, tutum ve uygulamalarının değerlendirilmesi. J Anatol Med Res 2020;5(2):11–16.

36. Akman N. Sağlık programları öğrencilerinin antibiyotik kullanımına ilişkin bilgi ve tutumların üzerine bir araştırma. Türk Mikrobiyoloji Cemiy Derg 2021;51(3):295–302.

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REVIEW

Analysis research public health trends with the RE-AIM model and vosviewer : a literature review

Ratna Yuliawati[1], Hanifa Maher Denny[2], Sutopo Patriajati[3], Yusniar Hanani Darundiati[4]

[1]PhD, Doctoral Program of Public Health, Faculty of Public Health, Universitas Diponegoro, Semarang, Indonesia
[2]Prof. Dr., Departement of Occupational Safety and Health, Faculty of Public Health, Universitas Diponegoro, Semarang, Indonesia
[3]MD., Public Health Administration and Policy, Faculty of Public Health, Universitas Diponegoro, Indonesia
[4]MD., Department of Environmental Health, Faculty of Public Health, Universitas Diponegoro, Indonesia

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Abstract

Objective: This study uses the VOSviewer tool to conduct research mapping analysis in order to examine public health research using the RE-AIM Framework. The purpose of this study was to determine the use of RE-AIM shells in public health research. And the Vosviewer application can be used to read the distribution of research evaluated with RE-AIM so that it can be used by researchers to obtain novelty in research.

Methods: Descriptive analysis is used with a quantitative bibliometric approach in this research strategy. Based on Web of Science search results, the research data was acquired with the keywords "sanitation, public health, RE-AIM".

Results: From the data produced in the last five years (2017–2022), A total of 279 scholarly articles were acquired. The findings demonstrated that each year, more study has been conducted on public health and RE-AIM, and the topic of sanitation or enviromental health and RE-AIM has never been conducted.

Conclusion: Currently, research on the subject of public health, environmental health and RE-AIM is worthwhile, and it involves research that is still infrequently done. It is therefore anticipated that this research will serve as a guide for selecting the research topic.

Keywords: Bibliometrics, VOSviewer, Public Health, RE-AIM

Correspondence: Prof. Dr., Hanifa Maher Denny, Departement of Occupational Safety and Health, Faculty of Public Health, Universitas Diponegoro, Semarang, Indonesia. **E-mail:** hanifadenny@live.undip.ac.id, **Phone**: 0811296228

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INTRODUCTION

4.5 billion people, or 57% of the world's population, had access to safely managed sanitation services in 2022. Seven of the eight SDG regions and 135 of the countries have national estimates of good sanitation access.[1] The ambitious goal of providing equitable sanitation for all by 2030 is one of the revised Sustainable Development Goals (SDGs).[2] Inadequate WASH (water, sanitation, and hygiene) negatively impacts social and mental health and is a major cause of the spread of infectious diseases.[3] Neglected tropical diseases (NTDs) are largely caused by deficiencies in WASH.[4]

Increasing access to and usage of facilities is necessary to lessen the negative effects of inadequate sanitation and hygiene.[5] The goal of Community Led Total Sanitation (CLTS) is to improve community knowledge and awareness of the dangers by promoting long-term behavioral change via mobilization and motivation.[6]

The Indonesian government is tackling this issue by enforcing the Indonesia Health Ministry Number 3/2014 Regulation for Community-Led Total Sanitation (CLTS) and educating the populace through a campaign about the significance of environmental health and hygiene practices. Every community program should be reviewed, and the sustainability of the program should not be determined only by the operation of the machinery, but also by the administration and the involvement of the community.[7]

RE-AIM framework (Reach, Efficacy, Adoption, Implementation, and Maintenance) to describe the cumulative impact of this health system-led community-partnered effort to promote health. The use of *the RE-AIM framework* in program evaluation can avoid excessive use of resources, program irregularities, and failure to improve the degree of public health.[1] However, previous research has shown a lack of studies mapping the use of the RE-AIM framework to evaluate community-based research in public health research.

RE-AIM has been widely used to evaluate health program interventions, so it needs to be analyzed more deeply whether this framework has been used to evaluate Community Led total Sanitation. The analysis is continued using the VOSviewer application where we will be able to determine a novelty in public health research evaluated using the RE-AIM framework. The focus of this research is the analysis of the RE-AIM framework in sanitation research using mapping analysis with the Vosviewer application. Descriptive analysis and quantitative bibliometric methodologies based on research keywords are combined in this research method.

METHODS

This research strategy combines a quantitative bibliometric approach with descriptive analysis. Based on search results for the terms public health, sanitation, and RE-AIM using the Web of Science electronic database, research data was acquired.

RE-AIM is an evidence-based evaluation framework commonly used to assess real-world applications and the impact of public health interventions in the community. The RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) framework offers a comprehensive approach taking into account five dimensions namely reach, effectiveness, adoption, implementation and maintenance. It is important to evaluate the

impact on public health of an intervention.[2]

The RE-AIM framework is an evaluation and planning tool used to understand and improve the effectiveness of public health interventions. It assists researchers and practitioners in planning, evaluating, and deploying health interventions by considering five key dimensions: Reach, Effectiveness, Adoption, Implementation, and Maintenance. Here is a brief description of each dimension:

Reach: How many individuals or groups were involved in the intervention? It assesses how well interventions reach the target population and how representative they are.

Effectiveness: How well did the intervention work in producing the desired outcome among the target population? It involves measuring the impact of interventions on relevant health outcomes.

Adoption: How well did the organization or individual receive and implement the intervention in a real context? It involves assessing the extent to which interventions are adopted by health care organizations or providers.

Implementation: To what extent are interventions implemented with consistency and integrity in the workplace or in healthcare settings? It considers how well the intervention was implemented according to the original plan.

Maintenance: To what extent can the intervention be maintained over the long term after the original period of the intervention? It considers the sustainability of the effect of the intervention, whether it remains effective after the initial intervention period.

By paying attention to all these dimensions, the RE-AIM framework helps in planning effective interventions, ensuring that they are well implemented and adopted, and sustainable in the long term. It is also useful in evaluating existing interventions to improve understanding of their feasibility and effectiveness.[3]

Our bibliographic search includes all health articles using the RE-AIM framework in the world published over a 5-year period, from 2017-2022, A total of 279 articles were analyzed. We set three eligibility criteria for selecting articles relevant to our research :

1. Studies are published in public environments in the fields of health, education research, and health policy. Books, monographs, and conferences are not included.
2. The manuscript included in the review must be conceptual, empirical, methodological, or meta-analytical/review with editorial case studies.
3. Due to linguistic constraints, the study was limited to articles published in English.

Many different types of data must be explored in a bibliographic data model. Metadata such as author, publishing data, category, and time are generally included with articles done using the VOSviewer application.

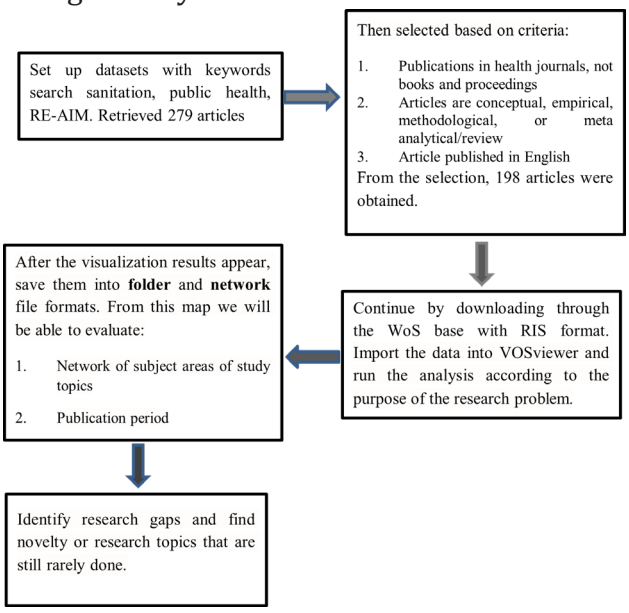

Figure 1. VOSviewer workflow

RE-AIM is a framework to guide program planning and evaluation according to RE-AIM outcomes: Reach, Effectiveness, Adoption, Implementation, and Maintenance

General workings of the VOSviewer application:

Data Input: First of all, you need to provide your bibliometric data. This data can be a text file that contains information such as article title, author name, year of publication, and number of citations. File formats supported by VOSviewer include BibTeX format, ris format, and plain text format.

Data Processing: Once the data is loaded into VOSviewer, it processes the data. This process involves mapping relationships between articles based on authors' citation or co-citation patterns, as well as calculating bibliometric statistics such as citation count, h index, and others.

Visualization: VOSviewer will generate a graphical visualization of your bibliometric data. These visualizations are often networks or maps that display relationships between entities (such as articles or authors). Frequently cited articles or authors who collaborate frequently tend to be placed closer to each other in visualization.

Analytics: Once the visualization is created, you can perform different types of analysis of your data. This includes identification of article clusters or groups of authors who collaborate frequently, analysis of distances or similarities between articles, and identification of high-impact articles.

Visualization Customization: VOSviewer allows you to customize the visualization according to your needs. You can change the color, size, or layout of entities in visualizations to improve data interpretation.

Interactive: VOSviewer also allows direct user interaction with visualizations. You can click on a specific entity to view detailed information, such as article titles or bibliometric statistics, or to highlight relationships with other entities.

RESULTS

Development of sanitation, public health, and RE-AIM framework

Data collection in this study used software by looking at published articles. In searching for data, we use the keywords sanitation, public health, and RE-AIM for the period 2017 to 2022, which have been published on the Web of Science. There are 279 articles that are pertinent to these keywords based on the search results.

From 279 articles selected based on criteria : Publications in health journals, not books and proceedings, Articles are conceptual, empirical, methodological, or meta analytical/ review, Article published in English. From the results of the selection, 198 articles were obtained.

The dynamics of the development of health research using the RE-AIM framework can be seen in figure 2.

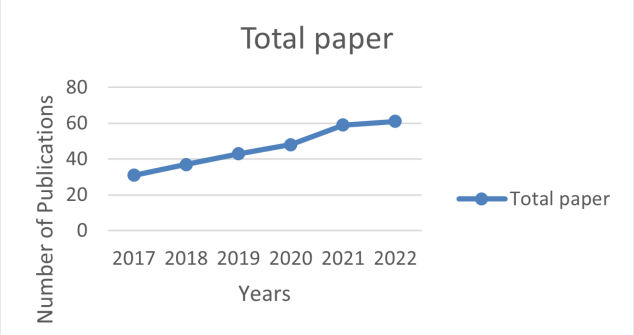

Figure 2. Graph of scientific articles on the theme of public health and RE-AIM

From the graph, we can see that the use of the RE-AIM framework in health research always increases every year.

Network visualization of topic subject areas

In network visualization, the topic of study is grouped into 10 clusters. The main areas per cluster are Re-Aim (blue cluster), Public Health (green cluster), Health promotion (yellow cluster), Mental health (red cluster), physical activity (light green cluster), Health impacts (light blue cluster), environment (light yellow cluster), Health policy (pink cluster), Health program effectiveness (purple cluster), disease (orange cluster).

The light color indicates that little research is being done. Environmental health research networks using the RE-AIM framework show a light yellow color, so this research is still rare.

Publication period Overlay Visualization

Overlay visualization illustrates the mapping of the novelty of the study. There is a section that indicates the color parameters ranging from the darkest (purple) to the lightest (yellow). Darker means that the year of publication of the article discussing the topic is years ago, while the one shown in light means that the article was published in the new year.

This study selected health articles using the RE-AIM framework in the last 5 years and obtained 21 articles.

Then we show you the 10 articles with the highest number of citations to see the extent of research interest in this topic.

Research using the *RE-AIM Framework* increased annually starting in 2017. The search results that have been carried out on the *Web of Science* get 198 articles that are in accordance with the research topic.

We have selected the top 21 papers from 21 distinct publications based on the data we filtered. Out of the 279 publications that were acquired, Table 1 presents statistics on the 10 articles that have received the most citations. The highest citation in the 2019 article was 278 citations, while the lowest citation was in the 2020 article with 1 citation.

The criteria for selecting articles are from the last 5 years, then articles that use the RE AIM framework to evaluate the impact of health interventions.

Table 1. Highest Quote Article Data on Health theme with RE-AIM

No	Author	Title	Cited	Years	Journal
1	Moullin, J C; Dickson, K S; Stadnick, N A; Rabin, B; Aarons, G A	Systematic review of the Exploration, Preparation, Implementation, Sustainment (EPIS) framework(4)	278	2019	Implementation Science
2	Messing, S; Rutten, A; Abu-Omar, K; Ungerer-Rohrich, U; Goodwin, L; Burlacu, I; Gediga, G	How Can Physical Activity Be Promoted Among Children and Adolescents? A Systematic Review of Reviews Across Settings(5)	91	2019	Frontiers In Public Health
3	Harden, S M; Smith, M L; Ory, M G; Smith-Ray, R L; Estabrooks, P A; Glasgow, R E	RE-AIM in Clinical, Community, and Corporate Settings: Perspectives, Strategies, and Recommendations to Enhance Public Health Impact(6)	87	2018	Frontiers In Public Health
4	Indig, D; Lee, K; Grunseit, A; Milat, A; Bauman, A	Pathways for scaling up public health interventions(7)	69	2017	Bmc Public Health
5	McCreight, M S; Rabin, B A; Glasgow, R E; Ayele, R A; Leonard, C A; Gilmartin, H M; Frank, J W; Hess, P L; Burke, R E; Battaglia, C T	Using the Practical, Robust Implementation and Sustainability Model (PRISM) to qualitatively assess multilevel contextual factors to help plan, implement, evaluate, and disseminate health services programs(8)	67	2019	Translational Behavioral Medicine
6	Jones, A; Magnusson, R; Swinburn, B; Webster, J; Wood, A; Sacks, G; Neal, B	Designing a Healthy Food Partnership: lessons from the Australian Food and Health Dialogue(9)the Federal Government established the Food and Health Dialogue (the Dialogue	66	2016	Bmc Public Health
7	Rabin, B A; McCreight, M; Battaglia, C; Ayele, R; Burke, R E; Hess, P L; Frank, J W; Glasgow, R E	Systematic, Multimethod Assessment of Adaptations Across Four Diverse Health Systems Interventions(10)	53	2018	Frontiers In Public Health
8	Asante, K P; Afari-Asiedu, S; Abdulai, M A; Dalaba, M A; Carrion, D; Dickinson, K L; Abeka, A N; Sarpong, K; Jack, D W	Ghana's rural liquefied petroleum gas program scale up: A case study(11)	48	2018	Energy For Sustainable Development
9	King, D K; Shoup, J A; Raebel, M A; Anderson, C B; Wagner, N M; Ritzwoller, D P; Bender, B G	Planning for Implementation Success Using RE-AIM and CFIR Frameworks: A Qualitative Study(12)	46	2020	Frontiers In Public Health
10	Kerkhoff, A D; Sachdev, D; Mizany, S; Rojas, S; Gandhi, M; Peng, J; Black, D; Jones, D; Rojas, S; Jacobo, J; Tulier-Laiwa, V; Petersen, M; Martinez, J; Chamie, G; Havlir, D V; Marquez, C	Evaluation of a novel community-based COVID-19 'Test-to-Care' model for low-income populations(13)	37	2020	Plos One

Visualization of the density of the study area

In this section, the popularity of the terms used as research topics is displayed. Bright colors in a term then this term is very popular, on the other hand if the color of the term dark means that the term is rarely researched. The theme of environmental health research using the RE-AIM framework shows a dark color so that it can be interpreted that this topic is still rarely studied.

DISCUSSION

Visualization of Public Health and RE-AIM with the VOSviewer application.

Software with strong visualization capabilities is required to carry out bibliometric analysis. The VosViewer software was selected because to its ability to provide three different kinds of mapping visualizations: overlay, density, and network visualization.[14]

Network visualization of topic subject areas

The analysis was conducted using Vosviewer to categorize 198 articles in the sample. The most commonly used keywords are identified and checked. Subjects that frequently appear in the investigated region stand out as the findings of this study. As shown on the map, is drawing 3. The area is grouped into 10 clusters. The main areas per cluster are Re-Aim (blue cluster), Public Health (green cluster), Health Promotion (yellow cluster), Mental Health (red cluster), Physical Activity (light green cluster), Health Impacts (light blue cluster), Environment (light yellow cluster), Health Policy (pink cluster), Health Program Effectiveness (purple cluster), and Disease (orange cluster).

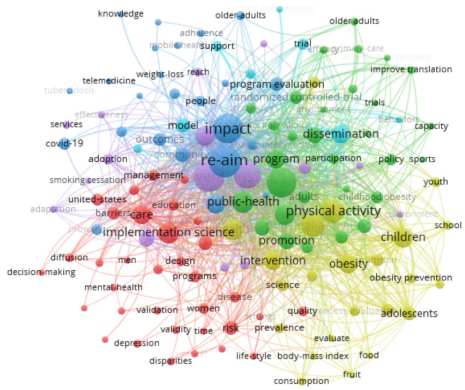

Figure 3. Visualization of public health networks and RE-AIM

One of the mapping functions in the VOSviewer.[20] Application is network visualization. An overview of the mapping between related themes and the theme's magnitude is given by the network feature. The correlation between the phrase and the number of included clusters in this network mapping Every term that has been described has several connections to other terms, suggesting that these terms have been determined for the particular research topic.

Publication period Overlay Visualization

Overlay visualization illustrates the mapping of research novelty on terms related to time-span references.[15] At the bottom, there are color parameters ranging from the darkest (purple) to the lightest (yellow). The darker color means that the year of publication of the article discussing the topic is the previous year, while the one shown in light colors such as green or yellow means that the article was published in the new year.

The results of the analysis show trends from year to year related to this study. The data was divided into 4 phases at the beginning of 2015 research discussed a lot about physical activity using Re-aim analysis, in 2018 research discussed a lot about Public Health and in 2020 discussed a lot about covid.

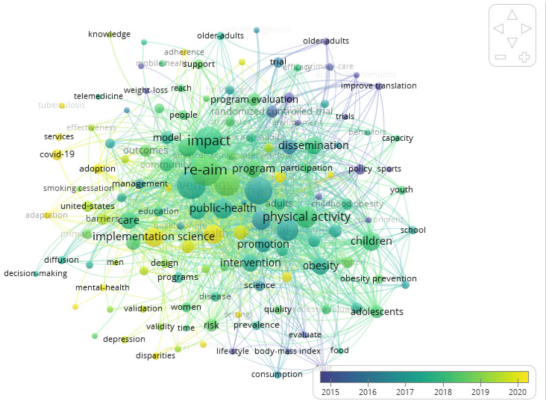

Figure 4. Network visualization by year of publication

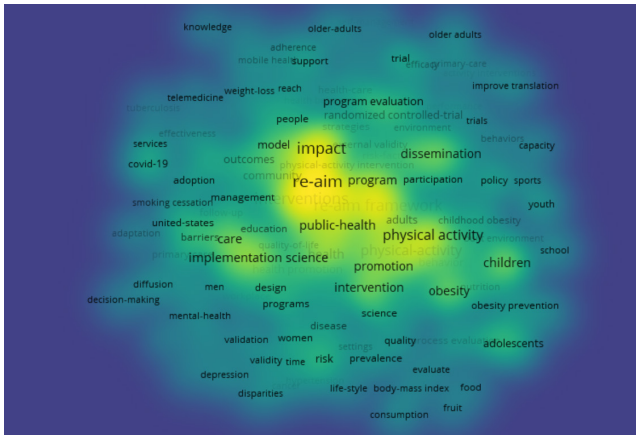

Figure 4. Visualization of Public Health and *RE-AIM density*

Visualization of the density of the study area

Density visualization is the final kind of mapping visualization available in the VOSviewer program. The popularity of terms used as research topics is displayed in this section.[23]. The bright color of a term then this term is very popular, on the other hand if the color of the term is dark it means that the term is rarely researched. It also confirms the effectiveness of bibliometric analysis.[17]

The density of research shows the depth of research, the more concentrated the color that appears, the research is still rarely studied. From VOSviewer analysis Re-Aim is a popular method in the analysis of health cases in developed countries. This shows that it is very important to have a more in-depth discussion about Public Health. Evaluation of an intervention needs to be done to assess the effectiveness of a program.[18]

Based on figure 4 many empirical cases related to child[19] , eating disorders in adolescents[20] environment[21] and occupational health.[23] Discussion related to Mental health.[24] Topic Sanitation[25] is still small. Researchers are interested in discussing the topic of evaluating community programs that use the RE-AIM dimension. These dimensions include achievement, effectiveness, adoption, implementation and maintenance.

RE-AIM to assess any possible effects on public health.

RE-AIM is an evidence-based evaluation framework commonly used to assess real-world applications and impacts of Public Health interventions in Society.[26] This evaluation activity is used for intervention in the community for promotive and preventive efforts.[33] Efficacy/Effectiveness, Adoption, Implementation, Maintenance The RE-AIM model includes five dimensions: achievement focuses on organizational characteristics and participants willing to participate in interventions, Effectiveness is an assessment of how well interventions achieve desired outcomes, Adoption assesses the influence of regulatory levels affecting program initiation.[28] Implementation focuses on the extent to which interventions are delivered[29] , and maintenance measures the extent to which interventions are maintained at the organizational and individual levels. This evaluation framework can be used to see the impact that arises from health behavior.[30] It can be used to make program planning.[31] And to see the impact and feasibility of health programs.[32]

RE-AIM analysis is often used to look at interventions and identification in chronic diseases in community groups[33] and to

assess the effectiveness of disease prevention programs[34] and to increase access to primary health care.[35]

Next, we investigated an examination of trends in publications and citations, author affiliations, including their countries and institutions, and the sources in which the study was published. Next, we present an in-depth analysis of the selected articles with the highest number of citations. Based on bibliometric with VOSviewer studies that have potential for future research is the use of the RE-AIM framework to evaluate community-based health programs in the community.(36) Research with the bibliometric VOSviewer application can help researchers in planning and strategizing for future research..[37]

This application can be used to search and analyze academic citations. We can find out the number of papers from certain researchers along with their h-index. This can make it easier to see the impact of a study. VOSviewer can also help find research gaps or novelty of a research theme.

The RE-AIM framework has several advantages that make it a useful evaluation tool in the development, evaluation, and deployment of public health interventions. Some of its advantages include:

Comprehensive: RE-AIM covers five critical dimensions of health interventions: reach, effectiveness, adoption, implementation, and maintenance. This allows for a more comprehensive assessment of the effectiveness of interventions from start to finish, including deployment and sustainability issues.

Context Appropriateness: RE-AIM is designed to be applicable in a variety of contexts, including in clinical research, community settings, or in healthcare settings. This makes it useful for a wide variety of practitioners and researchers in various fields.

Focus on Externalities: One of RE-AIM's key advantages is its emphasis on reach and adoption, which helps ensure that health interventions are not only effective in clinical trials, but can also be widely adopted and used by target populations in the real world.

Sustainability Orientation: RE-AIM places special attention on the maintenance of interventions, ensuring that the positive effects of interventions can be maintained in the long term after the original period ends. This is important to ensure a sustainable impact on public health.

Simple and Easy to Understand: Although it covers important aspects of health interventions, the RE-AIM framework is relatively simple and easy to understand, making it usable by a wide range of practitioners and researchers without an in-depth statistical or epidemiological background.

With these advantages, RE-AIM becomes a valuable tool in planning, evaluating, and deploying effective and sustainable health interventions to the wider population.

This can be seen in the publication of research results that use RE-AIM to evaluate the impact of health programs in a community. Among them to evaluate management support programs for type 2 diabetes.(38) use of RE-AIM to analysis of Clinical Encounters by Emergency Medical Services Physicians.(39) To evaluation of the Reaching Out to Kids with Emotional Trauma (ROcKET) intervention in an elementary school.[40] During the COVID pandemic, the RE-AIM framework was also used to evaluate open online course.[41]

Of the 17 community-based programs evaluated, 15 of them used the RE-AIM

dimension. The qualitative results of quantitative states that RE-AIM is stated as a practical implementation science framework. RE-AIM is an efficient framework for clinical and community-based project planning and evaluation. RE-AIM provides a structure for systematically evaluating the impact of health programs.[42]

CONCLUSION

Mapping with VOSviewer shows that public health and environmental health research using the RE-AIM framework is still rarely carried out. The use of the RE-AIM framework can be a method to evaluate health programs and see the effectiveness of these programs.

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Author Contrubition: Conceptualization, design, data collection and entry, literature search (YR); Methodology, Instructor, Equipment (HMD); Analysis and interpretation (SPJ); Data curation, writing, critical review (YHD)

REFERENCES

1. Escaron AL, Martinez C, Vega-Herrera C, Enger SM. RE-AIM analysis of a community-partnered policy, systems, and environment approach to increasing consumption of healthy foods in schools serving low-income populations. Transl Behav Med. 2019;9(5):899–909.
2. Glasgow RE, Klesges LM, Dzewaltowski DA, Estabrooks PA VT. Evaluating the Impact of Health Promotion Programs: Using the RE-AIM framework. Health Educ Res [Internet]. 2006; Available from: https://link.springer.com/article/10.1007/BF02872666
3. Stange KC. Commentary: RE-AIM Planning and Evaluation Framework: Adapting to New Science and Practice With a 20-Year Review. Front PUBLIC Heal. 2020;8.
4. Moullin JC, Dickson KS, Stadnick NA, Rabin B, Aarons GA. Systematic review of the Exploration, Preparation, Implementation, Sustainment (EPIS) framework. Implement Sci. 2019;14.
5. Messing S, Rutten A, Abu-Omar K, Ungerer-Rohrich U, Goodwin L, Burlacu I, et al. How Can Physical Activity Be Promoted Among Children and Adolescents? A Systematic Review of Reviews Across Settings. Front PUBLIC Heal. 2019;7.
6. Harden SM, Smith ML, Ory MG, Smith-Ray RL, Estabrooks PA, Glasgow RE. RE-AIM in Clinical, Community, and Corporate Settings: Perspectives, Strategies, and Recommendations to Enhance Public Health Impact. Front PUBLIC Heal. 2018;6.
7. Indig D, Lee K, Grunseit A, Milat A, Bauman A. Pathways for scaling up public health interventions. BMC Public Health. 2017;18.
8. McCreight MS, Rabin BA, Glasgow RE, Ayele RA, Leonard CA, Gilmartin HM, et al. Using the Practical, Robust Implementation and Sustainability Model (PRISM) to qualitatively assess multilevel contextual factors to help plan, implement, evaluate, and disseminate health services programs. Transl Behav Med. 2019;9(6):1002–11.
9. Jones A, Magnusson R, Swinburn B, Webster J, Wood A, Sacks G, et al. Designing a Healthy Food Partnership: lessons from the Australian Food and Health Dialogue. BMC Public Health. 2016;16.
10. Rabin BA, McCreight M, Battaglia C, Ayele R, Burke RE, Hess PL, et al. Systematic, Multimethod Assessment of Adaptations Across Four Diverse Health Systems Interventions. Front PUBLIC Heal. 2018;6.
11. Asante KP, Afari-Asiedu S, Abdulai MA, Dalaba MA, Carrion D, Dickinson KL, et al. Ghana's rural liquefied petroleum gas program scale up: A case study. ENERGY Sustain Dev. 2018;46:94–102.

12. King DK, Shoup JA, Raebel MA, Anderson CB, Wagner NM, Ritzwoller DP, et al. Planning for Implementation Success Using RE-AIM and CFIR Frameworks: A Qualitative Study. Front PUBLIC Heal. 2020;8.

13. Kerkhoff AD, Sachdev D, Mizany S, Rojas S, Gandhi M, Peng J, et al. Evaluation of a novel community-based COVID-19 "Test-to-Care" model for low-income populations. PLoS One. 2020;15(10).

14. Pihlajamaki J, Mannikko R, Tilles-Tirkkonen T, Karhunen L, Kolehmainen M, Schwab U, et al. Digitally supported program for type 2 diabetes risk identification and risk reduction in real-world setting: protocol for the StopDia model and randomized controlled trial. BMC Public Health. 2019;19.

15. Rahman FF, Haris F. COVID-19 emergency response in Southeast Asian region: A bibliographic analysis using VOSviewer software. Bali Med J. 2022;11(3):1656–9.

16. DF Al Husaeni AN. Bibliometrik menggunakan VOSviewer dengan Publish or Perish (menggunakan data Google Scholar): Dari pengolahan langkah demi langkah bagi pengguna hingga contoh praktis dalam analisis artikel pembelajaran digital pada masa sebelum dan sesudah pandemi Covid. J Sains dan Tek ASEAN. 2022;2(1):19–46.

17. SA Nugraha AN. Bibliometric analysis of magnetite nanoparticle production research during 2017-2021 using Vosviewer. Indones J Multydisciplinary Res. 2022;2(2):327–32.

18. DF Al Husaeni AN. Bibliometric using VOSviewer with Publish or Perish (using google scholar data): From step-by-step processing for users to the practical examples in the analysis of digital learning articles in pre and post Covid-19 pandemic. ASEAN J Sci Eng. 2022;2 (1):19–46.

19. MacDonald B, Gibson AM, Janssen X, Hutchinson J, Headley S, Matthews T, et al. Should We Scale-Up? A Mixed Methods Process Evaluation of an Intervention Targeting Sedentary Office Workers Using the RE-AIM QuEST Framework. Int J Environ Res Public Health. 2020;17(1).

20. Nacke B, Zeiler M, Kuso S, Klesges LM, Jacobi C, Waldherr K. A systematic review of reach, adoption, implementation and maintenance of Internet-based interventions to prevent eating disorders in adults. Eur J Public Health. 2021;31:29–37.

21. Moore L, de Silva-Sanigorski A, Moore SN. A socio-ecological perspective on behavioural interventions to influence food choice in schools: alternative, complementary or synergistic? Public Health Nutr. 2013;16(6):1000–5.

22. Bottorff JL, Huisken A, Hopkins M, Nesmith C. A RE-AIM evaluation of Healthy Together: a family-centred program to support children's healthy weights. BMC Public Health. 2020;20(1).

23. Lin CP, Li TY, Zou GY, Li XD, Ling L, Chen W. Implementation Evaluation of a Cluster Randomized Controlled Trial to Promote the Use of Respiratory Protective Equipment Among Migrant Workers Exposed to Organic Solvents in Small and Medium-Sized Enterprises. Front PUBLIC Heal. 2022;10.

24. Brazil K, Cardwell C, Carter G, Clarke M, Corry DAS, Fahey T, et al. Anticipatory care planning for community-dwelling older adults at risk of functional decline: a feasibility cluster randomized controlled trial. BMC Geriatr. 2022;22(1).

25. Clarke NE, Dyer CEF, Amaral S, Tan G, Nery SV. Improving uptake and sustainability of sanitation interventions in timor-leste: A case study. Int J Environ Res Public Health. 2021;18(3):1–13.

26. Glasgow RE, Vogt TM BS. Evaluating the public health impact of health promotion interventions: the re-aim framework. Am J Public Heal. 1999;89:1322–77.

27. Linder S, Ferschl S, Abu-Omar K, Ziemainz H, Reimers AK. Evaluating physical activity interventions for socioeconomically disadvantaged adults through the RE-AIM framework: A systematic review of experimental and non-/quasi-experimental trials. Prev Med REPORTS. 2022;29.

28. Zeiler M, Kuso S, Nacke B, Klesges LM, Waldherr K. Evaluating reach, adoption, implementation and maintenance of Internet-based interventions to prevent eating disorders in adolescents: a systematic review. Eur J Public Health. 2021;31:38–47.

29. Aranda-Diaz A, Imbert E, Strieff S, Graham-Squire D, Evans JL, Moore J, et al. Implementation of rapid and frequent SARS-CoV2 antigen testing and response in congregate homeless shelters. PLoS One. 2022;17(3).

30. Konrad LM, Ribeiro CG, Maciel EC, Tomicki C, Brito FA, Almeida FA, et al. Evaluating the implementation of the active life improving health behavior change program "BCP-VAMOS" in primary health care: Protocol of a pragmatic randomized controlled trial using the RE-AIM and CFIR frameworks. Front PUBLIC Heal. 2022;10.

31. D'Lima D, Soukup T, Hull L. Evaluating the Application of the RE-AIM Planning and Evaluation Framework: An Updated Systematic Review and Exploration of Pragmatic Application. Front PUBLIC Heal. 2022;9.

32. Hohmeier KC, Baker P, Storey C, Martin N, Gatwood JD. Exploring the Membership Pharmacy Model: Initial impact and feasibility. J Am Pharm Assoc. 2023;63(2):672-+.

33. Choma EA, Treat-Jacobson DJ, Keller-Ross ML, Wolfson J, Martin L, McMahon SK. Using the RE-AIM framework to evaluate physical activity-based fall prevention interventions in older adults with chronic conditions: A systematic review. Transl Behav Med. 2023;13(1):42–52.

34. Muttaqien Z, Wasityastuti W, Sofyana M, Agustiningsih D, Wibowo RA. A longitudinal controlled signage intervention to increase stair use at university buildings: Process and impact evaluation using RE-AIM framework. Front PUBLIC Heal. 2023;11.

35. Welch V, Pottie K, Gaudet C, Thuku M, Mallard R, Spenceley S, et al. Realist review of community coalitions and outreach interventions to increase access to primary care for vulnerable populations: a realist review. Arch PUBLIC Heal. 2023;81(1).

36. Raman R, Lathabhai H, Pattnaik D, Kumar C, Nedungadi P. Research contribution of bibliometric studies related to sustainable development goals and sustainability [Internet]. Vol. 5, Discover Sustainability. Springer International Publishing; 2024. Available from: https://doi.org/10.1007/s43621-024-00182-w

37. Zamzuri Z. A bibliometric analysis of COVID-19 research in Malaysia using latent dirichlet allocation | Suatu Analisis Bibliometrik Kajian COVID-19 di Malaysia menggunakan Agihan Dirichlet Terpendam. Sains Malaysiana. 2021;50(6):1815–1825.

38. Jaipakdee J, Jiamjarasrangsi W, Lohsoonthorn V, Lertmaharit S. Effectiveness of a self-management support program for Thais with type 2 diabetes: Evaluation according to the RE-AIM framework. Nurs Health Sci. 2015;17(3):362–9.

39. Rosenblum AJ, Wend CM, Ide RA, Owens MA, Cutchins CA, Levy MJ. Descriptive Analysis of Clinical Encounters by Emergency Medical Services Physicians Using the RE-AIM Framework. J PUBLIC Heal Manag Pract. 2023;29(2):E58–64.

40. McMahon E, Van Wyk C, Pena TG, Samuels LR, Teeters LA, Worsley SB, et al. Feasibility evaluation of the Reaching Out to Kids with Emotional Trauma (ROcKET) intervention in an elementary school: a single-arm, single-centre, feasibility study based on the RE-AIM framework. BMJ Open. 2023;13(3).

41. Yilmaz Y, Sarikaya O, Senol Y, Baykan Z, Karaca O, Yilmaz ND, et al. RE-AIMing COVID-19 online learning for medical students: a massive open online course evaluation. BMC Med Educ. 2021;21(1).

42. Bethany M Kwan 1, Hannah L McGinnes 1, Marcia G Ory 2, Paul A Estabrooks 3, Jeanette A Waxmonsky 1 REG 1. RE-AIM in the Real World: Use of the RE-AIM Framework for Program Planning and Evaluation in Clinical and Community Settings. Front Public Heal . 2019;22:7:345.

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TURKISH JOURNAL OF PUBLIC HEALTH

LETTER TO EDITOR

Vaccine hesitancy: balancing public health and political realities

Oche Joseph Otorkpa[1]

[1]MD, Dr., Department of Public Health, School of Public Health, Texila American University, Georgetown, Guyana

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Abstract

Vaccine hesitancy, which peaked globally during the COVID-19 pandemic and continues to garner significant attention amid ongoing global efforts to combat the morbidity and mortality associated with infectious diseases, poses a major challenge to disease prevention and control. Fueled largely by misinformation and distrust in government and scientific institutions, vaccine hesitancy jeopardizes individual and community health, as well as decades of progress in medicine and public health. Effectively addressing vaccine hesitancy entails balancing public health initiatives with political realities on the ground. To achieve this, effective communication of scientific evidence regarding vaccine safety and efficacy is paramount in dispelling myths and countering the myriad of misinformation. Health authorities and policymakers must engage with the public through transparent and accessible channels to build trust and confidence in vaccination. Recognizing the diversity of communities and their unique concerns is crucial in tailoring vaccination strategies. Community engagement initiatives that involve traditional or local leaders, religious organizations, and grassroots movements can help improve trust levels and increase vaccine acceptance. In this age of social media dominance, educational campaigns aimed at promoting health literacy and critical thinking skills can empower individuals to discern credible sources from misinformation. Socioeconomic factors often exacerbate vaccine hesitancy, disproportionately affecting marginalized communities; therefore, addressing socioeconomic disparities in access to healthcare, education, and resources is essential in ensuring equitable vaccine distribution and uptake. Evidence-based policy reforms that prioritize public health while respecting individual rights can also foster an environment conducive to vaccine acceptance.

Keywords: Vaccination Resistance, Vaccine Hesitancy, Political Realities

Correspondence: MD, Dr., Oche Joseph Otorkpa, Department of Public Health, School of Public Health, Texila American University, Georgetown, Guyana. **E-mail:** drochejoseph@gmail.com

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Dear Editor,

The issue of vaccine hesitancy reached its peak during the COVID-19 pandemic and has continued garner significant attention in the midst of ongoing global efforts to combat the morbidity and mortality associated with infectious diseases. While vaccines have historically been one of the most effective tools in public health, the global rise of vaccine hesitancy poses a major challenge in our collective pursuit of disease prevention and control through increased vaccination rates.[1]

Vaccine hesitancy, fueled by a myriad of factors ranging from misinformation to distrust in government and scientific institutions, has emerged as a complex phenomenon with far-reaching consequences for global public health.[2] It not only jeopardizes individual and community health but also undermines the foundation of public health initiatives and decades of progress that has been achieved through innovative advances in medicine and public health.[3]

As we navigate through the delicate landscape of vaccine hesitancy, it has become imperative to strike a balance between important public health initiatives and political realities on the ground.[4] While public health advocates have continued to emphasize the importance of widespread vaccination in order to achieve herd immunity and prevent disease outbreaks, policymakers are often confronted with the challenge of addressing public concerns and preserving individual freedoms.[5]

In our pursuit of bridging this fundamental divide, it is essential to embrace a multi-faceted approach that acknowledges the underlying reasons behind vaccine hesitancy and addresses them with required empathy and understanding.

Here, we list approaches that this entails:

Effective communication of scientific evidence regarding vaccine safety and efficacy is paramount in dispelling myths and countering the myriad of misinformation. Health authorities and policymakers must engage with the public through transparent and accessible channels to build trust and confidence in vaccination.6

Recognizing the diversity of communities and their unique concerns is crucial in tailoring vaccination strategies. Community engagement initiatives that involve traditional or local leaders, religious organizations, and grassroots movements can help improve trust levels and increase vaccine acceptance.

Empowering individuals with accurate information empowers them to make informed decisions about their health. In this age of social media dominance, educational campaigns aimed at promoting health literacy and critical thinking skills can empower individuals to discern credible sources from misinformation.[7]

Socioeconomic factors often exacerbate vaccine hesitancy, disproportionately affecting marginalized communities. Efforts to address socioeconomic disparities in access to healthcare, education, and resources are essential in ensuring equitable vaccine distribution and uptake. In addition, policymakers play a pivotal role in shaping the political landscape surrounding vaccination. Evidence-based policy reforms that prioritize public health while respecting individual rights can foster an environment conducive to vaccine acceptance.[8]

In conclusion, addressing vaccine hesitancy requires a concerted effort that goes beyond disciplinary boundaries and political ideologies. By encouraging improved collaboration between public health experts, policymakers, and our communities, we can navigate the complexities of vaccine hesitancy and pave the way for a healthier and more resilient society.

REFERENCES

1. Eddy JJ, Smith HA, Abrams JE. Historical lessons on vaccine hesitancy: smallpox, polio, and measles, and implications for COVID-19. Perspect Biol Med. 2023;661:145-159. doi: https://10.1353/pbm.2023.0008.
2. Goldenberg M. Vaccine Hesitancy and Institutional Credibility Pre-COVID-19 [Doctoral dissertation]. 2022. Available at: https://macsphere.mcmaster.ca/handle/11375/28261. Acces on: April 25, 2024.
3. Ali VE, Asika MO, Elebesunu EE, Agbo C, Antwi MH. Cognizance and mitigation of falsified immunization documentation: Analyzing the consequences for public health in Nigeria, with a focus on counterfeited COVID-19 vaccination cards: A case report. Health Sci Rep. 2024;72:e1885. doi: https://doi.org/10.1002/hsr2.1885.
4. Carey G, Crammond B. Action on the social determinants of health: views from inside the policy process. Soc Sci Med. 2015;128:134-141. doi: https://doi.org/10.1016/j.socscimed.2015.01.024.
5. Nuwarda RF, Ramzan I, Weekes L, Kayser V. Vaccine hesitancy: contemporary issues and historical background. Vaccines. 2022;1010:1595. doi: https://doi.org/10.3390/vaccines10101595.
6. Holt D, Bouder F, Elemuwa C, Gaedicke G, Khamesipour A, Kisler B, et al. The importance of the patient voice in vaccination and vaccine safety—are we listening? Clin Microbiol Infect. 2016;22:S146-S153. doi: https://doi.org/10.1016/j.cmi.2016.09.027.
7. Ali A, Qazi IA. Countering misinformation on social media through educational interventions: Evidence from a randomized experiment in Pakistan. J Dev Econ. 2023;163:103108. doi: https://doi.org/10.1016/j.jdeveco.2023.103108.
8. Faden R, Bernstein J, Shebaya S. Public health ethics. 2010. Available at: https://plato.stanford.edu/Entries/publichealth-ethics. Acces on: April 25, 2024.

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LETTER TO EDITOR

Sometimes there is no easy answer: Health care protection in conflict zones

Verda Tunalıgil[1]

[1]MD, MPH, PHD; SIMMERK Medical Simulation Center | Presidency of Disaster Emergency Medical Services, Health Directorate of İstanbul, Republic of Türkiye Ministry of Health, İstanbul, Türkiye

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Abstract

Globally, health care providers and facilities are facing growing risks due to political instability, sieges, and warfare. Public health is indisputably at the forefront of saving lives during military operations. In the current climate of global adversity, public health professionals have the responsibility to be prepared at all times and well-informed when responding to medical crises in conflict situations. Complex humanitarian emergencies cause great disruption, disabling, damaging, destroying community well-being. Public health services are evidently at the leading edge of health planning and provision in mass casualty incidents. This editorial letter draws attention to the critical and current subject of health care and medical workers under attack in war zones. Criminal violence is against the law and an action that requires punishment. Lawful conduct that is part of a legally legitimate military operation must comply with the fundamental principles that govern armed conflict. It is important not to confuse the two actions in terms of clarity and purpose. As for the extremely topical and vital issue, this editorial letter calls upon all parties in relevant fields to refresh and update their knowledge of the International Humanitarian Law, the Geneva Conventions and the additional protocols in relation to current crises. Particular emphasis is placed on alerting both national and international audiences at this seminal turning point in history. When health care is faced with war-torn ethical damage, it is incumbent upon every professional to understand the context, to refrain from getting caught up in dilemmas, avoid getting carried away by popular tabloid trends.

Keywords: War, Warfare, Combat, Armed Conflict, Complex Humanitarian Emergency, Mass Casualty Incident (MCI), Public Health Crisis

Correspondence: Dr. Verda Tunalıgil (MD, MPH, PHD), SIMMERK Medical Simulation Center | Presidency of Disaster Emergency Medical Services, Health Directorate of İstanbul, Republic of Türkiye Ministry of Health. **E-mail:** verda@post.harvard.edu

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INTRODUCTION

The international community is presently confronting unprecedented levels of hardship and suffering, which calls for a fundamental reassessment of humanity's vulnerabilities. The increasing frequency of global conflicts has led to a period where attacks on health care services have become alarmingly routine. Although profoundly troubling, attacks on public health professionals have regrettably become a disturbing norm, resulting in severe consequences for both patients and health care providers. In conflict zones, public health professionals play key roles in disease control and essential service delivery. Their roles also involve coordinating humanitarian assistance, where resilience, adaptability, and ethical rigor are essential for effectiveness. Public health strategies must be central to safeguarding lives.

Public health is fundamentally devoted to preserving life and protecting human well-being. This editorial letter emphasizes the importance of policies aimed at preventing war and highlights the need to prioritize these efforts. Concerns are expressed from the perspective of medical and public health ethics, also drawing attention to the need for public health professionals to stay well-informed and access timely information on medical services in conflict zones to enhance their preparedness, confidence, and response abilities. Due to the intrinsic objectives of their profession, health care providers are opposed to war and armed conflicts. While this holds true, they have a responsibility to recognize, acknowledge, understand the complexities and challenges these situations pose, rather than become enmeshed in the conflicts themselves. In such contexts, it is crucial for medical staff, particularly public health professionals, to gain a thorough understanding and advocate for anti-war policies from a broader societal perspective. This manuscript highlights issues related to attacks on health care professionals and hospitals in conflict zones and reviews international regulations on this topic. Particular emphasis is placed on nondiscriminatory care, the protection of civilian medical personnel and units, ensuring dignity and justice.

Situated at the crossroads, Türkiye is surrounded by hot wars, in relatively close spatial proximity to its borders. For the benefit of humanity at large, it is of great importance that Türkiye remains in a position of geostrategic stability, continues to serve regional peace and security. It is therefore especially critical that this article is presented to the international community from Türkiye.

APPLICABLE LAW REGARDING HOSPITAL ATTACKS

According to International Humanitarian Law (IHL), the greatest obligation of warring parties is to keep civilians and combatants distinguished in battle at all times. War crimes are defined in Part 2 of the Preamble to the 1998 Rome Statute of International Law by the United Nations International Criminal Court, where Article 8, Section 2 penalizes "intentionally directing attacks against buildings dedicated to religion, education, art, science or charitable purposes, historic monuments, hospitals and places where the sick and wounded are collected, provided they are not military objectives." Hospitals are protected under IHL with oversight from the International Committee of the Red Cross (ICRC). It is crucial to understand that civilian hospitals can forfeit their protection and become lawful targets if they are used for "acts harmful to the enemy," as specified in Articles

18 and 19 of the 1949 Geneva Convention Relative to the Protection of Civilian Persons in Time of War, and in the 1977 Additional Protocols I and II to the Geneva Conventions.[1] Attacking a hospital that is being used for purposes other than its civilian function and is considered "harmful to the enemy" does not contravene existing laws. The loss of protection for medical units and transports may be justified under certain circumstances outlined in Article 11 of the 1977. Article 19 of 1949 states that "the protection to which civilian hospitals are entitled shall not cease unless they are used to commit, outside their humanitarian duties, acts harmful to the enemy." When hospitals become targets, combatants are required under international laws to adhere to the principle that "all belligerents have a duty to give effective advance warning of attacks that may affect the civilian population, unless circumstances do not permit"[2]

While some arguments may seek to inflame extreme beliefs and provoke further violence, it is crucial to understand the legal perspective. Under the international law, designating civilian hospitals as legitimate military targets is an exceptionally rare circumstance. Such a designation is permitted only under the most exceptional conditions. Claims might be strong on occasion, with arguments supported by irrefutable evidence. Under the principle of absolute proof, only incontrovertible and unequivocal evidence can validate these claims. Over 700 attacks on hospitals, health workers, and other medical infrastructure have been reported from Ukraine. These incidents include bombings of hospitals, torture of medics, and shootings at ambulances. One Ukrainian doctor described witnessing a hospital being occupied and used by the warring party as a "human shield," because it could not be targeted in return.[3] There are numerous reports suggesting that attacking health service points has increasingly become a military "tactic" in the modern era.[4] Although individual actions may vary according to regional decisions and prosecutions concerning the targeting of civilian hospitals, they are consistently underpinned by judicial principles. The international community will remain uncertain about these inquiries until investigations are completed and decisions are finalized by the legal authorities.

COMPLICATIONS IN CONFLICTS INVOLVING TERRORIST ORGANIZATIONS

The legal landscape becomes more complex when one party in a conflict comprises civilians governed by an uncertain or unrecognized authority. The legitimacy of the state and the status of non-state actors complicate the application of IHL. Historical case studies, including those from Vietnam, Bosnia and Herzegovina, Palestine, and Afghanistan, illustrate the challenges of upholding IHL when combating groups with ambiguous legal status.[5] These complexities require a thorough understanding of IHL and demonstrate the inherent challenges in negotiating with entities whose international status is contested.

CURRENT LEGISLATION REGARDING HEALTH CARE PROVIDERS

Under IHL, Rule 25 of the ICRC, which has remained unchanged since 2005, mandates that medical personnel assigned exclusively to medical duties must be respected and protected. Protection is lost if they participate in actions that harm the enemy beyond their humanitarian role, as outlined in Rule 25.[6] The World Medical Association (WMA) has highlighted the fundamental right to health

as a core human right, reaffirmed in the "WMA Declaration on the Protection and Integrity of Medical Personnel in Armed Conflicts and Other Situations of Violence." The WMA asserts that medical personnel must uphold their ethical responsibilities and adhere to international laws, even in times of conflict. The ICRC also provides guidelines for protecting health care access in both armed conflicts and non-conflict situations, with relevant legal factsheets available on their official website. In "situations that do not meet the threshold of armed conflict, only international human rights law and domestic law apply," and these laws generally remain in force at all times unless derogated by the states. In a similar fashion, the safety and security of the United Nations humanitarian personnel are protected.[7] The issue remains, however, regarding the information provided by the Israeli authorities about the alleged involvement of several United Nations Relief and Works Agency (UNRWA) employees in the malicious attacks on Saturday, October 7th of 2023. An official statement by UNRWA Commissioner-General Philippe Lazzarini, titled "Serious allegations againts UNRWA staff in the Gaza strip" announced on Friday, January 26th, 2024 that the decision was made to terminate the staff members' contracts and that an investigation was launched.

Armed conflict is a major public health problem, causing significant injury and death globally. War impacts not only combatants but also civilian lives, leading to displacement, disruption of services, and heightened risk of disease. Civilians and health care workers, who are often caught in the crossfire, face significant challenges. An effective response and mitigation require advocacy, research, collaboration, and, crucially, training and preparedness for public health practitioners in conflict zones.[8,9]

CONCLUSION

This editorial letter explicitly declares that public health professionals are pro-life and unequivocally averse to the violence and loss of life associated with war. It brings into acute focus the persistent and critical issues regarding the protection of health care facilities and personnel in conflict zones. The interplay between legal frameworks, ethical considerations, and practical realities of modern warfare necessitates sustained vigilance, collaborative acumen, up-to-date knowledge and expertise in disaster public health. The practice of medicine, particularly in conflict settings, must be safeguarded as a fundamental humanitarian endeavor. The evolving nature of warfare demands strong emphasis on preserving the sanctity of health care and ensuring the protection of those who provide it under perilous conditions. This text forcefully advocates for the urgent necessity of policies designed to prevent war, emphasizing their crucial importance from an ethical public health perspective. It calls on medical and public health professionals not only to develop technical expertise but also to become unwavering advocates for anti-war policies.

REFERENCES

1. van der Heijden MR. Attacks on hospitals: current legal protections are insufficient. *Lancet.* 2023;402(10419):2293-4. doi:10.1016/S0140-6736(23)02632-6

2. Baruch PS, Neuman N. Warning civilians prior to attack under international law - theory and practice. *Israel Yearbook on Human Rights.* 2011;41:137-96. doi:10.1163/9789004226449_007

3. Mahase E. Ukraine: Over 700 recorded attacks on health facilities and workers in year since Russia invasion. *BMJ.* 2023;380:451. Published 2023 Feb 23. doi:10.1136/bmj.p451

4. Nickerson JW. Ensuring the security of health care

in conflict settings: An urgent global health concern. *CMAJ.* 2015 Aug 11;187(11):E347-8. doi:10.1503/cmaj.140410. Epub 2015 May 19.

5. Hakki L, Stover E, Haar RJ. Breaking the silence: Advocacy and accountability for attacks on hospitals in armed conflict. *International Review of the Red Cross.* 2020;102(915):1201-26. doi:10.1017/s1816383121000382

6. Vuorio A, Bor R. Safety of health care workers in a war zone - A European issue. *Front Public Health.* 2022 Mar 30;10:886394. doi:10.3389/fpubh.2022.886394

7. Sommario E. United Nations Bodies (2018). *Yearbook of International Disaster Law Online*. 2019;1(1):305-13. doi:10.1163/26662531-01001015

8. Murray CJ, King G, Lopez AD, Tomijima N, Krug EG. Armed conflict as a public health problem. *BMJ.* 2002 Feb 9;324(7333):346-9. doi:10.1136/bmj.324.7333.346.

9. American Public Health Association. The role of public health practitioners, academics, and advocates in relation to armed conflict. Policy Statement. Published Tuesday, November 10, 2009. Accessed Monday, July 22, 2024. Available from: https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2014/07/22/13/29/the-role-of-public-health-practitioners-academics-and-advocates-in-relation-to-armed-conflict