

■ Original Article

Relationship of deaths caused by malignant neoplasm of stomach with healthy life expectancy (HALE) and health expenditures: a time-based longitudinal analysis on the ICD-10 mortality list

Mide malign neoplazminın neden olduđu ölümlerin sağlıklı yaşam beklentisi (HALE) ve sağlık harcamaları ile ilişkisi: ICD-10 ölüm listesinde zamana dayalı bir analiz

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ABSTRACT

Aim: In this research, it was aimed to evaluate the relationship of deaths caused by malignant neoplasm of the stomach with healthy life expectancy (HALE) and health expenditures: a time-based longitudinal analysis on the ICD-10 mortality list.

Material and Methods: World Health Organization (WHO) ICD-10 mortality data and WHO-HALE at birth and HALE at 60 ages for 14 countries between 1996-2017 were used. Spearman's rho, year controlled partial correlation analysis and Logit model were used for the analysis of research parameters.

Results: Minimum total death was 1, and the maximum was 25.898 for all years and countries. The mean death was 3.030.50±6.307.23. HALE at birth mean was 62.75±4.52, and HALE at 60 age mean was 13.93±1.90. Both Spearman's rho correlation analysis and year-controlled partial correlation analysis results showed that malignant neoplasm of stomach death is negatively correlated with HALE at birth and HALE at 60 ages ($p<0.01$). Year-controlled correlation coefficients showed that these correlations have been in decreasing trend in a time period. Both HALE at birth and HALE at 60 ages have been significantly affected from malignant neoplasm of stomach deaths, gender, and country. Year has a positive and significant effect on HALE at 60 ages ($p<0.01$), whereas its effect was insignificant for HALE at birth ($p>0.05$). Model R² values showed that HALE at 60 age model has a higher explanation value than the model for HALE at birth.

Conclusion: Deaths due to malignant neoplasms of the stomach still emerge as an important public health problem in certain parts of the world. In addition, the fact that the HALE at birth and HALE at 60 age indicators do not have a certain order in these countries and there is no progress in time shows that there are still important deficiencies in public health. With such studies, it is important to examine public health variables in the global sense in terms of reaching all segments of health services and providing health services to each individual.

Keywords: Malignant neoplasm, stomach, ICD-10, mortality, HALE.

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ÖZ

Amaç: Bu araştırmada, midenin malign neoplazmına bağlı ölümlerin sağlıklı yaşam beklentisi (SYB) ile ilişkisinin değerlendirilmesi amaçlandı.

Gereç ve Yöntemler: 1996-2017 yılları arasında 14 ülke için Dünya Sağlık Örgütü (DSÖ) tarafından yayınlanan ICD-10 ölüm verileri ile yine DSÖ tarafından yayınlanan SYB-doğum ve SYB-60 yaş parametreleri kullanıldı. Araştırma parametrelerinin analizinde Spearman'ın rho yıl kontrollü kısmi korelasyon analizi ve Logit modeli kullanıldı.

Bulgular: Tüm yıllar ve ülkeler için minimum toplam ölüm 1, maksimum ölüm 25.898 idi. Ortalama ölüm $3.030.50 \pm 6.307.23$ idi. SYB-doğum ortalaması 62.75 ± 4.52 , SYB-60 yaş ortalaması 13.93 ± 1.90 idi. Hem Spearman'ın rho korelasyon analizi hem de yıl kontrollü kısmi korelasyon analizi sonuçları, mide malign neoplazmına bağlı ölümün SYB-doğum ve SYB-60 yaş ile negatif korelasyon gösterdiğini gösterdi ($p < 0.01$). Yıl kontrollü korelasyon katsayıları, bu korelasyonların zaman diliminde azalma eğiliminde olduğunu gösterdi. Hem SYB-doğum hem de SYB-60 yaş midenin malign neoplazmından, cinsiyet ve ülkeden önemli ölçüde etkilenmiştir. Yıl, SYB-60 yaş üzerinde pozitif ve anlamlı bir etkiye sahipken ($p < 0.01$), SYB-doğum için etkisi önemsizdi ($p > 0.05$). Model R2 değerleri, SYB-60 yaş modelinin SYB-doğum modeline göre daha yüksek anlama sahip olduğunu göstermiştir.

Sonuç: Midenin malign neoplazmına bağlı ölümler dünyanın bazı bölgelerinde hala önemli bir halk sağlığı sorunu olarak karşımıza çıkmaktadır. Ayrıca SYB-doğum ve SYB-60 yaş göstergelerinin bu ülkelerde belirli bir düzene uymaması ve zamanla bu süreçte gelişme olmaması halk sağlığı konusunda halen önemli eksikliklerin olduğunu göstermektedir. Bu tür çalışmalarla halk sağlığı değişkenlerinin küresel anlamda incelenmesi, sağlık hizmetlerinin tüm kesimlerine ulaşması ve her bireye sağlık hizmeti sunulması açısından önemlidir.

Anahtar kelimeler: Malign neoplazm, Mide, ICD-10, Mortalite, HALE

Introduction

Malignant neoplasm of the stomach is still among the cancer types that cause death today and is one of the important public health problems, especially in undeveloped countries. In the literature, many studies have been conducted on deaths caused by malignant neoplasms of stomach [1-8]. However, it can be stated that these studies do not adequately address the disease in the context of public health at a global level.

Healthy life expectancy (HALE) at birth and HALE at 60 ages are important health indicators developed and used by World Health Organization (WHO). Health indicators have an important role in showing health inequalities between countries, especially in the global context. In this respect, HALE is an important public health indicator in terms of revealing the healthy life expectancy of individuals [9-12].

Although HALE and malignant neoplasm of stomach issues are the subjects of various studies in the literature, there are not enough studies that address the relationship between malignant neoplasm of the stomach and HALE a global context. In this research, it was aimed to evaluate the relationship of deaths caused by malignant neoplasm of the stomach with healthy life expectancy (HALE) and health expenditures: a time-based longitudinal analysis on the ICD-10 mortality list.

Material and Methods

In the research, WHO ICD-10 mortality data and WHO-HALE at birth and HALE at 60 ages were used. ICD-11 has been recently published, but its mortality parameters were not confirmed yet. In the ICD-10 mortality list, a total of 14 countries were listed for malignant neoplasm of stomach mortality (Seychelles, Brunei Darussalam, Cyprus, Oman, Sri Lanka, Syrian Arab Republic, Andorra, Azerbaijan, Belarus, Kazakhstan, Russian Federation, San Marino, Turkmenistan, Ukraine). According to years, 1996-2017 years were reported as malignant neoplasm of stomach deaths.

Nominal parameters were described with frequency analysis, whereas scale parameters were described with means and standard deviations. Kolmogorov Smirnov Test was used for normality of parameters. Spearman's rho correlation was used for correlation analysis, and partial correlation analysis was used for year-controlled longitudinal analysis. Since parameters were not normally distributed, logistic transformation was used for HALE at 60 age and total death parameters. Logit model was used for multivariate analysis with cofounders. All analysis was performed at SPSS 17.0 for windows at a 95% confidence interval.

Ethics: This study is observational research. No human/animal participant is available so no ethics approval is mandatory. All study is done under Helsinki declarations.

Results

Turkmenistan had the highest malignant neoplasm of stomach death rate (13.7%) followed by the Russian Federation (12.9%), Brunei Darussalam (12.0%), Seychelles (9.6%) and Syrian Arab Republic (9.6%) (Table 1).

Table 1. Gender and country distributions of malignant neoplasm of stomach deaths for all years

	Gender		Total
	Male	Female	
Seychelles	13 (54,2)	11 (45,8)	24 (9.6)
Brunei Darussalam	15 (50,0)	15 (50,0)	30 (12.0)
Cyprus	2 (50,0)	2 (50,0)	4 (1.6)
Oman	1 (50,0)	1 (50,0)	2 (0.8)
Sri Lanka	7 (50,0)	7 (50,0)	14 (5.6)
Syrian Arab Republic	12 (50,0)	12 (50,0)	24 (9.6)
Andorra	5 (55,6)	4 (44,4)	9 (3.6)
Azerbaijan	4 (50,0)	4 (50,0)	8 (3.2)
Belarus	9 (50,0)	9 (50,0)	18 (7.2)
Kazakhstan	9 (50,0)	9 (50,0)	18 (7.2)
Russian Federation	16 (50,0)	16 (50,0)	32 (12.9)
San Marino	5 (50,0)	5 (50,0)	10 (4.0)
Turkmenistan	17 (50,0)	17 (50,0)	34 (13.7)
Ukraine	11 (50,0)	11 (50,0)	22 (8.8)
Total	126 (50,6)	123 (49,4)	249 (100.0)

In 1996, 1997, 1998, and 2015, total malignant neoplasm of stomach death rates was lower, compared to other years. In 1999, the death rate was the highest (Figure 1).

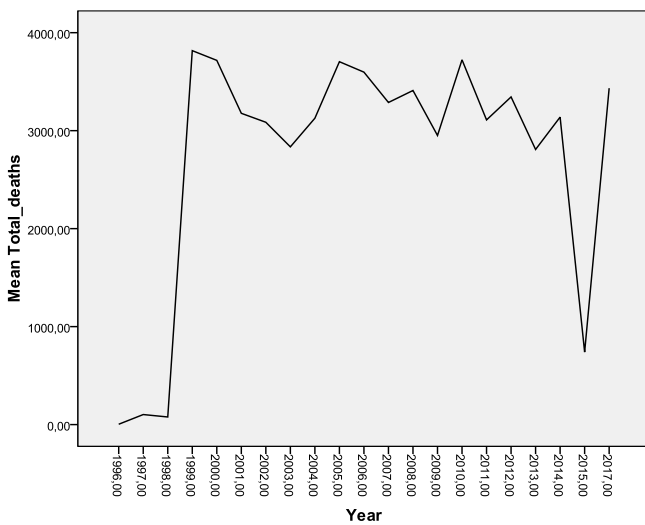


Figure 1. Total deaths for all countries according to years

HALE at birth and HALE at 60 ages were the highest in Oman. HALE at birth was the lowest in Turkmenistan, and HALE at 60 ages was the lowest in Kazakhstan (Figure 2).

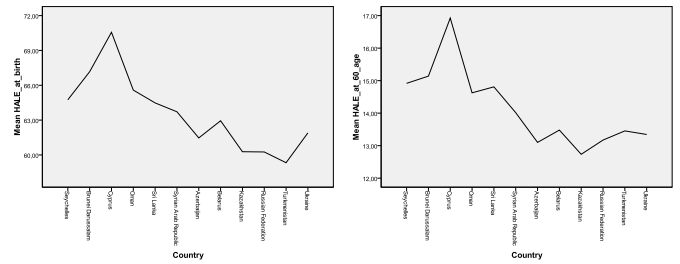


Figure 2. HALE at birth and 60 ages changes of countries for all years

In 1996, HALE at birth was the highest, whereas the lowest in 2005. HALE at 60 age was also the lowest in 2005. The highest rate of HALE at 60 ages was seen in 2014. According to change trends, both HALE at birth, and 60 ages did not have a trend and randomly changed within time periods (Figure 3).

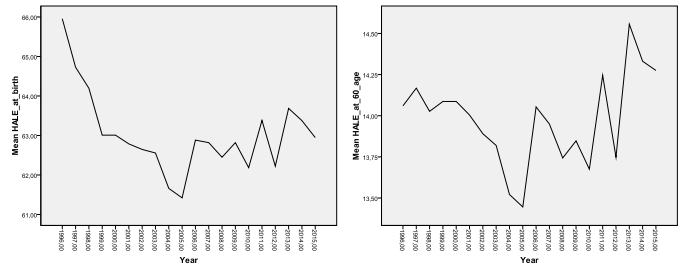


Figure 3. HALE at birth and 60 ages changes according to years for all countries

Minimum total death was 1, and the maximum was 25.898 for all years and countries. The mean death was $3.030.50 \pm 6.307.23$. HALE at birth mean was 62.75 ± 4.52 , and HALE at 60 age mean was 13.93 ± 1.90 . According to Kolmogorov Smirnov Test, HALE at birth distribution was not significantly different from standard normal distribution ($p > 0.05$). However, total death and HALE at 60 age parameter distributions were significantly different from the standard normal distribution ($p < 0.05$) (Table 2). Thus, logarithmic transformations were applied for total deaths and HALE at 60 ages for the logit model.

Both Spearman's rho correlation analysis and year controlled partial correlation analysis results showed that malignant neoplasm of stomach death is negatively correlated with HALE at birth and HALE at 60 ages ($p < 0.01$). Year controlled correlation coefficients showed that these correlations have been in decreasing trend in time period (Table 3).

Logit model results showed that both HALE at birth and HALE at 60 ages have been significantly affected from malignant neoplasm of stomach deaths, gender and country. Year has a positive and significant effect on HALE at 60 ages ($p < 0.01$), whereas its effect was insignificant for the HALE at birth ($p > 0.05$). Model R2 values showed that HALE at 60 age model has a higher explanation value than the model for HALE at birth (Table 4).



Table 2. Descriptive values and normality tests of research parameters

	Minimum	Maximum	Mean	Std. Deviation	Kolmogorov Smirnov-Z	p
Total deaths	1.00	25898.00	3030.50	6307.23	5.799	0.000
HALE at birth	52.46	71.91	62.75	4.52	1.270	0.079
HALE at 60 ages	10.10	18.06	13.93	1.90	1.504	0.022

Table 3. Spearman's rho correlation and year controlled correlation analysis results for total deaths

	Spearman's rho		Year controlled	
	r	p	r	p
HALE at birth	-0.451	0.000	-0.347	0.000
HALE at 60 ages	-0.399	0.000	-0.302	0.000

Table 4. Logit Model for time dependent regression for HALE at birth and 60 ages

	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
HALE at birth					
(Constant)	-66.814	75.163		-0.889	0.375
Log Total deaths	-0.397	0.105	-0.257	-3.797	0.000
Year	0.063	0.037	0.068	1.691	0.092
Gender	5.948	0.356	0.659	16.719	0.000
Country	-0.001	0.000	-0.236	-3.539	0.000
R2: 0.654; F: 108.142; p<0.01					
HALE at 60 ages					
(Constant)	-3.673	2.031		-1.809	0.072
Log Total deaths	-0.016	0.003	-0.326	-5.556	0.000
Year	0.003	0.001	0.105	3.022	0.003
Gender	0.208	0.010	0.738	21.602	0.000
Country	-1.863E-5	0.000	-0.118	-2.040	0.042
R2: 0.740; F: 162.302; p<0.01					

Discussion

Although malignant neoplasm of the stomach is still among the important types of cancer today, it has lower mortality rates compared to other cancer types on the WHO ICD-10 list for all countries. However, it still causes deaths in undeveloped countries. Studies on malignant neoplasm of the stomach in the literature report that important new diagnoses and treatment possibilities regarding the disease are being developed day by day [13-21]. Although there have been significant improvements in diagnosis and treatment opportunities, malignant neoplasm of stomach deaths is still a serious public health problem, especially in for some countries. In our study, Turkmenistan had the highest mortality rates, followed by Russia and Brunei Darussalam, respectively. In all these countries, rates of over 10% of all deaths were seen.

According to deaths due to malignant neoplasm of stomach, it was not observed that the effect of time was limited, or that there was no decrease or increase in the mortality rate among

the countries studied over time. This situation shows that there is not enough struggle with deaths due to malignant neoplasm of stomach.

When the studies on HALE at birth and HALE at 60 ages are examined, it is seen that these indicators are affected by many different public health indicators. Among these, mortality rates have an important place [22-25]. In our study, the average values of both indicators were relatively low in countries where deaths due to malignant neoplasm of stomach were reported.

According to the results of correlation analysis, although it is seen that the studies on HALE at birth and HALE at 60 ages have an effect on mortality over time, the logit model results show that this effect is only valid for HALE at 60 ages, for HALE at birth the year or It shows that the time variable has no significant contribution.

Conclusion

Although health is seen as a global public good today, deaths due to malignant neoplasms of stomach still emerge as an

important public health problem in certain parts of the world. In addition, the fact that the HALE at birth and HALE at 60 age indicators do not have a certain order in these countries and there is no progress in time shows that there are still important deficiencies in public health. With such studies, it is important to examine public health variables in the global sense in terms of reaching all segments of health services and providing health services to everyone.

Ethics

This study is observational research. No human/animal participant is available so no ethics approve is mandatory. All study is done under Helsinki declarations.

Conflict of interest

There is no any conflict of interest for this study. There is not any funding/sponsor for this study.

Ethics Committee Approval

This study is retrospective observational research. No human/animal participant is available, so no ethics approve is mandatory. All study is done under Helsinki declarations.

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version.

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