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Analysis of Change in Marriage and Divorce and Associated Socioeconomic Variables during the COVID-19 Pandemic Period

Evlenme ve Boşanma ve İlişkili Sosyoekonomik Değişkenlerin COVID-19 Pandemi Döneminde Değişiminin Analizi

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Abstract: Due to the COVID-19 pandemic, people have contended with health, economic, and social issues on a global scale. Therefore, the study aimed to investigate the effect of the COVID-19 epidemic on marriage-divorce, (Crude marriage rate, divorce rate, birth rate, male and female first marriage age) and their socioeconomic related indicators (The ratio of female high school and undergraduate school graduates, man and women employment rates, unemployment rate, GDP per capita ,suicide rate). The regions had the highest female employment rate were differentiated by lowest crude marriage and crude birth rates. In addition to this, the regions had the highest divorce rate were differentiated by the highest educated women rate and GDP per capita. As a result, the regional differences were high in the country in terms of study indicators.

Keywords: COVID-19, Clustering, Marriage, Divorce, Socioeconomic Indicators.

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Öz: COVİD-19 salgını nedeniyle insanlar küresel ölçekte sağlık, ekonomik ve sosyal sorunlarla boğuşmak durumunda kaldı. Bu nedenle çalışmada, COVID-19 salgınının evlenme-boşanma (Kaba evlilik hızı, kaba boşanma hızı, erkek ve kadın ilk evlenme yaşı ve kaba doğum hızı) ve sosyoekonomik ilişkili göstergeleri (lise ve lisans mezunu kadın oranı, erkek ve kadın istihdam oranları, işsizlik oranı, kişi başına düşen GSYH ($) ve intihar oranı) üzerindeki etkisinin araştırılması amaçlandı. Türkiye'nin NUTS-2 düzeyindeki 26 bölgesi K-means kümeleme analizi kullanılarak analiz edildi. Kadın istihdam oranının en yüksek olduğu bölge grubu, en düşük evlilik ve doğum oranlarına sahip olduğu, kaba boşanma oranının en yüksek olduğu bölgelerin ise , en yüksek kadın eğitimi ve kişi başına düşen GSYH sahip olduğu bulunmuştur. Sonuç olarak COVID-19'un evlilik-boşanma ve ilişkili değişkenlerin bütün bölgelerde aynı derecede etkilemediği sonucuna varılmıştır.

Anahtar Kelimeler: COVID-19, Kümeleme, Evlilik, Boşanma, Sosyoekonomik Değişkenler

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1. Introduction

The family is the foundation of all societies. For this reason, marriages are very crucial for all cultures. Most developed countries have suffered from late marriages, high divorce rates, as a result low fertility rates were observed since 1960s (Kalmijn, 2007:243; Yüksel-Kaptanoğlu, Abbasoğlu Özgören, & Keskin, 2015:. 50) . Although Turkey's divorce rate is not as high as European countries, Turkey has major socioeconomic changes since last decades. Turkey had two major regulations which gave strength to women's right in marriages which effect the family life in the country: No fault divorce law in 1988 and Turkish Civil Code regulation in 2001. Therefore, the divorce rates, marriage ages has highly increased, and fertility has decreased and gender roles has changed (Caarls and de Valk 2018:610; Kavas and Thornton 2013:230; Yüksel-Kaptanoğlu and Ergöçmen 2014:1710).

In addition to this, the changes were not similar in all parts of Turkey. There have been huge regional differences due to socioeconomic variations throughout the country (Aksoy and Yerlikaya 2021:63; Caarls and de Valk 2018:609; Erkan and Yamak 2017:75; İğdeli and Ay 2021:1; Kavas and Gündüz-Hoşgör 2010:108; Kutlar, Torun, and Işık 2016:2985; Sandalcılar 2012:225; Üçler and Kızılkaya 2014:28). The women in rural areas had higher fertility rates and lower divorce rates than women in urban areas.

The COVID-19 disease, which started in Wuhan, China in December of 2019 and was declared a pandemic by WHO in March 2020, has affected the whole world. During the pandemic, people have been affected economically, socially, and psychologically. Globally, unemployment rate, inflation rose, most industries effected negatively and because of economic recession, families had difficulties. Elsamandony et al. (Elsamadony et al. 2022:133812) investigated 72 countries according to their impact of COVID-19 on sustainable development indicators. They pointed out that economic growth and gender inequality (violence against women, more responsibility at home..etc) indicators are the most affected topics by COVID-19 for all countries, regardless of income.

Therefore, the study aimed to investigate the effect of the COVID-19 epidemic on marriage, divorce, and their socioeconomic related variables in Turkey's regions by using clustering analysis. 26 regions at NUTS-2 level were used to find regional differences. Year 2019 was accepted as a base year. Firstly, 26 regions of the country were clustered according to marriage-divorce and related socioeconomic indicators for 2019, 2020 and 2021 to find similar characteristic regions.

The rest of the study is organized as follows: Section 2 is material and methods, Section 3 presents findings, Section 5 explains conclusion and limitations.

2. Materials and Methods

2.1. Data Collection

The data obtained from the Turkish Statistical Institute for NUTS-2 level, 26 regions, for 11 indicators in 2019, 2020 and 2021 (TURKSTAT 2023). It was used two types of variables for clustering analysis: Marriage-divorce variables and their related socioeconomic indicators. Marriage-divorce variables are crude marriage rate (CMR), crude divorce rate (CDR), male first marriage age (MMA), female first marriage age (FMA) and crude birth rate (CBR). The related socioeconomic variables were women education level (WE) (The ratio of female high school and undergraduate school graduates), man employment rates (MER), man and women employment rates (WER), unemployment rate (UR), GDP per capita ($) (GDP) and suicide rate (SR). Women education in NUTS-2 level was used just for year of 2021, due to the lack of data.

The marriage and divorce related variables were determined according to the literature review. There are various studies which investigated marriages and divorce patterns in countries at national and

international level. Kalmijn (Kalmijn 2007:259) found that higher female employment rates were associated with lower marriage rates, higher divorce and cohabitation rates in European countries. Cohen (Cohen 2014:623) pointed out that women education was an indicator of relationship between divorce and unemployment rates in the USA. There were also several studies investigating the relationship which confirm the regional differences in Turkey. They pointed out that female education, female employment rates, region's income level, men unemployment rates were mainly associated with divorce rates, marriage ages and fertility rates (Caarls and de Valk 2018:612; Erkan and Yamak 2017:75; İğdeli and Ay 2021:1; Kutlar, Torun, and Işık 2016:2985; Üçler and Kızılkaya 2014: 28). There were also some studies which found a relationship between suicide rates and divorce rates (Aksoy and Yerlikaya 2021:54; Alptekin and Duyan 2019:225).

2.2. Analysis

In cluster analysis, the regions were divided into clusters by using K-means clustering method according to marriage, divorce, and related socioeconomic indicators. The year of 2019 was accepted as the control and 2020 and 2021 years were included to determine the effect of COVID-19 better. In clustering analysis, all year's data was used together to see the differences better. As a result, there were 78 units (26 regions for all three years) in clustering analysis.

Before the analysis, variables were normalized according to the mean is zero and standard deviation is one method. R Studio 2022.07.2 and its factoextra, NbClust, clValid, clustertrend packages were used for the analysis.

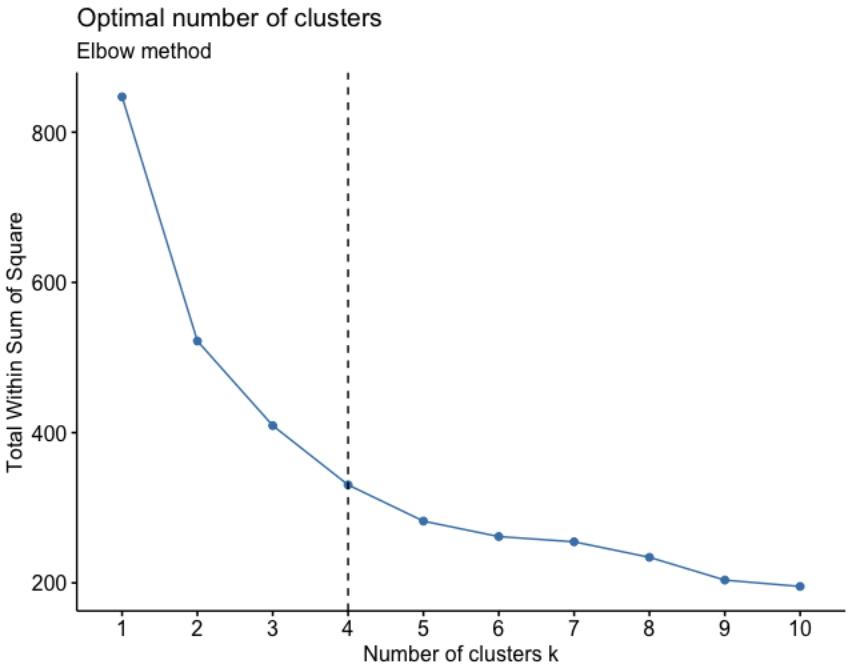
2.3. K-Means Clustering Analysis

The primary objective of cluster analysis is to group subjects based on their similarities. High within-cluster homogeneity and high between-cluster heterogeneity should characterize the clusters (Hair et al. 2018:218). There are three categories of clustering algorithms: partitioning, density-based, and hierarchical. K-Means is a clustering algorithm of the partitioning type. It partitions data into K (user-defined) clusters with its centroid (cluster mean) and assigns observations iteratively until its criteria are satisfied. The objective of the criteria is to minimize the distance between cluster observations and maximize the distance from other clusters. The distance is calculated using Euclidean distance.

3. Findings

K-means clustering method was used for clustering the regions to find similar characteristic ones. The method is frequently used in the literature due to its simplicity and efficiency. Finding optimal clusters is a crucial issue in this method. Elbow method was used in this analysis to find K clusters., Four clusters are optimal cluster to find more similar regions as shown in Figure-1. Table-1 displays clustered validity results. Table 2 summarizes statistics of clusters. The clustered regions using K-Means were shown in Table 3.

Figure 1: The optimal number of cluster in Elbow method



Clustered validity measured with discriminant analysis (DA). Table-1 summarizes the results of DA. There were three discriminant functions and all of them is significant. Discriminant functions explains 95.1%; 87.5%; 86.5% of variance, respectively. The clustered accuracy is 97.4%. As a result, it can be said that four clusters are eligible for this data.

Table 1: Clustered Validity Results

Discriminant Function	Eigenvalue	Percentage of Variance (%)	Canonical Correlation	Wilk's Lambda	Chi-Square	Sig
1	9.503	60.3	0.951	0.006	360.455	p<0.001
2	3.282	20.8	0.875	0.059	197.011	p<0.001
3	2.976	18.9	0.865	0.252	95.93	p<0.001

Cluster 1 consisted of 29 regions which are in Turkey's west side which are more urbanized and industrialized ones , apart from the Malatya region in 2021 which is at east side of country and Ankara which is the capital city of the country and in central Turkey. İstanbul, İzmir, Aydın, Bursa, Kocaeli, Ankara, Adana were in this cluster for three examining years. It means, they have similar characteristics during investigated time. Tekirdağ and Balıkesir regions were in this cluster for the year of 2019 and 2021. The cluster shows mean values of the highest crude divorce rate, male and female first marriage age, woman education rate, man employment rate, GDP per capita, suicide rate, and the second highest female employment rate, the second smallest crude birth rate and crude marriage rate.

Table 2: Clustering Mean, Minimum and Maximum Values

	Cluster-1			Cluster-2		
	Mean	**Min**	**Max**	**Mean**	**Min**	**Max**
CMR	6.30	5.36	7.00	6.63	5.70	7.37
CDR	2.29	1.59	3.04	0.56	0.41	0.85
MMA	28.41	28.01	29.14	27.03	26.65	27.53
FMA	25.63	25.00	26.67	23.85	22.49	24.61
CBR	11.59	8.66	14.28	23.10	19.55	26.54
WE	43.33	38.48	51.27	28.74	27.11	30.50
MER	63.05	57.50	71.30	50.06	39.10	55.40
WER	29.52	23.70	37.50	17.50	12.40	25.30
UR	12.04	7.90	17.10	23.51	12.10	34.10
GDP	10249	5699	15666	3958	3327	4864
SR	5.12	2.89	8.10	4.56	3.40	5.63
	Cluster-3			**Cluster-4**		
	Mean	**Min**	**Max**	**Mean**	**Min**	**Max**
CMR	6.96	6.01	7.98	5.76	5.13	6.52
CDR	1.71	0.70	2.29	1.45	0.74	2.04
MMA	26.99	26.31	27.63	27.95	26.99	29.01
FMA	23.87	22.69	24.63	25.18	24.10	26.27
CBR	14.93	10.82	21.18	11.05	8.34	15.56
WE	33.84	28.36	37.34	35.85	31.06	39.63
MER	61.76	54.50	67.70	62.11	57.70	67.60
WER	24.54	20.50	30.90	31.19	24.50	38.60
UR	12.09	6.90	18.10	8.96	5.80	11.20
GDP	6435	4055	8138	6504	5499	10465
SR	4.56	3.02	5.84	4.68	2.81	6.27

Cluster-2 comprised of 10 regions. This cluster contains regions of east side of the country. They are economically less developed regions. Van, Şanlıurfa and Mardin regions were in this cluster for the three examined years. However, Ağrı region was in this cluster just in 2020. They had mean value for the smallest divorce rate, female age in the first marriage, women education, man and women employment rate, GDP per capita, the highest unemployment rate, and crude birth rate, the second highest marriage rate, male age in the first marriage.

Table 3: Clustered Regions

Cluster-1	Cluster-2	Cluster-3	Cluster-4
İstanbul	Van	Manisa (2019&2021)	Zonguldak
İzmir	Şanlıurfa	Konya	Kastamonu
Aydın	Mardin	Hatay	Samsun
Bursa	Ağrı (2020)	Kırıkkale	Trabzon
Kocaeli		Kayseri	Erzurum
Ankara		Ağrı(2019&2021)	Malatya (2019&2020)
Antalya		Gaziantep	Tekirdağ (2020)
Adana			Balıkesir (2020)
Tekirdağ(2019&2021)			Manisa (2020)
Balıkesir(2019&2021)			
Malatya (2021)			

Cluster 3 had 19 regions which were mostly in Central Turkey. Manisa is located in the Aegean region and Ağrı, Gaziantep are located in eastern side of Turkey. Konya, Hatay, Kırıkkale, Kayseri, Gaziantep were in this cluster for three investigated years. However, Manisa and Ağrı were in this cluster for 2019 and 2021. The cluster showed mean values of the highest marriage rate, the smallest man age at first marriage, the second highest crude divorce rate, birth rate, unemployment rate, the second smallest female age in the first marriage, woman education rate, man and female employment rate, GDP per capita, the smallest suicide rate.

The fourth cluster had 19 regions which are in ,north side, Black Sea part (Zonguldak, Kastamonu, Samsun, Trabzon), east side (Malatya) and west side (Tekirdağ, Balıkesir and Manisa) of the country. Zonguldak, Kastamonu, Samsun, Trabzon and Erzurum located in this cluster for three examined years. Malatya is in this cluster for the years of 2019 and 2020 whereas Tekirdağ, Balıkesir and Manisa for 2020. The cluster had the highest female employment rate, smallest crude marriage rate, unemployment rate, crude birth rate, the second smallest crude divorce rate, the second highest man and female marriage age, women education, man employment rate, GDP per capita.

Tekirdağ, Balıkesir, Manisa, Ağrı regions were in different cluster in 2020, but Malatya region changed its cluster in 2021. Other 21 regions did not show any difference according to studied variables in the years of 2019-2021.

4. Conclusion

COVID-19 pandemic has affected deeply people all around the world. They had to deal with health problems, economic crises, and social life difficulties. As a result, families, which are the foundation of all societies, were affected. The study purposed to examine the change in marriage, divorce, and related socioeconomic indicators in the regions of Turkey during the pandemic period. For this aim, the regions were clustered on the basis of marriage and divorce and socioeconomic indicators to find closely involved regions and their differences during pandemic by using K-means clustering.

Huge regional differences of the country were also confirmed in this study (Aksoy and Yerlikaya 2021:63; Caarls and de Valk 2018:609; Erkan and Yamak 2017:75; İğdeli and Ay 2021:1; Kavas and Gündüz-Hoşgör 2010:108; Kavas and Thornton 2013; Kutlar, Torun, and Işık 2016:2985; Sandalcılar 2012:225; Üçler and Kızılkaya 2014:28). Urban regions had more likely higher educated women, higher GDP per capita, more

female employment rate and higher divorce rate, male and female first marriage age, lower marriage rate and birth rate. On the other hand, less urbanized regions more likely had the lower educated women, female employment rate, GDP per capita, and the higher unemployment rate, and the lower divorce rate and the higher birth rate. Low female education and female employment rate, especially in the eastern region of Turkey, have also been confirmed by other studies as the main factors affecting marriage and divorce behaviors (Erkan and Yamak 2017:75; İğdeli and Ay 2021:1). The low divorce rates in these regions are due to the high cost of divorce (Amato and Beattie 2011:706; Erkan and Yamak 2017:80; Kalmijn 2007:244; Sandalcılar 2012:235). The regions had the highest female employment rate were differentiated by lowest crude marriage and crude birth rates. In addition to this, the regions had the highest crude divorce rate were differentiated by the highest educated women rate and GDP per capita. Consequently, it can be concluded that the divorce-marriage behaviors in these regions are associated with female high education and female employment rates according to other literature (Erkan and Yamak 2017:75; İğdeli and Ay 2021:1; Yüksel-Kaptanoğlu, Abbasoğlu Özgören, and Keskin 2015:82). Suicide rate was not statistically significant to differ clusters in this study. However, suicide rates found associated with divorce rates in several studies (Aksoy and Yerlikaya 2021:54; Alptekin and Duyan 2019:225; Kalmijn 2007:247; Kposowa 2000:254).

In addition to this, Istanbul, Izmir, Aydın, Bursa, Kocaeli, Ankara, Antalya, Adana, Van, Şanlıurfa, Mardin, Konya, Hatay, Kırıkkale, Kayseri, Gaziantep, Zonguldak, Kastamonu, Samsun, Trabzon, Erzurum were the regions that have the same characteristic during the investigated three years. Tekirdağ, Balıkesir, Ağrı, Manisa were similar in 2019 and 2021 but differ in 2020. However, Malatya, located in eastern part of Turkey, was differ in 2021 and showed more similar characteristic with urbanized regions of Turkey.

There are several limitations of the study. The study examined for a restricted time and indicators. Apart from these limitations, the study is important to present regions similarities and differences about marriage and divorce and socioeconomic indicators and their difference during the pandemic. Further studies are needed with expanded time series data with more indicators to check the possibility of structural break during pandemic. Also, the examination of reasons for change can be conducted in locations that underwent transformations throughout the period of the pandemic.

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