

## The Prevalence of Consanguineous Marriages in the City of Malatya, Turkey

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**Aims:** The aim of this study was to determine the prevalence of consanguineous marriages and the associated factors in the city of Malatya.

**Materials and Methods:** Thirty cluster survey methodology was used to select the study population. Selecting 13 married women per cluster, a total of 409 women were interviewed at their home. Information on the sociodemographic and fertility characteristics of the women and genetic disorders among children was gathered using a face-to-face questionnaire. Data analysis was done by SPSSWIN 13.0.

**Results:** The overall prevalence of consanguinity was 28.4%, with a mean inbreeding coefficient of 0.01081. The principal type of consanguineous marriage was first-cousin marriages, which account for 74.2% of all consanguineous unions. There was no association between consanguinity and sociodemographic characteristics of the participants. Consanguineous marriages had significantly more spontaneous abortions, infant deaths and children with a genetic disorder ( $P<0.05$ ).

**Conclusions:** The prevalence of consanguinity and of first-cousin marriages was found to be high in the city of Malatya compared to the studies conducted in the past. Future research on the reasons for and negative outcomes of consanguineous marriages should be conducted.

**Key Words:** Consanguineous marriage, inbreeding, birth defects

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### Malatya (Türkiye) İlinde Akraba Evliliği Sıklığı

**Amaç:** Bu çalışmanın amacı Malatya ilinde akraba evliliği prevalansını ve ilişkili faktörleri saptamaktır.

**Yöntem ve Gereç:** Örnek seçiminde otuz küme yöntemi kullanıldı. Her kümeden 13 evli kadınla evlerinde görüşülerek 409 kadın araştırma kapsamına alındı. Kadınlara sosyo-demografik ve doğurganlık özellikleri ile malforme çocuk öyküsü bakımından yüz-yüze anket uygulandı.

**Bulgular:** Akraba evliliği prevalansı % 28.4, ortalama soyluluk katsayısı 0.01081 olarak bulundu. Akraba evliliğinin en yaygın tipi olan birinci kuzen evliliği tüm akraba çiftler arasında % 74.2 olarak saptandı. Akraba evliliği yapma sosyo-demografik özellikler ile ilişkili bulunmadı. Akraba evliliği yapanlarda kendiliğinden düşük, ölü doğum ve genetik hastalıklı çocuk sahibi olma daha yüksekti ( $P<0.05$ ). Veri analizleri için SPSSWIN 13.0 programı kullanıldı.

**Sonuç:** Malatya ilinde akraba evliliği ve birinci kuzen evliliklerinin sıklığı önceden yapılan çalışmalara göre daha yüksek bulundu. Akraba evliliğinin nedenleri ve olumsuz sonuçlarıyla ilgili ileri araştırmalar yapılmalıdır.

**Anahtar Sözcükler:** Akraba evliliği, inbreeding, doğum anomalileri

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### Introduction

Consanguineous marriages (marriage between blood relatives) influence the genetic structure of the population. Studies of the association of inbreeding with disease risk provide clues about the causes of familial aggregation. Consanguineous marriages have a greater risk of producing offspring that are homozygous for a deleterious recessive gene. Studies have shown that polygenic or multifactorial diseases, sterility, stillbirths, spontaneous abortions, infant mortality, as well as congenital malformations were higher among consanguineous marriages (1,2).

Consanguineous marriages continue to be practiced in several areas of the world, with higher frequencies in the Middle East and Asian and African populations (3-9). It is less common in Europe and the United States (10). In the Turkish society, which is

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predominantly Muslim, consanguineous marriage is quite common. The first study on consanguineous marriages in Turkey was conducted by Sayli in 1969, and the prevalence was determined as 28.4%. Other studies have shown that the frequency of marriages between couples related as second cousins or closer was about 21.1%, varying between 11.7% in western regions to 46.9% in eastern regions (11-16). This clearly shows that consanguinity is gradually decreasing in Turkey. Social, cultural and economic variables are all suggested to be important factors in consanguineous marriages.

Turkey, which is a Mediterranean country with a point of junction between Europe, Africa and Asia, has attracted gene flow from various invaders. For countries like Turkey, where consanguineous marriages are common, the association between consanguinity and genetic diseases is highly important for public health. A comprehensive program on mother and child health was conducted in Turkey between 1989 and 1994, and public education about consanguineous marriages was also performed. Consanguineous marriage prevalence in Malatya at that time was 25.9% (17). In this study, we aimed to determine the prevalence of consanguinity in the city of Malatya with the associated factors in order to update the information.

## Materials and Methods

This cross-sectional study was carried out in the city of Malatya, which is in the east of Turkey, with a population of 395,000 according to the 2000 census. The World Health Organization's Expanded Programme for Immunization (WHO/EPI) thirty cluster survey methodology was used to select the study population. Selecting 13 married women per cluster, a total of 409 women were interviewed at their home. Information on the sociodemographic and fertility characteristics of the women and genetic disorders among children was gathered using a face-to-face questionnaire. Consanguinity was defined as three groups: first-cousin marriages (children of parent), other consanguinity (half-first and second-degree cousins, distant consanguineous marriages, if known) and non-consanguineous marriages.

The data were processed by SPSSWIN 13.0 program. Comparisons were done with chi-square test, and a P-value of <0.05 was considered statistically significant.

The average inbreeding coefficient for each level of consanguinity was calculated for the number of couples at that relationship level. The mean inbreeding coefficient was calculated according to the formula,  $\alpha = \sum C_i F_i$ , where  $i$  is the degree of consanguinity, and  $C$  is the frequency of consanguineous marriages of degree in the sample.

## Results

The overall prevalence of consanguineous marriage in the sample was 28.4%, equivalent to a mean inbreeding coefficient ( $\alpha$ ) of 0.01081. The frequency of first-cousin marriages was 21.0% (Table 1). In other words, of the consanguineous marriages recorded, 74.1% were between first cousins and 25.8% between second cousins.

Table 1. Percentage distribution of marriage types among participants.

Marriage type	N	%
Non-consanguineous	293	71.6
First-cousin	86	21.0
Cross-cousin	15	3.7
Distant relative	15	3.7
Total	409	100.0

According to the survey, the age of the women at marriage, educational status and family income were not statistically different between the consanguineous and non-consanguineous marriages (Table 2).

Reproductive patterns among women in consanguineous (first-cousin) and non-consanguineous marriages were compared and are presented in Table 3. The frequencies of spontaneous abortions and infant deaths were significantly higher among consanguineous marriages ( $P < 0.01$ ). There were no differences in the frequency of stillbirth. Of all mothers, 3.3% had a living child with a genetic disorder. Significant differences were noted in the frequency of genetic disorders, which ranged between 6.7-8.2% among consanguineous marriages and was 1.4% among the non-consanguineous group (Table 4). The reported genetic disorders were Down syndrome, diabetes mellitus, heart defects, hand and foot anomalies, ataxia, cleft lip/palate and strabismus (Table 5).

Table 2. Distribution of marriage types by sociodemographic characteristics.

Sociodemographic characteristics		Non-consanguineous		First-cousin		Cross-cousin relative		Distant		Total	
		N	%	N	%	N	%	N	%	N	%
Education	Primary incomplete	87	68.5	33	26.0	5	3.9	2	1.6	127	100.0
	Primary complete	141	74.2	34	17.9	7	3.7	8	4.2	190	100.0
	Secondary and higher complete	66	71.7	19	20.7	3	3.3	4	4.3	92	100.0
Age	15-24 years	21	72.4	5	17.2	2	6.9	1	3.4	29	100.0
	25-34 years	98	74.8	22	16.8	5	3.8	6	4.6	131	100.0
	35-44 years	91	68.9	33	25.0	4	3.0	4	3.0	132	100.0
	45 +	84	71.8	26	22.2	4	3.4	3	2.6	117	100.0
Family income	<380 YTL	108	76.1	26	18.3	5	3.5	3	2.1	142	100.0
	380 YTL	143	67.5	52	24.5	9	4.2	8	3.8	212	100.0
	>380 YTL	43	78.2	8	14.5	1	1.8	3	5.5	55	100.0
Total		293	71.6	86	21.0	15	3.7	15	3.7	409	100.0

Table 3. Percentage distribution of reproductive wastage (spontaneous abortions, stillbirths and infant deaths) by marriage types.

Marriage type	Spontaneous abortus* (n: 402)		Stillbirths (n: 409)		Infant deaths* (n: 409)	
	N	%	N	%	N	%
Non-consanguineous	59	20.1	34	11.6	47	16.3
First-cousin	20	23.3	15	17.4	26	30.6
Cross-cousin	8	53.3	3	20.0	3	20.0
Distant relative	6	42.9	0	0.0	1	7.1
Total	93	22.7	52	12.7	77	19.2

\* P < 0.05, X<sup>2</sup> test

Table 4. Distribution of congenital disorders by marriage type\*\*.

Marriage type	Congenital disorder*					
	Positive		Negative		Total	
	N	%	N	%	N	%
Non-consanguineous	4	1.4	276	98.6	280	100.0
First-cousin	7	8.2	78	91.9	85	100.0
Cross-cousin	1	6.7	14	93.3	15	100.0
Distant relative	1	7.1	13	92.9	14	100.0
Total	13	3.3	381	96.8	394	100.0

\* P < 0.05, X<sup>2</sup> test

\*\* The total N consist those who has a living child

Table 5. Distribution of genetic disorders\*.

Genetic disorders	N	%
Down syndrome	3	23.1
Diabetes mellitus	2	15.4
Heart defects	2	15.4
Hand and foot anomalies	2	15.4
Ataxia	1	7.7
Cleft lip/palate	1	7.7
Strabismus	2	15.4

\* For frequency calculations, the denominator was the total N (13).

## Discussion

The frequency of consanguinity in Malatya was 28.4% (equivalent to a mean inbreeding coefficient ( ) of 0.01081), which is less than that observed in other studies in eastern Anatolia and higher than the average for Turkey. Reports to date show that the prevalence of consanguineous marriages was the highest in South-eastern Anatolia (42%) and the lowest in west Marmara (10%) (16). According to the 2003 Turkey Demographic and Health Survey, the prevalence of consanguineous marriages in Turkey was 22% and equivalent to a mean inbreeding coefficient ( ) of 0.011 (18). Despite marked urbanization and modernization, the prevalence of consanguineous marriages was higher in our study compared with the prevalence in Malatya in 1990 (25.9%) (17). This increase is a reverse shift and might be due to the migration to Malatya from other eastern cities or may reflect the lower socioeconomic status in Eastern Anatolia than the country as a whole (19). Bittles et al. (10) estimated that 20-50% of all marriages in many regions of Asia and Africa are between first cousins. In Turkey, first-cousin unions are the most common type of consanguineous unions, and account for 76% of all consanguineous marriages (16). Comparable to the literature, the most frequent type of consanguineous marriage in our study was between first cousins (74.1%).

To determine the factors responsible for mating among relatives, we investigated demographic and educational characteristics of the Malatya population. There was no significant association between consanguinity and educational level, age at first marriage and family income, although first-cousin unions were more common among women who had not completed primary school and were over 35 years and were less

common among those whose family incomes were higher (14,16,20,21).

It is well known that inbreeding leads to an increase in homozygosity by expression of some of the lethal recessive genes and results in an increase in genetic anomalies that cause congenital malformations, polygenic or multifactorial diseases, spontaneous abortions, stillbirths, infant death and sterility (1,4,22,23). Kerkeni et al. (9) reported that the rates of spontaneous abortions and stillbirths were not correlated with consanguinity. However, higher rates of neonatal and post-neonatal deaths and deaths of children younger than 5 years were observed in consanguineous couples. In this study, parallel with the literature, the reproductive wastages in terms of spontaneous abortion and infant deaths were significantly higher in the consanguineous group compared to the non-consanguineous group. Jain et al. (24), Kulkarni et al. (25) and Hamamy et al. (26) found that congenital malformations were significantly higher in offspring born to mothers in consanguineous marriages. Mosayebi and Movahedian (27) determined that the rate of congenital malformation was 2.0% among neonates from non-consanguineous marriages and 7.0% from consanguineous marriages. We also determined some congenital malformations and they were significantly higher among consanguineous unions.

We have to emphasize that the study had some limitations. Some information was not gathered, such as detailed marriage, migration and employment history; thus, the causal factors of consanguineous marriages could not be determined clearly. Furthermore, reasons for infant deaths and stillbirths were not questioned in sufficient detail to conclude that it was related to consanguinity. The recall factor and the sample size were the other limitations.

In conclusion, the prevalence of consanguinity and of first-cousin marriages was found to be very high in the city of Malatya. There was an increase in the prevalence compared to the studies conducted in the past and this finding is particularly important. Despite the various programs performed to promote mother and child health which included activities to decrease the frequency of the consanguineous marriages, it seems that expected outcomes could not be achieved. The findings of the study also showed that genetic malformations were higher among consanguineous marriages. Thus, our findings indicate the importance of conducting future research on

the reasons for and negative outcomes of consanguineous marriages. Public education programs on the negative outcome of consanguineous marriages need to be continued and efforts should be made to lower the associated social factors.

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