Consanguineous Marriages in a Suburb of a Metropolitan City: A Study from Bursa, Turkey

Büyük Bir Şehrin Kenar Mahallesinde Akraba Evlilikleri: Bursa Türkiye'den Bir Çalışma

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ABSTRACT Objective: The objective of this study was to explore consanguinity, consanguineous marriages, their different types, and socio-demographic correlates in a suburb of Bursa, the fourth largest city in Turkey. **Material and Methods:** A total of 1380 ever married women, who attended the Emek Family Medicine Clinic in this suburb over a period of one year, were requested to participate in the study. Those who gave their informed consent were accepted as study participants. A total of 1110 women were interviewed. The questionnaire provided information on consanguinity and socio-demographic data. Analyses were made by using SPSS V.11.5. **Results:** The mean age of our study participants was (mean ± SE) 34.2 ± 0.6 years. Most of them were illiterate and housewives. About one-third of the participants had consanguineous marriages and about 93% of those marriages were between first cousins. Among first cousin unions, marriage with uncle's male child was the most common. The mean coefficient of inbreeding was 0.015458. Consanguineous marriages were more prevalent among illiterate women. Consanguineous marriages were 4 times more common in women with a family history of consanguinity than in women without any such history. There were no significant correlations between consanguineous marriages and reported stillbirths, miscarriages or infant deaths. However, we found a significant relationship between consanguineous marriages and reported congenital malformations of the offspring. **Conclusion:** We conclude that offspring of consanguineous unions are at high risk for some congenital malformations and diseases. Hence, we recommend that families with a high risk for genetic diseases be identified and be provided with prospective genetic counseling.

Key Words: Marriage; consanguinity; inbreeding

ÖZET Amaç: Bu çalışmanın amacı, Türkiye'nin dördüncü büyük şehri olan Bursa'nın kenar mahallelerinden birinde var olan akraba evliliklerini, bu evliliklerin tipini ve bu evliliklerle ilişkili olan sosyo-demografik özellikleri saptamaktır. **Gereç ve Yöntemler:** Bir yıl boyunca Emek Aile Hekimliği Kliniğine başvuran 1.380 evli kadına çalışma hakkında bilgi verilmiş, katılmak isteyip istemedikleri sorulmuş ve çalışmaya dahil olmak istediğini ifade eden 1.110 kadın ile görüşülmüştür. Anket formunda akraba evliliği ve sosyo-demografik özellikler ile ilgili sorular yer almıştır. Veriler, SPSS V 11.5 programı ile değerlendirilmiştir. **Bulgular:** Katılımcıların yaş ortalaması (ortalama ± SH) 34.2 ± 0.6 yıl olarak bulunmuştur. Çoğunun okuryazar olmadığı ve ev kadını olduğu belirlenmiştir. Katılımcıların 1/3'ünün akraba evliliği yapmış olduğu ve bunların %93'ünün de birinci kuzen evliliği olduğu saptanmıştır. Akraba evliliklerinin en çok amca oğlu ile yapıldığı belirlenmiştir. Ortalama kendileşme katsayısı (soyluluk katsayısı) 0.015458 olarak bulunmuştur. Akraba evliliklerinin okur yazar olmayan kadınlar arasında daha sık olduğu gözlenmiştir. Ailesinde akraba evliliği hikâyesi olan kadınların böyle bir hikâyesi olmayan kadınlara göre 4 kez daha fazla akraba evliliği yaptığı saptanmıştır. Akraba evlilikleri ile bildirilen ölü doğumlar, düşükler ve bebek ölümleri arasında istatistiksel olarak anlamlı bir ilişki saptanamamıştır. Konjenital malformasyon ile akraba evlilikleri arasında ise anlamlı bir ilişkinin bulunduğu belirlenmiştir. **Sonuç:** Akraba evliliklerinden doğacak olan çocuklar konjenital malformasyonlar ve bazı hastalıklar nedeni ile tehlike altındadır. Bu nedenle de genetik hastalıklar bakımından yüksek risk grubu olan ailelerin tanınması ve bu ailelere genetik danışmanlık hizmetinin sunulması uygun olacaktır.

Anahtar Kelimeler: Evlilik; akrabalık; akraba evliliği

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Consanguineous marriages are marriages contracted between blood relatives. In clinical genetics, a consanguineous marriage is most commonly defined as union between persons related as second cousins or closer.[1] About 20% of the human population is estimated to live in communities that have a tendency for consanguineous marriage.[2]

In the literature, for the purposes of classification, consanguineous marriages were divided into different types:[3,4]

(1) Parent-child or brother-sister marriages which include 1st degree relationship with an inbreeding coefficient of 0.25 (1/4).

(2) Brother-half sister or uncle-niece our aunt-nephew marriages which include 2nd degree relationship with an inbreeding coefficient of 0.125 (1/8).

(3) Half uncle-niece or first cousins marriages which include 3rd degree relationship with an inbreeding coefficient of 0.0625 (1/16).

(4) Double first cousins marriages which include 2nd degree relationship with an inbreeding coefficient of 0.125 (1/8).

(5) Half first cousins and first cousins once removed marriages which include 4th degree relationship with an inbreeding coefficient of 0.0313 (1/32).

(6) Second cousins marriages which include 5th degree relationship with an inbreeding coefficient of 0.0156 (1/64).

From a biomedical perspective, there should be increased awareness that consanguineous marriages could lead to genetic effects in the offspring, especially if consanguinity has been practiced over generations within a family.[5] Consanguinity was suggested to contribute to sterility, stillbirths, spontaneous abortions, infant and child mortality, and congenital malformations.[6-12] Total mortality (including prenatal mortality) was reported to be two-and-a-half times higher in inbred sub-samples than in non-inbred sub-samples.[6] Similarly, incidence of spontaneous abortions and stillbirths were higher in offspring of consanguineous marriages than in those of non-consanguineous marriages.[11] The occurrence of asthma, mental retardation, epilepsy and diabetes is significantly more common in offspring of consanguineous than non-consanguineous couples.[12]

The frequency of consanguineous marriages has decreased considerably over the past few decades all over the world. However, they are still very common in Muslim populations.[1,13-15] In Turkey, the past two decades have witnessed a decreasing trend in consanguineous marriages from 23 to 22%.[15-24] However, consanguineous unions are still prevalent and there are differences in consanguinity among people residing in different regions. Table 1 sums up studies on consanguineous marriages from Turkey.

The purpose of this study was to evaluate consanguineous marriages in a suburb of the metropo-

TABLE 1: Consanguineous marriages in Turkey, results of selected studies.

Author	Year	Region	Sample size	Percent of consanguinity
Tunçbilek, E. et al[15]	1988	Turkey	7.872.120	23.1
Başaran et al[16]	1988	Turkey	55.175	21.2
Guz et al[17]	1989	Antalya	1.020	35.2
Baki et al[18]	1992	Trabzon	999	20.0
Demirel et al[19]	1997	Konya	1.120	23.2
Şimşek et al[20]	1999	Denizli	1.000	11.7
Dönbak L[21]	2004	Kahramanmaraş	1.000	22.6
Alper et al[22]	2004	Antalya	1.500	33.9
Kır et al[23]	2005	Ankara	387	24.1
Koç I[24]	2008	Turkey	8.075	22.0

litan city of Bursa and some socio-demographic correlates of consanguineous unions.

MATERIAL AND METHODS

This cross-sectional study was conducted in the Emek district of Bursa metropolitan city. Emek is a suburban area and its settlers are mainly immigrants from Northern and Eastern Anatolia. According to the 2007 census, the total population of this area is about 41.373 (19.695 female).

A Family Medicine Clinic and a Health Center serve as primary health care units in the Emek district. Established in 2004 through a protocol signed between the Uludağ University and Emek Municipality, the Family Medicine Clinic also serves as a training facility for medical students of the university. The clinic provides a wide range of preventive and therapeutic primary health care services free of charge. Only small contributions are accepted for laboratory tests. The medical staff members of the Department of Family Medicine in Uludağ University serve in the clinic on a rotation basis.

The Health Center is managed by the Health Directorate as a peripheral unit of the general health system. Its primary duty is to give preventive health services like immunizations, periodic examinations of children and pregnant women, and health education. General practitioners, midwives and nurses work at the health center.

We conducted this study from September 2006 to December 2007 in the Family Medicine Clinic. We informed every married woman who visited the clinic about our research, and asked her to participate in the study. Out of 1.380 women 1.110 gave their verbal consent; and were accepted as study participants. We assured their privacy and interviewed them in seclusion. Our questionnaire consisted of 28 questions pertaining to their age, level of education, relationship with husband, reasons for a marriage with a relative, reproductive performance, outcome of pregnancies, infant and child deaths, and presence of congenital malformations among children. We marked their answers on printed questionnaires and coded the data on a computer.

We used the SPSS (Version 11.5) program to analyse the collected data. Descriptive statistics including means and standard errors for continuous data, frequency tables, odds ratios, 95% confidence intervals and χ^2 analyses were used to test the significance of the results. p values less than 0.05 were considered significant.

We classified consanguineous marriages into four types:

1. First cousin unions: marriages between children of sisters and/or brothers.

2. First cousin once removed unions: marriages between children and grandchildren of sisters and/or brothers.

3. Second cousin unions: Marriages between grandchildren of sisters and/or brothers.

4. Beyond second cousin unions: All other types of consanguineous marriages.

RESULTS

The mean age of our study participants was (mean ± SE) 34.2 ± 0.6 years. Most of them were illiterate and housewives. The distribution of participants with respect to some socio-demographic characteristics was shown in Table 2.

The prevalence of consanguineous marriages was 32.9% and first cousin unions were as high as 21.4% (Table 3). Among first cousin unions, marriage with uncle's male child was the most common.

The mean inbreeding coefficient was calculated as (F): $SP_iF_i = 0.015458$; where P_i was the proportion of marriages with inbreeding coefficient F_i.[25]

We found no significant correlation between age and consanguinity. Women in consanguineous marriages were living in households with an extended structure, 1.6 times more frequent than those in non-consanguineous marriages (Table 4).

Consanguineous marriages were 4 times more common in women with a family history of consanguinity than in women without any such history (Table 5).

TABLE 2: Socio-demographic characteristics of participants.

Age groups	n	%
15-19	64	5.8
20-29	432	38.9
30-39	322	29.0
40-49	138	12.4
50-59	80	7.2
60 and over	74	6.7
Education		
Illiterate	612	55.1
Primary school	387	34.9
Secondary school or more	111	10.0
Husband's education		
Illiterate	152	13.7
Primary school	686	61.8
Secondary school or more	272	24.5
Women's age of marriage		
< 15	68	6.1
15-19	772	69.6
20-24	244	22.0
25 and >	26	2.3
Women's profession		
Housewife	1062	95.7
Other	48	4.3
Husbands' profession		
Labor worker	776	70.0
Merchant	92	8.3
Retired	74	6.7
Unemployed	70	6.3
Civil servant	41	3.6
Other	57	5.1
Type of family lived in before the marriage		
Nuclear	1008	90.8
Extended	102	9.2
Type of current family		
Nuclear	796	71.7
Extended	314	28.3
History of consanguineous marriages within the family		
Present	716	64.5
Absent	394	35.5
Mean number of pregnancies	3.7 ± 0.12	
Mean number of live births	3.4 ± 0.40	

We found a significant relationship between consanguineous marriages and the educational level of women. Consanguinity was more common among illiterate women (Table 6). However, we did not find any significant relationship between the educational level of their husbands and consanguinity (χ^2= 2.0395, df= 3, p> 0.05).

The prevalence of reported malformations and diseases of offspring were 3.5 times higher among consanguineous unions (Table 7).

The most commonly reported malformations or diseases were deafness, blindness, mental retardation, strabismus and polydactyly, respectively. We did not find any significant relationship between consanguineous or non-consanguineous unions and stillbirths (χ^2= 0.1785, df= 1, p> 0.05), spontaneous abortions (χ^2= 0.7377, df= 1, p> 0.05), and infant deaths (χ^2= 0.4484, df= 1, p> 0.05).

A significant number of women in non-consanguineous marriages as compared to those in consanguineous marriages were aware of the harmful effects of consanguineous marriage on offspring (Table 8).

We asked women in consanguineous unions why they opted for consanguineous marriages. We received the following answers: Tradition 42.6%; family pressure 32.2%; falling in love 23.5%; preservation of property 0.6%, and other 1.1%.

DISCUSSION

The prevalence of consanguineous unions in our study group was higher than that in Turkey. According to the latest available data, the prevalence of consanguinity in Turkey is 22% while the mean coefficient of inbreeding is 0.011.[24] Considering that the study participants consisted of immigrants from the North-Eastern part of Turkey, where consanguinity is up to 30.3%,[24] this finding was not surprising.

The predominance of first cousin unions among consanguineously married women is part of the pattern of consanguinity across Muslim countries,[10,12,14,26-28] in accordance with the results of our study. Further, our study revealed that first cousin marriages constituted 65.0% of consanguineous unions and that it was more common with sons of paternal uncles.

The inverse association between consanguinity and women's educational level has been re-

TABLE 3: Number, proportion and inbreeding coefficients of marriages by type and degree of relationship.

Marriage	Number	Proportion (Pi)	Inbreeding (Fi)	Inbreeding coefficient (PiFi)	Degree of relationship
Non-consanguineous	744	0.671	0	0	None
First cousins	238	0.214	0.0625 (1/16)	0.013375	3rd
First cousins once removed	23	0.020	0.0313 (1/32)	0.000625	4th
Second cousins	102	0.092	0.0156 (1/64)	0.001435	5th
Beyond second cousins	3	0.003	0.0078 (1/128)	0.000023	
Total	1110	1.000	-	0.015458	

TABLE 4: Type of current family and consanguineous marriages.

	Non consanguineous marriages		Consanguineous marriages		Total	
Family type	**n**	**%**	**n**	**%**	**n**	**%**
Nuclear	560	75.3	236	64.5	796	71.7
Extended	184	24.7	130	35.5	314	28.3
Total	744	100.0	366	100.0	1110	100.0

X^2= 14.074, df= 1, p= 0.001, O.R.= 1.67, 95% CI: 1.2782-2.1989.

TABLE 5: History of consanguineous marriages within the family and current consanguinity.

History of consanguineous	Consanguineous marriages		Non- consanguineous marriages		Total	
marriages within the family	**n**	**%**	**n**	**%**	**n**	**%**
Present	304	83.1	412	55.4	716	64.5
Absent	62	16.9	332	44.6	394	35.5
Total	366	100.0	744	100.0	1110	100.0

X^2= 82.114, df= 1, p= 0.0000, O.R.= 3.95, 95%: CI 2.9008-5.3818.

TABLE 6: Women's education and consanguinity.

	Consanguineous marriages		Non-consanguineous marriages		Total	
Education of women	**n**	**%**	**n**	**%**	**n**	**%**
Illiterate	256	69.9	416	55.9	672	60.5
Primary school	96	26.3	290	39.0	386	34.8
Secondary or higher	14	3.8	38	5.1	52	4.7
Total	366	100.0	744	100.0	1110	100.0

X^2= 20.31, df= 2, p< 0.0001.

TABLE 7: Consanguinity and reported malformations or diseases of the offspring.

	Malformation or diseases present		Malformation or diseases absent		Total	
Type of marriage	**n**	**%**	**n**	**%**	**n**	**%**
Consanguineous	28	60.9	300	31.1	328	32.4
Non-consanguineous	18	39.1	666	68.9	684	67.6
Total	46	100.0	966	100.0	1012*	100.0

* 98 women had no living children and were excluded from the analysis.

X^2= 17.81, df= 1, p< 0.0001, OR= 3.45, 95% CI:, 1.8809-6.3405.

TABLE 8: Distribution of participants regarding their answers to the question: " Does consanguineous marriage do harm to the health of the offspring?"

	Yes		No		Did not know*		Total
Type of marriage	n	%	n	%	n	%	n
Consanguineous	132	36.1	168	45.9	66	18.0	366
Non-consanguineous	566	76.0	78	10.5	100	13.5	744
Total	698	62.9	246	22.1	166	15.0	1110

* Women who answered "did not know" were excluded from the analysis.

χ^2= 204.59 df=1, p< 0.0001 OR= 9.2354, 95% CI: 6.6480- 12.8288.

ported in several previous studies.[12,19-24,26,29,30] Our study also showed that the consanguinity level significantly decreased among women with secondary education or more. However, we could not find any association between the educational level of their husbands and consanguinity whereas some former studies revealed such a relationship.[20-24]

Nuclear family is the modal family pattern in Turkey. Nevertheless, extended family system is observed in less developed regions and suburban areas of large cities, where immigrants from less developed regions had settled down. It was 1.7 times more common for women in consanguineous unions to live in an extended family set-up. This finding appears to be consistent with the argument that consanguinity allows the extended family structure to remain intact and in fact perpetuates itself.[28]

We observed that women with a family history of consanguinity opted for consanguineous marriages 4 times more common than those without any such history did. Similar results were obtained from other studies.[24,28]

The main risk of consanguinity is the expression of various autosomal recessive disorders in the offspring because both parents may be carriers of the same deleterious gene. As a result, such marriages have a significant implication for recessive diseases, congenital malformations and decreased reproductivity. Findings regarding the effect of consanguinity on reproductivity are conflicting. Several studies have reported an increased incidence of abortions, stillbirths and infant deaths in consanguineous marriages.[2,6-11,16-18,21,31] A few concluded that consanguinity had no or negligible effect on these parameters.[12,19,22] Our study could not find significant differences between consanguineous and non-consanguineous unions in terms of abortions, stillbirths and infant deaths.

Several studies have shown a higher rate of congenital malformations among offspring of consanguineous marriages than among offspring of non-consanguineous marriages.[11,17-19,21,22] Our study revealed similar results and reported 3.5 times more frequent congenital malformations among the consanguineous group. Deafness was the most commonly reported malformation. A study from Tunisia found that the risk of non-syndromic recessive deafness was 10.7 times higher in first cousin marriages than in non-consanguineous marriages.[32] Another study among students who attended a special school for deaf showed that genetic etiology was responsible for 41.4% of the cases and that 36.7% of the cases were offspring of consanguineous marriages.[33] Color blindness in Turkey was higher in regions where consanguineous marriages were more common.[34] A recent study of Turkish children with cerebral palsy revealed that consanguineous marriages constituted 23.8% of the risk factors after low birth weight, preterm birth and birth asphyxia.[35]

In conclusion, we suggest that the prevalence of consanguinity is high in Turkey despite marked urbanization and modernization. As a result of urbanization, there is increased incidence of consanguineous marriages in suburbs of large cities, where the population consists of immigrants from rural parts. Consanguineous marriages may be considered to indicate traditional behaviors and are mostly

practiced by people with lower educational level and a family history of consanguinity. The predominance of first cousin unions is the prevailing pattern of consanguinity. We conclude that offspring of consanguineous unions are at high risk for some congenital malformations and diseases. Hence, we recommend that families with a high risk for genetic diseases be identified and be provided prospective genetic counseling.[36,37]

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REFERENCES

1. Bittles AH, Savithri HS, Venkatesha Murthy HS, Wang W, Cahil J, Baskaran G, et al. Consanguineous marriage: a familiar story full of surprises. In: Machbeth H, Shetty P, eds. Ethnicity and Health. 1st ed. London: Taylor and Francis; 2001. p.68-78.
2. Modell B, Darr A. Science and society: genetic counselling and customary consanguineous marriage. Nat Rev Genet 2002;3(3):225-9.
3. Nussbaum RL, McInnes RR, Willard HF. Patterns of single gene inheritance. Thompson & Thompson Genetics in Medicine. 6th ed. Chapter 5. Philadelphia: Saunders; 2004. p. 59-94.
4. Bittles AH, Grant JC, Shami SA. Consanguinity as a determinant of reproductive behaviour and mortality in Pakistan. Int J Epidemiol 1993;22(3):463-7.
5. Calderón R, Peña JA, Delgado J, Morales B. Multiple kinship in two Spanish regions: new model relating multiple and simple consanguinity. Hum Biol 1998;70(3):535-61.
6. Reddy PG. Effects of inbreeding on mortality: a study among three South Indian communities. Hum Biol 1985;57(1):47-59.
7. Khoury MJ, Cohen BH, Chase GA, Diamond EL. An epidemiologic approach to the evaluation of the effect of inbreeding on prereproductive mortality. Am J Epidemiol 1987; 125(2):251-62.
8. Khlat M. Consanguineous marriage and reproduction in Beirut, Lebanon. Am J Hum Genet 1988;43(2):188-96.
9. Dorsten LE, Hotchkiss L, King TM. The effect of inbreeding on early childhood mortality: twelve generations of an Amish settlement. Demography 1999;36(2):263-71.
10. Bittles AH. Consanguineous marriage and childhood health. Dev Med Child Neurol 2003;45(8):571-6.
11. Das KB. The effect of inbreeding on mortality and morbidity among Telugu-Speaking populations of Kharagpur, West Bengal, India. Intl Jnl Anthropology 2006;21(2):151-63.
12. Bener A, Hussain R. Consanguineous unions and child health in the State of Qatar. Paediatr Perinat Epidemiol 2006;20(5):372-8.
13. Bittles AH. The role and significance of consanguinity as a demographic variable. Popul Dev Rev 1994;20(3):561-84.
14. Bittles AH, Hussain R. An analysis of consanguineous marriage in the Muslim population of India at regional and state levels. Ann Hum Biol 2000;27(2):163-71.
15. Tuncbilek E, Ulusoy M. Consanguinity in Turkey. Turkish Journal of Population Studies 1988;11:35-46.
16. Başaran N, Sayli BS, Başaran A, Solak M, Artan S, Stevenson JD. Consanguineous marriages in the Turkish population. Clin Genet 1988;34(5):339-41.
17. Güz K, Dedeoğlu N, Lüleci G. The frequency and medical effects of consanguineous marriages in Antalya, Turkey. Hereditas 1989; 111(1):79-83.
18. Baki A, Karagüzel A, Beser E, Cakmakçi T, Uçar F, Omeroglu A. Consanguineous marriages in the province of Trabzon, Turkey. East Afr Med J 1992;69(2):94-6.
19. Demirel S, Kaplanoğlu N, Acar A, Bodur S, Paydak F. The frequency of consanguinity in Konya, Turkey, and its medical effects. Genet Couns 1997;8(4):295-301.
20. Simşek S, Türe M, Tugrul B, Mercan N, Türe H, Akdağ B. Consanguineous marriages in Denizli, Turkey. Ann Hum Biol 1999;26(5):489-91.
21. Donbak L. Consanguinity in Kahramanmaras city, Turkey, and its medical impact. Saudi Med J 2004;25(12):1991-4.
22. Alper OM, Erengin H, Manguoğlu AE, Bilgen T, Cetin Z, Dedeoğlu N, et al. Consanguineous marriages in the province of Antalya, Turkey. Ann Genet 2004;47(2):129-38.
23. Kir T, Güleç M, Bakir B, Hoşjgönül E, Tümerdem N. The frequency and effecting factors of consanguineous marriage in a group of soldiers in Ankara. J Biosoc Sci 2005;37(4):519-23.
24. Koc I. Prevalence and sociodemographic correlates of consanguineous marriages in Turkey. J Biosoc Sci 2008;40(1):137-48.
25. Emery AEH. Estimation of factors affecting the genetic structure of populations. Methodology in Medical Genetics: An Introduction to Statistical Methods. 2nd ed. Edinburgh: Churchill Livingstone; 1986. p 16-7.
26. Rajab A, Patton MA. A study of consanguinity in the Sultanate of Oman. Ann Hum Biol 2000;27(3):321-6.
27. Hamamy H, Jamhawi L, Al-Darawsheh J, Ajlouni K. Consanguineous marriages in Jordan: why is the rate changing with time? Clin Genet 2005;67(6):511-6.
28. Hussain R, Bittles AH. Sociodemographic correlates of consanguineous marriage in the Muslim population of India. J Biosoc Sci 2000;32(4):433-42.
29. Ben Arab S, Masmoudi S, Beltaief N, Hachicha S, Ayadi H. Consanguinity and endogamy in Northern Tunisia and its impact on nonsyndromic deafness. Genet Epidemiol 2004; 27(1):74-9.
30. Gunaid AA, Hummad NA, Tamim KA. Consanguineous marriage in the capital city Sana'a, Yemen. J Biosoc Sci 2004;36(1):111-21.
31. Tunçbilek E. Clinical outcomes of consanguineous marriages in Turkey. Turk J Pediatr 2001;43(4):277-9.
32. Ben Arab S, Masmoudi S, Beltaief N, Hachicha S, Ayadi H. Consanguinity and endogamy in Northern Tunisia and its impact on nonsyndromic deafness. Genet Epidemiol 2004;27(1):74-9.
33. Egeli E, Çiçekci G, Silan F, Oztürk O, Harputluoğlu U, Onur A, et al. Etiology of deafness at the Yeditepe School for the deaf in Istanbul. Int J Pediatr Otorhinolaryngol 2003;67(5):467-71.
34. Citirik M, Acaroglu G, Batman C, Zilelioglu O. Congenital color blindness in young Turkish men. Ophthalmic Epidemiol 2005;12(2):133-7.
35. Erkin G, Delialioglu SU, Ozel S, Culha C, Sirzai H. Risk factors and clinical profiles in Turkish children with cerebral palsy: analysis of 625 cases. Int J Rehabil Res 2008;31(1):89-91.
36. Bokesoy I, Karabulut HG. [Consanguinity and genetic counseling]. Turkiye Klinikleri J Pediatr Sci 2005;1(2):30-5.
37. WHO. Medical Genetic Services in Developing Countries: The Ethical, Legal and Social Implications of Genetic Testing and Screening. Geneva: WHO; 2006. p.38-41.