Original Article

Prevalence and Risk Factors of Consanguineous Marriage

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ABSTRACT

Consanguineous marriage is a global health problem with several health-related and social adverse outcomes. In this study we aimed to identify the prevalence and epidemiologic features of consanguineous marriage. This case-control study was carried out at the premarital advisory centers in Tabriz city in the North-West of Iran. The participants consisted of 1532 subjects (766 couples) with166 couples as the case group. The one year occurrence rate of consanguineous marriage was 13.80%. After adjustment for other variables, age at marriage for both women (OR=0.90, 95%CI=0.86-0.94) and men (OR=0.87, 95%CI=0.82-0.93), and level of knowledge for both women and men were significantly related to consanguineous marriage. Father's profession, participant's level of income, and parent's consanguinity were independent predictors of consanguineous marriage in men but not in women. The frequency of consanguineous is still high, so it seems necessary to design and implement special preventive interventions including multi-level educational programs in order to address the problem.

Key words: Consanguinity, marriage, determinants, prevalence

Akraba Evliliğinin Risk Faktörleri ve Sıklığı

ÖZET

Akraba evliliği çeşitli sağlık sorunları ve sosyal olumsuz sonuçları ile küresel bir sağlık sorunudur. Bu çalışmada akraba evliliği sıklığı ve epidemiyolojik özelliklerini belirlemeyi amaçladık. Bu vaka-kontrol çalışması İran Kuzey-Batı Tebriz kentinde evlilik öncesi danışma merkezlerinde gerçekleştirilmiştir. Katılımcı olarak 1532 kişi (766 çift) ve vaka grubu olarak 166 çift alındı. Akraba evliliğinin bir yıllık oluşma oranı 13.80% olmuştur. Diğer değişkenler için düzeltme yapıldıktan sonra hem kadın (OR = 0.90,% 95 CI = 0,86-0,94) hem erkekler (OR = 0.87,% 95 CI = 0,82-0,93) için evlenme yaşı ve bilgi düzeyi önemli ölçüde akraba evliliği ile ilgili idi. Baba mesleği, katılımcının gelir seviyesi ve ebeveynin akrabalığı erkeklerde akraba evliliğinin bağımsız göstergesi olup bu kadınlarda gösterilememiştir. Akraba evliliği sıklığı hala yüksek olup, bu yüzden tasarım ve sorunu çözmek için çok düzeyli eğitim programları dahil olmak üzere özel koruyucu müdahalelerin uygulanması gerekli görülmektedir.

Anahtar kelimeler: Akrabalık, evlilik, belirleyiciler, sıklık

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INTRODUCTION

Consanguinity or marriage between a man and woman who are related by blood is a global health issue with a variety of distributions and occurrence rates around the world (1). Consanguineous marriage is defined by human geneticists as the unions of second cousins (forth degree relatives) or closer relatives (2,3). It is recently estimated that 20% of human populations live in communities with a tendency toward endogamy and globally 8.5% of all children have consanguineous parents (1,2). The prevalence of consanguineous marriage varies widely between and within countries. Although consanguinity is declined dramatically in many of western communities is still prevalent in parts of Middle-East, North Africa, and West Asia (4,5).

Many researchers have demonstrated a variety of adverse outcomes regarding this issue. Several studies came to the agreement that consanguinity is the most common risk factor for congenital anomalies (1,6,7). It has been proven that off-springs of consanguineous parents are at higher risk for perinatal and postnatal mortality and morbidity, stillbirth, low birth weight, preterm labor, childhood mortality, and lower IQ level (1,4,8,9). Consanguinity is associated with ten-fold higher risk of autosomal recessive disorders for progenies (10).

Additionally there is a growing evidence that supports the association between parent's consanguinity and complex, multi-factorial adult diseases in off-springs including Alzheimer's disease, hypertension, cardiovascular disease, stroke, cancers, depression, asthma, gout, epilepsy, osteoporosis, and peptic ulcer (3,11). On the other hand consanguineous marriages are related to various social problems for families and the community including domestic violence and infertility in couples, and illicit drug abuse in children (4,11). In several studies different factors are detected as the predictors for consanguineous marriage such as socioeconomic status, educational level, location and size of the area, and people's attitude (4,12). Better understanding of these factors can help us in implementation of appropriate interventions to prevent this health problem. In this study we aimed to document the epidemiologic features of consanguineous marriage considering three main objectives; to determine the prevalence of consanguineous marriage in our region, to identify the socioeconomic and demographic determinants of consanguineous marriage, and to evaluate the knowledge of couples about the impacts of this kind of marriage.

MATERIALS AND METHODS

This case-control study was carried out at two premarital counseling centers in Tabriz city in the North-West of Iran from April-2012 to May-2013. Ordinarily it is an obligation for each couple who are going to marry in our country to obtain a certificate from these health centers. In these premarital counseling centers, health services are delivered for couples including screening for thalassemia, educations about reproductive health issues and contraceptive methods, and genetic counseling for consanguineous spouses. The participants consisted of 1532 subjects (766 couples) using the consecutive sampling method. All of the participants were informed about the study and couples who had consent were included in the study. The case group (166 couples) included spouses who had consanguineous marriage. Controls (600 couples) were non-consanguineous couples.

Two trained nurses interviewed men and women using a structured questionnaire in order to collect the data for:

a) Demographic characteristics of participants

b) Educational and economic status of participants

c) Marriage-related variables

d) Participant's family and parent characteristics

e) Two questions to evaluate couple's knowledge about the impacts of consanguineous marriage

f) Participant's information sources of the issue

The consanguineous marriage was classified as: first cousin, double-first cousin, first cousin once removed, second cousin, and more distant relatives. Ethical approval was obtained from the Research Ethics Committee in Tabriz University of Medical Sciences (reference number 5/4/2344). We used univariate logistic regression to calculate the odds ratios (OR) and 95% confidence intervals and to identify the potential predicting factors of consanguinity. Variables with a p-value <0.05 in univariate analysis were included in the multiple logistic regression model.

RESULTS

In one year period in Tabriz city 19,639 marriages were registered in the premarital advisory centers, from which 13.80% were consanguineous. Table 1 shows the frequency of different types of consanguineous mating in study participants.

The median age at marriage was 21 years for women (Q25-Q75=17-25) and 26 years for men (Q25-Q75=23-29). In 710 of women they attended for their first marriage (92.7%) and in 56 cases for the second one (7.3%). For men these were 90.7% and 9.1% respectively. In the case group, 161 of women (97%) and 165 of men (99.4%) reported that they had themselves chosen to marry consanguineously and the rest indicated the parent's pressure as the cause of their consanguineous mating.

In general 26.9% of all participants had consanguineous parents and 73.1% did not. In univariate analysis of women's characteristics association between the occurrence of consanguineous marriage and variables including age at marriage, location of residence, education, level of income, father's job, and level of knowledge were statistically significant (Table 2). For men's characteristics, variables of age at marriage, location of residence, education, level of income, father's job, marriage grade, parent's consanguinity, and level of knowledge were significantly related to consanguineous marriage (Table 3). The final analysis made it clear that independent predictors of consanguineous marriage for both men and women can be lower marriage age and lower level of knowledge about the impacts of consanguineous marriage.

Among all study participants, more than half of men and women reported having lower than intermediate level of knowledge about the adverse health impacts of consanguinity for their off-springs and more than one third had intermediate level of information. Participants in-

dicated their families as the most common source of information about consanguineous marriage (36% and 30% for men and women respectively), following by media (TV or radio), friends, and teachers, internet, books, and at last the health-care centers.

DISCUSSION

Consanguinity is a longstanding tradition in Muslim communities; however this kind of marriage occurs in every religion and is not attributable to a certain religious rule (2,3,13). Based on marriage regulations in Islam, first cousin and double-first cousin marriages are permitted and Unions between first degree relatives and uncle-niece are prohibited. Consanguineous marriage is not encouraged in Islam; even Prophet Muhammad has endorsed non-related marriage (4,11). So it seems that in spite of general attention to the effects of religion, consanguinity is fundamentally rooted in cultural, historical, regional, and socio-economic factors (2,3,13).

The preference of consanguinity is considered to be due to its perceived social and financial advantages such as strengthening the family ties, maintaining the family structure and possessions, closer relationship between the bride and her in-laws, greater durability and stability of family, more acquaintance of spouses before marriage, greater compatibility between families, and lower possibility of hidden financial and health issues. Economic benefits ascribed to consanguineous marriage are lower cost and more simplicity or ease of premarital negotiations and marital arrangements, lower expectations of parents and partners, and financial advantages regarding dowry (2,4,5,9,13,14). But it is a fact that no studies have investigated the rate of divorce in consanguineous marriages.

The frequency of consanguineous marriage in this study (13.8%) was lower compared to previous studies in urban settings of Iran ranging from 17 to 35 percent (6,7,9,15,16). This prevalence was reported much lower in western communities like Austria (less than 1%), but higher in other countries; 35% in Syria, 49% in Jordan, 22% in Turkey, 35% in Egypt, and over 50% in Saudi Arabia (1,4,10,12,16,17). On the other hand our results showed that 26.9% of all participants had consanguineous parents which reflect the higher frequency of consanguinity in the previous generations. It seems that the tendency toward consanguineous mating has declined in our com-

Table 1. Frequency of Consanguineous Marriages

Consanguinity type	n	%
Double-first cousin	2	1.2
First cousin	110	66.3
First cousin once removed	19	11.4
Second cousin	29	17.5
Distant relatives	6	3.6
Total	166	100

Table 2. *Characteristics and Determinants of Consanguineous Marriage Related to Woman*

Characteristic	Marriage type		Odds Ratio (95%CI)	
	Cases	controls	Unadjusted	Adjusted[1]
Median age, years(IQR)	19 (15-21)	22 (18-26)	0.88 (0.85-0.92)	0.90 (0.86-0.94)***
Residency				
Rural	53 (31.9)	131 (21.8)	1.67 (1.14-2.45)	1.21 (0.76-1.92)
Urban	113 (68.1)	469 (78.2)	Referent	Referent
Home				
No (live with parents)	165 (100)	584 (98)	4.5 (NA)	
Hire	0	3 (0.4)	NA	-
Possession	0	9 (1.2)	Referent	
Education				
Literacy	1 (0.6)	5 (0.8)	1.04 (0.11-9.15)	0.45 (0.04-5.05)
Primary	49 (29.5)	131 (21.8)	1.95 (1.22-3.10)	0.63 (0.33-1.22)
High school	74 (44.6)	245 (40.8)	1.57 (1.03-2.39)	0.69 (0.40-1.18)
University	42 (25.3)	219 (36.5)	Referent	Referent
Profession				
Housewife	85 (51.2)	317 (52.8)	0.89 (0.63-1.26)	
Simple worker	1 (0.6)	4 (0.7)	0.83 (0.09-7.55)	-
Technician	1 (0.6)	16 (2.7)	0.20 (0.02-1.59)	
Employee	79 (47.6)	263 (43.8)	Referent	
Father's job				
Not working	5 (3.3)	17 (3.2)	1.50 (0.51-4.36)	1.81 (0.57-5.73)
Simple worker	15 (9.8)	41 (7.7)	1.87 (0.93-3.77)	1.34 (0.62-2.88)
Technician	100 (65.4)	305 (57.3)	1.67 (1.08-2.59)	1.23 (0.75-2.02)
Employee	33 (21.6)	169 (31.8)	Referent	Referent
Father				
Dead	12 (7.3)	66 (11)	Referent	-
Alive	153 (92.7)	532 (89)	1.58 (0.83-3.00)	
Income				
No income	154 (93.9)	516 (86.7)	5.07(1.20-21.35)	2.44 (0.31-19.26)
Low	8 (4.9)	45 (7.6)	3.02(0.60-15.15)	3.98 (0.44-35.49)
Intermediate/High	2 (1.2)	34 (5.7)	Referent	Referent
Birth grade				
First offspring	57 (34.3)	187 (31.1)	1.15 (0.80-1.66)	-
Others	109 (65.6)	413 (68.8)	Referent	
Single Offspring				
Single	1 (0.6)	22 (3.7)	0.16 (0.02-1.19)	-
Have siblings	165 (99.4)	578 (96.3)	Referent	
Single daughter				
Single	35 (21.1)	149 (24.8)	0.81 (0.53-1.22)	-
Have sisters	131 (78.9)	451 (75.2)	Referent	
Living situation				
With parents	148 (89.7)	521 (87)	Referent	
Single parent	8 (4.8)	51 (8.5)	0.55 (0.25-1.18)	-
Step family	4 (2.4)	6 (1)	2.34 (0.65-8.42)	
Others[2]	5 (3)	21 (3.5)	0.83 (0.31-2.26)	
Marriage grade				
First	159 (95.8)	551 (91.8)	1.02 (0.89-1.54)	-
Second	7 (4.2)	49 (8.2)	Referent	
Parent's consanguinity				
Yes	47 (28.3)	129 (21.5)	1.44 (0.97-2.12)	-
No	119 (71.1)	471 (78.5)	Referent	
Knowledge				
No information	23 (13.9)	63 (10.5)	5.11(1.44-18.10)	5.64 (1.20-26.56)*
Low	108 (65.1)	250 (41.7)	6.04(1.83-19.93)	6.52 (1.51-28.09)*
Intermediate	32 (1.8)	245 (40.8)	1.82 (0.53-6.24)	2.02 (0.45-8.96)
High	3 (1.8)	42 (7)	Referent	Referent

Note. Data are presented as no. (%) unless otherwise indicated.
NA: not applicable, *: P<.05, **: p<.01, ***: P<.001
1 Adjusted for age, location of residence, education, father's job, income, level of knowledge.
2 living alone, with siblings or relatives other than parents.

Table 3. Characteristics and Determinants of Consanguineous Marriage Related to Man

Characteristic	Marriage type		Odds Ratio (95%CI)	
	Cases	Controls	Unadjusted	Adjusted 1
Median age, years(IQR)	23 (21-26)	26 (23-30)	0.86 (0.82-0.90)	0.87(0.82-0.93)***
Residency				
Rural	52 (31.3)	125 (20.8)	1.73 (1.18-2.54)	1.35 (0.83-2.21)
Urban	114 (68.7)	475 (79.2)	Referent	Referent
Home				
No (live with parents)	161 (97)	570 (96)	0.14 (0.59-34.33)	
Hire	4 (2.4)	8 (1.3)	0.08 (0.76-83)	-
Possession	1 (0.6)	16 (2.7)	Referent	
Education				
Literacy	0	4 (0.7)	0 (NA)	0 (NA)
Primary	44 (26.5)	181 (30.2)	1.04 (0.66-1.64)	0.45 (0.24-1.07)
High school	74 (44.6)	209 (34.8)	1.52 (1.01-2.29)	0.77 (0.44-1.33)
University	48 (28.9)	206 (34.3)	Referent	Referent
Profession				
Not working	1 (0.6)	2 (0.3)	2.32 (0.20-26.31)	
Simple worker	12 (7.3)	44 (7.3)	1.26 (0.61-2.63)	-
Technician	115 (69.7)	381 (63.6)	1.40 (0.92-2.11)	
Employee	37 (22.4)	172 (28.7)	Referent	
Father's job				
Not working	10 (6.6)	12 (2.3)	5.26 (2.08-13.33)	5.06 (1.56-16.37)**
Simple worker	13 (8.6)	30 (5.8)	2.73 (1.27-5.87)	1.49 (0.61-3.67)
Technician	100 (66.2)	298 (57.6)	2.12 (1.34-3.35)	1.52 (0.88-2.63)
Employee	28 (18.5)	177 (34.2)	Referent	Referent
Father				
Dead	15 (9)	80 (13.4)	Referent	-
Alive	151 (91)	517 (86.6)	1.55 (0.87-2.78)	
Income				
No income	5 (3.4)	8 (1.6)	3.08 (0.97-9.73)	1.47 (0.37-5.86)
Low	80 (53.7)	192 (37.2)	2.05 (1.41-2.99)	1.75 (1.11-2.74)**
Intermediate/High	64 (43)	316 (61.2)	Referent	Referent
Birth grade				
First offspring	48 (28.9)	155 (25.8)	1.16 (0.79-1.71)	-
Others	118 (71.1)	445 (74.2)	Referent	
Single Offspring				
Single	0	7 (1.2)	2.21 (NA)	-
Have siblings	166 (100)	593 (98.8)	Referent	
Single son				
Single	24 (14.5)	107 (17.8)	0.77 (0.48-1.25)	-
Have Brothers	142 (85.5)	493 (82.2)	Referent	
Living situation				
With parents	142 (85.5)	493 (82.2)	Referent	
Single parent	11 (6.6)	64 (10.7)	0.59 (0.31-1.16)	-
Step family	2 (1.2)	5 (0.8)	1.38 (0.26-7.23)	
Others 2	11 (6.6)	38 (6.3)	1.01 (0.50-2.02)	
Marriage grade				
First	163 (98.2)	532 (88.8)	6.84 (2.12-22.04)	1.74 (0.48-6.31)
Second	3 (1.8)	67 (11.2)	Referent	Referent
Parent's consanguinity				
Yes	47 (28.3)	102 (17)	1.92 (1.29-2.87)	1.84 (1.13-2.98)*
No	119 (71.7)	498 (83)	Referent	Referent
Knowledge				
No information	20 (12)	53 (8.8)	4.34 (1.38-13.62)	1.79 (1.12-6.70)*
Low	101 (60.8)	230 (38.3)	5.05 (1.77-14.40)	1.86 (0.57-6.11)
Intermediate	41 (24.7)	271 (45.2)	1.74 (0.59-6.08)	0.74 (0.22-2.47)
High	4 (2.4)	46 (7.7)	Referent	Referent

Note. Data are presented as no. (%) unless otherwise indicated.
NA: not applicable, *: P<.05, **: p<.01, ***: P<.001
1 Adjusted for age, location of residence, education, father's job, income, marriage grade, parent's consanguinity, and level of knowledge.
2 living alone, with siblings or relatives other than parents.

munity but is still high and needs appropriate attention. These changes in the frequency of consanguineous mating observed in this study can be attributable to various factors including access to larger marriage pool due to urbanization and mobility from rural to urban settings, promotion in education, developments in socioeconomic status of the families, increase in occupational opportunities and participation in labor force for women, more awareness about the effects of consanguineous marriages on children's health, decline in the fertility rate and so lower number of relatives available for marriage, and increase in liberty of deciding for marriage. It is vital to keep in mind that this frequency is derived from the data of an urban context, although some couples from rural areas were included in this study because they had performed their marriage registration process in the city and entered in Tabriz's premarital center's data. So it is not surprising to predict that this rate is an under-estimation of all marriages in the region including rural ones, as it has been demonstrated in other studies that consanguinity occurs more commonly in rural settings (4,14,16).

Similar to other studies, in our study the most common form of consanguineous marriage was between first cousins, (2,6,9,16). The frequency of marriage between double-first cousins in this study was 1.2%, which is lower than a study in Egypt (4). These kinds of marriages need special attention because of their high coefficient of inbreeding (F=0.125), which means that their progeny will be homozygous at 12.5% of all loci and at higher risk for autosomal recessive disorders (5). Our analysis indicated that the majority of participants had themselves chosen to marry consanguineously. This finding along with the low awareness of couples in this study about the effects of consanguineous mating on children's health, reflect the need for appropriate educational programs in our community.

On the other hand participants' information source about this problem presents the unmet need for delivering education through mass media and health-care centers. These findings are in parallel with other studies in our country (15,16). Results of this study suggest that there is an independent association between consanguineous mating and age at marriage in both women and men. After adjustment for other variables, our results showed that on average with one year increase in the age of participants, the chance of consanguineous marriage decreases by 10% in women and 13% in men.

Many other studies also have reported that consanguineous marriage occurs in younger ages in comparison with non-consanguineous marriage (4,10,12,16). It has been demonstrated that this can result in lower maternal age at first child-birth, higher pregnancy-related risk, and higher number of children (8,10,12).

In agreement with other researches, the univariate analysis in this study showed a significant positive association between consanguinity and living in rural settings for both men and women, but this relationship was not significant when adjusted for other determinants (4,14,16). This can be explained by the fact that other factors associated with living in rural areas such as lower educational level, lower age at marriage, and lower socioeconomic status may act in combination to cause this phenomenon. We did not find a significant association between consanguinity and participant's level of education and profession after adjustment for other factors, which may be due to higher educational and occupational status in the urban context. This was reported similarly in a study in Iran but is contrary to others who reported a significant association between consanguinity and lower level of education (2,4,12,15,16).

In our country children live with their parents until they marry and commence a separate life, therefore the parents' characteristics influence the marriage pattern of their offsprings. Lower grade of father's job in both women and men was associated with higher occurrence of consanguineous marriage and remained significant after adjustment for other determinants in men but not in women. Men whose fathers were not working were 5 times more likely to marry consanguineously compared to men whose fathers were employees. Similarly in another study lower grade of job in parents was a predictor for consanguinity in children (4). This result along with the significant association between the consanguineous marriage and level of income in men indicate that the economic status of men have more predictive value for consanguinity compared to which in women.

Parents' consanguinity was associated with 84% more chance of consanguineous marriage in men but no association was seen in women. Although in other studies this was not investigated separately for men and women, it has been proven that parent's consanguinity predicts the occurrence of this tradition in progeny as a result of the effect of familial customs and parent's believes (2,4,15,16). The level of awareness about the

impacts of consanguineous marriage was strongly related to consanguineous mating in both men and women. Having no information about the effects of consanguineous marriage was associated with 5.6-folds more risk of consanguinity in women and approximately 2-folds more risk in men. This finding consistently with other researches reflects that there is still space for educational programs in our community in order to increase the public awareness and improve community's attitude toward consanguineous marriages (16).

In addition to variables noted above, we included other family-related characteristics in our analysis which were not investigated in other studies, from which father's death, living situation with the parents, birth grade, being single offspring, being single son or daughter of the family, and marriage grade were not significantly associated with the consanguineous marriage. Our study was subject to some limitations. Many of variables in this study were self-reported and could not be validated, so the results are vulnerable to recall bias and social desirability. Besides this study was conducted in an urban context which limits the generalizability of findings through the community.

This study has several implications for public health in preventing the problem. Our results showed the very shortage of community's knowledge about consanguineous marriage and the strong need for designing and implementing appropriate individual, family, community, and school-based educational programs. Additionally it seems reasonable to integrate these educations whit ones for early marriage and to start these programs at a younger age, as there is consistent evidence for the interaction between consanguinity and the age of marriage. The role of mass media in increasing the level of knowledge in the population can be of value. We propose to investigate this phenomenon in other regions because it appears that the ethnicity influences the marriage habitues. In summary our study challenged the prevalence and determinants of consanguineous marriage in an urban area. The frequency of consanguineous mating is still high and needs special preventive interventions, especially in rural areas. It is necessary to implement multi-level educational programs due to the lack of knowledge in our community and its positive association with the occurrence of consanguineous marriage demonstrated in this study.

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