Received: 24 Dec. 2014 **Accepted: 23 Feb. 2015**

Comparison of the frequency of dentoalveolar deformities in consanguineous marriages and non-consanguineous marriages in Kerman, Iran

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Original Article

Abstract

BACKGROUND AND AIM: Consanguineous marriage is one of the causes of congenital deformities and genetic diseases. The aim of this study was to evaluate the role of consanguineous marriage in dentoalveolar deformities in 16-18 years old adolescents with parental consanguineous marriages in Kerman, Iran.

METHODS: A total of 388 female and male adolescents participated in this study. The subjects were divided into two groups of case and control (with consanguineous marriages and non-consanguineous Marriages respectively) and examined carefully and a special questionnaire was completed for each group, then data were analyzed by SPSS using multiple logistic regression analysis.

RESULTS: Showed that Class III malocclusion in girls and boys was significantly more prevalent in consanguineous marriages ($P < 0.001$), and the prevalence of Class I malocclusion was significantly higher in non-consanguineous marriages ($P = 0.001$). The prevalence rates of other dentoalveolar deformities were not significantly different between the two consanguineous and non-consanguineous marriage groups ($P > 0.050$).

CONCLUSION: When parents have Class III malocclusion, consanguineous marriage can play a major role as a predisposing factor for Class III malocclusion in their children.

KEYWORDS: Consanguineous Marriage, Malocclusion, Deformity, Dentoalveolar

Citation: Faryabi J, Hoseinifar R. **Comparison of the frequency of dentoalveolar deformities in consanguineous marriages and non-consanguineous marriages in Kerman, Iran.** J Oral Health Oral Epidemiol 2015; 4(1): 10-6.

Consanguineous marriages are one of the most important causes of congenital deformities and physical handicaps. This type of marriage is a centuries-old tradition, which is usually supported by economic, psychological, and social factors, and has been a long-standing social habit among Iranians and pre-dates conversion of Islam.[1-4]

Infants born as a result of first cousin marriages are at a 4.4% higher risk of death before they reach their child-bearing age compared to those born as a result of non-consanguineous marriages. In fact, the main reason for risks in consanguineous marriages is similar genetic background of the parents. Subsequent to consanguineous marriages latent defective and disease-inducing genes which are carried in apparently healthy individuals are coupled due to identical ancestral source and are manifested as various kinds of congenital anomalies, physical handicaps, and mental retardation in children; genetic similarities in first cousin increase by two folds.[5-7]

In fact, consanguineous marriage not only increases the risk of hereditary diseases in children, but also it increases such diseases and defective genes in future generations.[6] Based on studies carried out in Iran, the

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prevalence of consanguineous marriages is 38.0%, with first cousin marriages comprising 27.0% of them.[4,6,8] Studies on relation between parents and their off springs about heritability of craniofacial characteristics have shown that maxillofacial variables such as the position of the lower jaw, the anterior and posterior face height and the cranial base dimensions were greater than that of dentoalveolar measurements and also, for complex polygenic multifactorial traits or abnormalities, genetic aberration can be detected[9] and on the other hand, in another study states that: overall, the relative contributions of genetic and environmental factors in the etiology of mandibular prognathism (MP) are unclear.[10] Therefore, the present study was undertaken to evaluate the relationship between dentoalveolar deformities and consanguineous marriages in Kerman, Iran.

Methods

The subjects in the present case-control study consisted of 388 high school students, 16-18 years of age in Kerman (case group: consanguineous marriage, control group: non-consanguineous marriage), by regarding to Cochrane formula (d = 0.05, z = 1.96, standardized normal distribution 95%) we calculated that at least 384 subjects must participate in the study, so we decided to study 450 subjects regarding to practical problems in performing studies in such population, and finally 388 subjects had completed our examination form and regarded as our sample size. The subjects were examined by the corresponding author under the supervision of the first author, using wooden tongue blades and disposable gloves under ambient light on a conventional chair.

Inclusion criteria consisted of 16-18 age range. Exclusion criteria consisted of the following:

1. History of any maxillofacial surgery
2. History of fixed and removable orthodontic treatment
3. History of trauma to the jaws and treatment of fractures
4. History of maxillofacial tumors
5. History of tooth extraction due to caries and periodontal problems
6. History of adverse oral habits
7. History of any congenital maxillofacial disorder

The examination forms consisted of forms A and B. Form A included information about sex, the consanguineous marriage relation (non-consanguineous marriage, first cousin, second cousin, and other) and dentofacial deformities, but form B included only information about sex and the consanguineous marriage relation.

Form A was filled out for subjects with deformities and form B was filled out for subjects without any deformities.

Dentofacial deformities that evaluated in examination forms were as follow:

1. Malocclusion Class I (normal molars relationship but with one or more tooth malposition), malocclusion Class II, malocclusion Class III
2. Deep bite, open bite, crowding of teeth
3. Dental midline shift (discrepancy between the midline of maxillary central incisors and mandibular central incisors), anterior and posterior cross bite
4. Gummy smile

After the forms had been completed, data were analyzed by SPSS (version 13.5, SPSS Inc., Chicago, IL, USA) using multiple logistic regression analysis and $P < 0.050$ was considered statistically significant.

Results

Of 388 male and female subjects in the 16-18 years age range, 236 subjects had parents with non-consanguineous marriages (60.8%), and 152 had parents with consanguineous marriages (39.2%). Of the 236 adolescents with non-consanguineous marriage of parents, 47.9% had dentoalveolar deformities; of the 152 adolescents with consanguineous marriages of parents, 53.3% had

dentoalveolar deformities, with no significant differences between the two groups (P = 0.289) (Table 1).

The detail of the frequency distribution of dentoalveolar deformities due to consanguineous and non-consanguineous marriages is also presented in table 1. Statistical analysis revealed that tooth malalignment with Class I occlusion was significantly more prevalent in non-consanguineous marriages (P = 0.001) and Class III malocclusion was significantly more prevalent in consanguineous marriages (P < 0.001). No significant differences were observed in other anomalies between the two groups (P > 0.050).

Of 112 female adolescents, whose parents had non-consanguineous marriages, the prevalence of dentoalveolar anomalies was 46.4% and of 82 female adolescents, whose parents had consanguineous marriages, the prevalence of dentoalveolar anomalies was 54.88%, with no statistically significant differences between the two groups (P = 0.245).

Table 1. Frequencies of dentoalveolar deformities in 16-18 years old adolescents as a result of consanguineous and non-consanguineous marriages (type of marriage/type of deformity)

Deformity		Marriage					
		Non-consanguineous	Consanguineous	OR	95% CI		χ^2 (P)
		n (%)	n (%)		Lower	Upper	
Total deformity	No	123 (52.12)	71 (46.71)	-	-	-	1.082 (0.289)
	Yes	113 (47.88)	81 (53.29)	1.24	0.83	1.87	
	Total	236 (100)	152 (100)	-	-	-	
Class I malocclusion	No	23 (20.35)	34 (41.98)	-	-	-	10.561 (0.001)
	Yes	90 (79.65)	47 (58.02)	0.35	0.19	0.67	
	Total	113 (100)	81 (100)	-	-	-	
Class II malocclusion	No	98 (86.73)	70 (86.42)	-	-	-	0.004 (0.951)
	Yes	15 (13.27)	11 (13.58)	1.03	0.44	2.37	
	Total	113 (100)	81 (100)	-	-	-	
Class III malocclusion	No	105 (92.92)	58 (71.60)	-	-	-	16.016 (< 0.001)
	Yes	8 (7.08)	23 (28.40)	5.20	2.19	12.37	
	Total	113 (100)	81 (100)	-	-	-	
Deep bite	No	92 (81.42)	69 (85.19)	-	-	-	0.480 (0.488)
	Yes	21 (18.58)	12 (14.81)	0.76	0.36	1.65	
	Total	113 (100)	81 (100)	-	-	-	
Anterior/posterior open bite	No	102 (90.27)	70 (86.42)	-	-	-	0.686 (0.408)
	Yes	11 (9.73)	11 (13.58)	1.46	0.60	3.55	
	Total	113 (100)	81 (100)	-	-	-	
Crowding	No	13 (11.50)	21 (25.93)	-	-	-	3.704 (0.073)
	Yes	100 (88.50)	60 (74.07)	0.17	0.37	0.80	
	Total	113 (100)	81 (100)	-	-	-	
Midline shift	No	97 (85.84)	68 (83.95)	-	-	-	0.132 (0.716)
	Yes	16 (14.16)	13 (16.05)	1.16	0.52	2.57	
	Total	113 (100)	81 (100)	-	-	-	
Unilateral/bilateral posterior cross bite	No	89 (78.76)	62 (76.54)	-	-	-	0.134 (0.714)
	Yes	24 (21.24)	19 (23.46)	1.14	0.57	2.25	
	Total	113 (100)	81 (100)	-	-	-	
Gummy smile	No	103 (91.15)	70 (86.42)	-	-	-	1.079 (0.299)
	Yes	10 (8.85)	11 (13.58)	1.62	0.65	4.02	
	Total	113 (100)	81 (100)	-	-	-	
Anterior cross bite	No	97 (85.84)	68 (83.95)	-	-	-	0.132 (0.716)
	Yes	16 (14.16)	13 (16.05)	1.16	0.52	2.57	
	Total	113 (100)	81 (100)	-	-	-	

OR: Odds ratio; CI: Confidence interval

The prevalence of Class I malocclusion was significantly higher in non-consanguineous marriages (P = 0.007), and Class III malocclusion was significantly more prevalent in consanguineous marriages (P = 0.004). No significant differences were observed in other deformities between the two groups (P > 0.050).

Of 124 male adolescents, whose parents had non-consanguineous marriages, 49.2% had dentoalveolar deformities and of 70 male adolescents, whose parents had consanguineous marriages, 51.4% had dentoalveolar deformities, with no significant differences between the two groups (P = 0.765).

The prevalence of Class I malocclusion was significantly higher in non-consanguineous marriages (P = 0.050), and Class III malocclusion was significantly more prevalent in consanguineous marriages (P = 0.005). No significant differences were observed in other deformities between the two groups (P > 0.050).

Of 82 female adolescents, whose parents had consanguineous; marriages, 54.9% had facial and dentoalveolar deformities, and of 70 male adolescents, whose parents had consanguineous; marriages, 51.4% had facial and dentoalveolar deformities, with no statistically significant differences between the two groups (P > 0.050) (Table 2).

Table 2. Frequency of dentoalveolar anomalies in 16-18 years adolescents with parental consanguineous marriages (gender-deformity)

Deformity		Gender		OR	95% CI		χ^2 (P)
		Male	Female				
		n (%)	n (%)		Lower	Upper	
Total deformity	No	34 (48.57)	37 (45.12)	-	-	-	0.181 (0.671)
	Yes	36 (51.43)	45 (54.88)	1.15	0.61	2.18	
	Total	70 (100)	82 (100)	-	-	-	
Class I malocclusion	No	15 (41.67)	19 (42.22)	-	-	-	0.173 (0.682)
	Yes	21 (58.33)	26 (57.78)	0.13	0.05	0.37	
	Total	36 (100)	45 (100)	-	-	-	
Class II malocclusion	No	32 (88.89)	38 (84.44)	-	-	-	0.621 (0.324)
	Yes	4 (11.11)	7 (15.56)	10.95	3.31	36.20	
	Total	36 (100)	45 (100)	-	-	-	
Class III malocclusion	No	25 (69.44)	33 (73.33)	-	-	-	0.148 (0.700)
	Yes	11 (30.56)	12 (26.67)	0.83	0.31	2.18	
	Total	36 (100)	45 (100)	-	-	-	
Deep bite	No	32 (88.89)	37 (82.22)	-	-	-	0.720 (0.396)
	Yes	4 (11.11)	8 (17.78)	1.73	0.48	6.28	
	Total	36 (100)	45 (100)	-	-	-	
Anterior/posterior open bite	No	28 (77.78)	42 (93.33)	-	-	-	4.175 (0.041)
	Yes	8 (22.22)	3 (6.67)	0.25	0.06	1.02	
	Total	36 (100)	45 (100)	-	-	-	
Crowding	No	10 (27.78)	11 (24.44)	-	-	-	0.115 (0.734)
	Yes	26 (72.22)	34 (75.56)	1.19	0.44	3.22	
	Total	36 (100)	45 (100)	-	-	-	
Midline shift	No	31 (86.11)	37 (82.22)	-	-	-	0.227 (0.634)
	Yes	5 (13.89)	8 (17.78)	1.34	0.40	4.52	
	Total	36 (100)	45 (100)	-	-	-	
Unilateral/bilateral posterior cross bite	No	26 (72.22)	36 (8.00)	-	-	-	0.671 (0.413)
	Yes	10 (27.78)	9 (20.00)	0.65	0.23	1.82	
	Total	36 (100)	45 (100)	-	-	-	
Gummy smile	No	33 (91.67)	37 (82.22)	-	-	-	1.585 (0.208)
	Yes	3 (8.33)	8 (17.78)	2.38	0.58	9.72	
	Total	36 (100)	45 (100)	-	-	-	
Anterior cross bite	No	31 (86.11)	37 (82.22)	-	-	-	0.227 (0.634)
	Yes	5 (13.89)	8 (17.78)	1.34	0.40	4.52	
	Total	36 (100)	45 (100)	-	-	-	

OR: Odds ratio; CI: Confidence interval

Table 3. Frequency of dentoalveolar anomalies in adolescents with first-cousin parental marriages and other marriage types

Deformity		Marriage					
		First cousin	Others	OR	95% CI		χ^2 (P)
		n (%)	n (%)		Lower	Upper	
Total deformity	No	40 (42.55)	31 (53.45)	-	-	-	1.711 (0.191)
	Yes	54 (57.45)	27 (46.55)	0.65	0.33	1.25	
	Total	94 (100)	58 (100)	-	-	-	
Class I malocclusion	No	25 (46.30)	9 (33.33)	-	-	-	1.259 (0.262)
	Yes	29 (53.70)	18 (66.67)	1.72	0.66	4.51	
	Total	54 (100)	27 (100)	-	-	-	
Class II malocclusion	No	47 (87.04)	23 (85.19)	-	-	-	0.052 (0.820)
	Yes	7 (12.96)	4 (14.81)	1.17	0.31	4.40	
	Total	54 (100)	27 (100)	-	-	-	
Class III malocclusion	No	36 (66.67)	22 (81.48)	-	-	-	2.038 (0.153)
	Yes	18 (33.33)	5 (18.52)	0.45	0.15	1.40	
	Total	54 (100)	27 (100)	-	-	-	
Deep bite	No	45 (83.33)	24 (88.89)	-	-	-	0.459 (0.498)
	Yes	9 (16.67)	3 (11.11)	0.63	0.15	2.53	
	Total	54 (100)	27 (100)	-	-	-	
Anterior/posterior open bite	No	46 (85.19)	24 (88.89)	-	-	-	0.217 (0.642)
	Yes	8 ()14.81	3 (11.11)	0.72	0.17	2.96	
	Total	54 (100)	27 (100)	-	-	-	
Crowding	No	14 (25.93)	7 (25.93)	-	-	-	0.000 (1.000)
	Yes	40 (74.07)	20 (74.07)	1.00	0.35	2.87	
	Total	54 (100)	27 (100)	-	-	-	
Midline shift	No	46 (85.19)	22 (81.48)	-	-	-	0.180 (0.671)
	Yes	8 (14.81)	5 (18.52)	1.31	0.38	4.46	
	Total	54 (100)	27 (100)	-	-	-	
Unilateral/bilateral posterior cross bite	No	37 (68.52)	25 (92.59)	-	-	-	6.716 (0.010)
	Yes	17 (31.48)	2 (7.41)	0.17	0.04	0.82	
	Total	54 (100)	27 (100)	-	-	-	
Gummy smile	No	45 (83.33)	25 (92.59)	-	-	-	1.438 (0.230)
	Yes	9 (16.67)	2 (7.41)	0.40	0.08	2.00	
	Total	54 (100)	27 (100)	-	-	-	
Anterior cross bite	No	46 (85.19)	22 (81.48)	-	-	-	0.180 (0.671)
	Yes	8 (14.81)	5 (18.52)	1.31	0.38	4.46	
	Total	54 (100)	27 (100)	-	-	-	

OR: Odds ratio; CI: Confidence interval

Frequency percentages of facial and dentoalveolar anomalies in male and female adolescents with parental consanguineous marriages are also presented in table 2.

Of 94 adolescents with first-cousin parental consanguineous marriages, 57.4% had dentoalveolar deformities and of 58 adolescents with other types of parental consanguineous marriages, 46.5% had dentoalveolar deformities, with no statistically significant differences between the two groups (P = 0.191) (Table 3). Table 3 also presents frequency percentages of facial and dentoalveolar deformities in adolescents with first-cousin parental consanguineous marriages.

Discussion

The results of the present study indicated significant differences in the prevalence of Class III malocclusion between the consanguineous and non-consanguineous marriage groups, with a significantly higher prevalence of Class III malocclusion in the consanguineous marriage group, consistent with the results of previous studies.

A study by Cruz et al. on 2562 from 55

families done for evaluation of familial transmission of MP showed that 89.1% of the families showed an autosomal dominant inheritance pattern and incidence of MP in members of affected families was 14.3% which suggests a familial contribution to the etiology of nonsyndromic MP which may be at least in parts genetics.[11]

In the other study, Wolff et al. evaluated 409 members of 13 European noble families and reported that consanguineous marriage is a predisposing factor in MP.[12] It should be pointed out that in the above-mentioned study, males and females have not been separately evaluated; however, in the present study, both sexes exhibited a significantly higher prevalence of Class III malocclusion. The results of the present study demonstrate a significantly higher prevalence of Class I malocclusion in the non-consanguineous marriage group.

A study by Mossey showed that in population with monogenic inheritance pattern malocclusion is almost non-existent; however, in heterogeneous population, the prevalence of dentoalveolar problems is much higher.[13] In the present study, no significant difference was observed in the prevalence of other dentoalveolar anomalies between the two consanguineous and non-consanguineous marriage groups.

Fallahinejhad and Rashidifard carried out a cross-sectional study on 488 students in an attempt to determine the prevalence of malocclusion and dental anomalies. They reported no relationship between the prevalence of malocclusion and consanguineous marriage,[14] which is consistent with the results of other studies in this respect. The research of Johannsdottir et al. also showed that the low heritability of the dental variables suggests strong environmental influences regarding tooth position.[9] In the present study, no significant differences were observed between male and female students. Which were confirmed by the results of a study by Johannsdottir et al.[9] on some families from Iceland, which are isolated and homogeneous from a genetic point of view?

In several studies done on MP concluded that MP familial distribution can be explained with the presence of a dominant major gene with an autosomal mendelian mode of transmission, under the influence of other genes and environmental factors, and finally stated that: results support the previous findings that there is a hereditary component to the expression of MP.[10,11,15] Jaber et al. concluded that for diseases where carrier screening and/or prenatal diagnosis are available, the students should be informed about probability of congenital malformations and be encouraged to participate in premarital and prenatal testing.[2]

Conclusion

In cases in which parents have skeletal malocclusion, especially Class III malocclusion, consanguineous marriage may play a major role as a predisposing factor in the incidence of such a problem in their children, necessitating the incorporation of the results of this study in pre-marital educational programs for young adults planning their marriages.

Conflict of Interests

Authors have no conflict of interest.

Acknowledgments

The present study was financially supported by Kerman University of Medical Sciences. The authors wish to extend their gratitude to the Vice Chancellor of Research of the University.

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