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Full Length Research Paper

Prevalence and severity of periodontal disease among Iraqi twin population

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The aims of this study were to determine the prevalence of periodontal disease for two clinical parameters: probing pocket depth (PPD) and attachment loss (AL) among twins, and to compare between mono zygote (MZ) and dizygote (DZ) twins, in addition to the evaluation of the degree to which MZ and DZ twins are concordant for four clinical parameters. The sample consisted of 75 pairs of twins reared together, with an age range of 16-45 years. They were selected from different cities of Iraq. The examination was carried out using a graduated Williams's periodontal probe, on a portable chair, using artificial light. The clinical examination included recording of PPD and AL. Results of the present study have shown significant difference in periodontal pocket depth between MZ and DZ group; which was higher in MZ were higher than in DZ twins. No significance difference was found between MZ and DZ twins in attachment loss. Results from this study have demonstrated that the degrees of concordance for MZ were higher than in DZ twins for PPD and AL and there were significant differences between MZ and DZ twins. These findings provide evidence that genetic factors play an important role in the etiology of periodontal disease.

Key words: Periodontal disease, probing pocket depth, attachment loss among mono zygote, dizygote.

INTRODUCTION

Periodontal disease and dental caries are the most prevalent oral diseases and are also the primary causes of loss of permanent teeth in man (Bayaty et al., 2010; Russel, 1967). Periodontal disease is characterized by loss of supporting tissues of the teeth. This loss often compromises of function and esthetics and may also be associated with pain and discomfort (Al- Bayaty et al., 2008; Philip 1990). Prevention of this needless loss of supporting tissue of the teeth can occur by a complete understanding of the etiologic factors involved (Gorlin et al., 1967). Bacterial plaque is generally accepted as the primary etiological agent in gingivitis (Loe et al., 1965) and periodontitis ((Jacob and Cate, 2006, Socransky, 1977). Many studies have demonstrated immunological responses to putative pathogenic strains within the oral flora **(**Nibali et al 2009; Ebesrole, 1990). However, it is established that the mere presence of bacterial plaque, even in large amounts, does not invariably induce periodontal attachment loss (Loe et al., 1986). Thus other host factors may well be required for periodontitis to occur in the individual who is exposed to the appropriate environmental challenge (Schulz et al., 2008). Studies of twins and epidemiological investigations on the natural history of periodontitis have suggested that the genetic factors, in addition to dental plaque, play a major role in determining the actual clinical presentation of periodontitis (Marja et al., 2010; Michalowicz et al., 1991a).

Twin investigations; have been used to ascertain genetic influences in the production of periodontal disease (Richard, 1963). To investigate the contribution of genetic factor in the etiology of periodontal disease, Linda et al. (1993) collected a questionnaire data from 4,908 twin pairs included in the population of Virginia Twin Registry. History of periodontal disease was

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reported from each member of monozygotic twin pairs. Concordance rates were 0.38 for monozygous (MZ) and dizygous (DZ) twins. These findings provide evidence that genetic factors make an important contribution to periodontal disease. Ciancio et al. (1969) examined 26 twin pair, (12 to 17) years old, MZ and DZ for gingival recession, crevice depth, gingivitis, subgingival plaque and calculus. No evidence was found to suggest that any of these parameters were influenced by genetic factors. Michalowicz et al. (1991a) examined 110 pairs of twin (16 to 70) years old consisted of 63 MZ, 33 DZ pairs of twin reared together, and 14 MZ twin pairs reared apart. There were no significant differences between the mean values for plaque index (PLI), gingival index (GI), probing pocket depth (PPD) and attachment loss (AL) for these MZ, DZ and monozygous twin reared apart (MZA). Michalowicz et al. (2000) estimated genetic environmental variances and heritability for gingivitis and adult periodontitis using data from 117 pairs of twins 64 MZT and 53 MZT adult twins, they measured PPD, AL, PLI, and GI. Results showed that MZ twins were more similar than DZ twins for all clinical measures and concluded that half of the variance in disease in the population is attributed to genetic variance.

According to our knowledge no such study had been done previously in Iraq. The present epidemiological study investigated the prevalence of periodontal disease and contribution of genetic factors in the etiology of periodontal disease, by evaluating clinical data from a sample of Iraqi twin population.

MATERIALS AND METHODS

The study received ethical approval from the Ethical Committee of Baghdad University. Subjects who agreed to participate in this study after reading and signing informed consent were examined. Prior to the intraoral examination, background information such as name, age, sex, were recorded. A total of seventy five pairs of twins (35 males and 40 females) were recruited from different cities of Iraq, Nainawa 14, Al-Ta'amim 5, Baghdad 13, Babylon 16, Karbala 10, Thiqar 4 and Basra 13 subjects. The sample was divided into two major groups: MZ and DZ groups. The mean age of twin sample population was 33.7 years with a range of 16 to 45 years. Twin pairs were chosen according to the following criteria:

1. Both members of each twin pair were of the same sex.
2. Both members of each twin pair were reared together.
3. Age of the twin pairs should not be less than16 years old.
4. All subjects were in good general health, and those with a history of systemic disease or drug intake were excluded from the study.

Pilot study

Finger print

A pilot study was carried out in which five subjects were chosen randomly. The purpose of this study was to make the operator familiar with finger printing procedure. Training was done on finger prints of persons under the supervision of an expert officer from the institute of crime evidence. Finger prints were repeated for the same subjects, and fingers prints formats were sent to the institute of crime evidence for evaluation.

Oral examination

A pilot study was carried out, in which eight subjects were chosen randomly. The purpose of the pilot study was to carry out an intra-examiner calibration. The correlation coefficient (r) for gingival index, probing pocket depth and attachment loss was (0.78, 0.96, 0.91) respectively.

Methods for diagnosis of zygosity in twins

The zygosity of twins was determined by the following steps:

1. List criteria for twin classification: Striking similarity in general appearance and essential identity in hair color, form and texture, eye form, skin color, shape of nose, lips, chin, ears and type of teeth (Lykken, 1978).
2. Blood typing: Blood group testing was done for each subject. The two members of each twin pair were compared for identity in ABO blood groups and the rhesus system (Lykken, 1978).
3. Finger print ridge counts: Achievement of approval from the institute of crime evidence was obtained. For each individual of each pair of twin, fingers prints were register in a finger prints format (Smith, 1977). Finger print ridge counts were assessed under the supervision in the institute of crime evidence.
4. Oral examination: Information regarding name, age, sex, address were registered for each patient prior to oral examination. Clinical examination included the recording of periodontal pocket depth (PPD) and attachment loss (AL) on the mesiobuccal surface of the six Ramfjord teeth (1959) for each individual.

Statistical analysis

Statistical analysis of difference for the recorded parameters between MZ and DZ twin groups and between males and females was carried out using the t-test. In addition to that Z test was used for comparing the percentage of concordance and discordance between MZ and DZ twins. The discordance between the members of each twin pair was considered if the difference was > 0.3 for all clinical measurements.

RESULTS

Seventy five pairs of twins were included in the analyses. Zygosity determination was depended on finger print ridge counts and the correlation between two members of each twin pair, blood typing and similarity in appearance. Thirty eight twin pairs were classified as MZ and 37 pairs as DZ. The distributions of MZ and DZ twin groups according to age and gender is shown in Table 1. Table 2 illustrates the mean values and SD for PPD of MZ and DZ groups distributed according to gender. The mean values for PPD were higher in males than in females, statistical analysis revealed non-significant differences.

Table 3 shows the mean values and SD for PPD of both MZ and DZ groups in each of the three age groups. From this table we observed that, for the younger age groups (16 to 25), the mean value for PPD was higher in

Table 1. Distribution of MZ and DZ twins by age and sex.

Age group	MZ		DZ	
	Male	Female	Male	Female
16-25	7	8	6	8
26-35	6	6	6	7
36-45	5	6	5	5
Total sample	18	20	17	20

Table 2. Distribution of mean score and standard deviation of the PPD with difference in significance between male and female among MZ, DZ and twin groups.

Parameter	MZ		DZ		Twin	
	Mean	SD	Mean	SD	Mean	SD
PPD						
M	2.002	(±0.6)	1.9	(±0.6)	1.9	(±0.6)
F	1.99	(±0.8)	1.7	(±0.6)	1.8	(±0.7)
Significance	N.S.		N.S.		N.S.	

Table 3. Distribution of mean score and standard deviation of the PPD with difference in significance between among MZ and DZ according to 3 age subgroups.

Parameter	MZ		DZ		Significance
	Mean	SD	Mean	SD	
PPD					
16-25	1.6	(±0.3)	1.5	(±0.4)	N.S.
26-35	1.8	(±0.5)	1.8	(±0.5)	N.S.
36-45	2.7	(±0.8)	2.1	(±0.7)	S.
Total	1.99	(±0.7)	1.8	(±0.6)	S.

Table 4. Distribution of mean score and standard deviation of the AL with difference in significance between male and female among MZ, DZ and twin group.

Parameter	MZ		DZ		Twin	
	Mean	SD	Mean	SD	Mean	SD
AL						
M	1.8	(±1.5)	1.9	(±1.2)	1.8	(±1.4)
F	1.9	(±1.4)	1.3	(±0.99)	1.6	(±1.2)
Significance	N.S.		N.S.		N.S.	

MZ group than in DZ group. There was no significant difference between them. In addition to that, the mean values of PPD for the age group (26 to 35) were equal in both MZ and DZ groups. On the other hand, the mean values of PPD for older age groups (36 to 45) were higher in MZ than in DZ groups, statistical analysis showed significant difference between them ($P < 0.05$).

Table 4 illustrates the mean values and SD for AL of twin group, distributed according to gender. The mean value of AL for MZ group was higher in females than in male. A comparison between males and females showed non significant difference. On the other hand, in DZ group; the mean value of AL was higher in males than in females statistical analysis showed significant difference ($P < 0.05$).

Table 5 shows the mean values and SD for AL of both MZ and DZ in each age group. Non significant difference was found between MZ and DZ groups. A comparison between the three age groups for MZ and DZ showed that the mean values of AL were higher in MZ than in DZ groups.

A comparison between MZ and DZ groups showed that

Table 5. Distribution of mean score and standard deviation of the AL with difference in significance between among MZ and DZ according to 3 age subgroups.

Parameter	MZ		DZ		Significance
	Mean	SD	Mean	SD	
AL					
16-25	0.7	(±0.4)	0.7	(±0.5)	N.S.
26-35	1.5	(±0.7)	1.5	(±0.8)	N.S.
36-45	3.7	(±0.9)	2.8	(±1.03)	H.S.
Total	1.8	(±1.4)	1.6	(±1.1)	N.S.

Table 6. Demonstrates the concordance and discordance rates for both MZ and DZ groups, distributed according to periodontal parameters, PPD and AL.

Parameter	MZ (NO.=38)		DZ (NO.=37)		Significance
	%	(NO.)	%	(NO.)	
PPD					
Concordance	60.5	23	37.8	14	S
Disconcordance	39.5	15	62.2	23	S
AL					
Concordance	63.2	24	35.1	13	S
Disconcordance	36.8	14	64.9	24	S

the concordance rates for PPD and AL were higher in MZ than in DZ groups, and that there were significant differences between them. On the other hand, the discordance rates for PPD and AL were higher in DZ than in MZ groups, with significant differences Table 6.

DISCUSSION

Most human morbidity, including dental, is caused by commonly occurring chronic diseases of complex etiology in which host susceptibility, environmental exposure, behaviors, and life styles all influence risk in important ways. The goal of genetic epidemiology is to study the way environmental risk factors interact with the genetic makeup of a given population (Marja et al., 2010).

Twin studies play a vital role in the development of human genetics. Such studies are not easy in our country, because there is no specific center to facilitate conducting such studies. The present study includes a sample of seventy five pairs of MZ and DZ twins reared together. Twins reared apart were not included in this study because they were not or very rarely available in Iraqi population, due to strong social relationships between members of the families in the society. Paramount to twin studies is the accurate assessment of zygosity. In this study, the zygosity of twins reared together was determined by similarities in appearance, blood tests and finger print ridge counts.

Results from twin studies can be extrapolated to non twin populations if the twin sample is representative of the general population. To determine this; we compared the level of disease in our twins with the results from different studies.

In the current study, the significant observation for elevated mean value of PPD in MZ than DZ twins has been encountered, which is considered a surprising one. This finding disagreed with the findings of many authors (Michalowicz et al., 1991; 2000; Michalowicz et al., 1999) who reported that there was no significant difference between MZ and DZ twins. Results of this study have illustrated that the prevalence and mean values of PPD increased with increasing age in both MZ and DZ twins. These results are consistent with results obtained from many non twin studies (Okamoto et al., 1988; Jackson et al., 1990; Gregory et al., 1992).

Comparisons between the mean values of PPD for MZ and DZ twins in each age groups, demonstrated non significant differences between (16 to 25) and (26 to 35) age groups. On the other hand, the mean value of PPD for MZ (36 to 45) age group was higher than DZ (36 to 45) age groups, statistical analysis revealed significant difference. Moreover; gender is considered one of the factors that affect the PPD. It is in accordance with other studies that report a higher mean value of PPD in males than in females (Albandar and Kingman, 1999).

It is clearly demonstrated from the current study that the level of loss attachment is very high among both MZ and DZ twins. There was no significant difference between them.

These findings coincide with many studies reported by (Michalowicz et al., 1991; 1999; 2000). Results of this

study have demonstrated that the prevalence and mean value of AL increased with increasing age in both MZ and DZ twins. These observations are consistent with the findings from non twin studies (Lindhe et al., 1989; Jackson et al., 1990; Holmgren et al., 1994; Sara et al., 1994; Albandar and Kingman, 1999). Comparison between the mean values of AL for MZ and DZ twins in each age group demonstrated that there were no significant differences between (16 to 25) and (26 to 35) age groups. However, the mean value of AL was higher in MZ than in DZ twins in (36 to 45) age group, with a highly significant difference between them.

In DZ twins, the mean value of AL in males was higher than in females, these results were consistent with many non twin studies which were performed by (Louise et al., 1994; Albandar and Kingman, 1999).

The degree of rate of concordance in MZ twins appeared greater than in DZ twins for PPD and AL, and there were significant differences between them. MZ and DZ twins in the samples of present study were reared together, so the environmental effect was similar between the two members of each twin pair. Although environmental factors are generally considered as the primary etiological factor in periodontal disease, it is also recognized that individuals exposed to similar environments develop disease at substantially different rates (Loe et al., 1986).

Data from the current study suggest that genetic factors appear to influence periodontal disease. These observations are consistent with the findings presented by (Michalowicz et al., 1991; 2000; Linda et al., 1993; Michalowicz, 1994). In addition, these results were consistent with Ciancio et al. (1969), who found no evidence to support a genetic influence on clinical measures in teenagers. This pilot study, however, involved a small number of twins (7 MZ and 19 DZ) pairs at an age of (12 to 17) years generally not considered at risk for periodontitis.

Chung et al. (1977) refuted their earlier findings in (1970) by failing to detect an effect of racial inbreeding on periodontal disease in a large family of racial groups. This study also did not detect a significant component of heritability in the population. One difficulty in interpreting family studies of periodontitis is that disease can develop at various times, most often with advancing age. Almost invariably, the offspring has less disease than their parents.

Conclusions

Results from the present study conclude that the prevalence and mean value of PPD and AL were higher in MZ than DZ twins. Degrees of concordance for PPD and AL were higher in MZ than DZ twins. These findings provide evidence that genetic factors make an important contribution to periodontal disease.

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