The effect of residential factor on periodontal status among the primary school children in Ninevah Governorate/Iraq.

Tarik Y. Khamrco B.D.S., DDPH (RCS), M.Sc.*
Ala' Al-Deen A. Al-Mitres B.D.S., M.Sc.**

Abstract:

The purpose of the study was to determine the effect of residential factor on periodontal status (oral hygiene, gingival health and calculus assessment) among the primary school children in Ninevah.

An oral health survey was conducted among 2640 primary school children aged 6 and 12 years old from 66 randomly selected schools in different geographical locations (urban, peri-urban and rural areas) of Ninevah Governorate.

Examination of periodontal status was performed using WHO periodontal probe. The indices used to assess the periodontal status are (plaque index, gingival index and calculus index).

The results showed that (63.1%) of 6 year old and (29.5%) of 12 years old have a healthy gingiva. The prevalence of gingivitis was higher in rural than peri-urban and urban, with significant differences while no significant between boys and girls.

The result indicated that the urban children have a lower significant mean gingival index score than peri-urban and rural areas.

According to the geographical locations, the children in urban and peri-urban areas have less mean plaque index than rural areas with significant differences between children of urban and rural areas of 6 years old children only. According to the sex difference, there were no statistically significant differences between the boys and girls.

The study demonstrated that the mean of calculus index was almost similar in different areas for both 6 and 12 years old children, while according to the sex, the girls reported significantly lower mean that boys.

Keywords:

Periodontal status, plaque index, gingival index, calculus index, gingival health, oral hygiene, school children.

Introduction:

Periodontal disease is a generalized term for a range of the pathological conditions affecting the supporting and investing structure of the teeth [1]. The onset of periodontal disease as well as it is progression, vary among different population groups, however, the sequence of disease is essentially the same every where, so the gingival inflammatory changes usually proceed followed by the destruction phase of the disease [2]. The major etiological factor associated with the disease are un-calcified and calcified bacterial plaque [3,4].

The prevalence and severity of periodontal disease show significant

*Professor in the Community Dentistry, Dean College of Dentistry, Al-Mustansiria University.
**Dental Specialist in Preventive Dentistry in a Specialized Dental Center, Ninevah.

variation from one geographical region to another, many studies have shown that people living in urban centers have less periodontal problems than people living in rural areas [5-9].

The difference between urban and rural population could be attributed to the interaction of several factors among which are living conditions, education, occupation, economic levels, different in oral hygiene and dental care, near and far from dental health center, traveling facilities and variation in the dental manpower distribution according to their attention [8,10].

The purpose of this study was to conduct an epidemiological study among primary school children aged 6 and 12 years in Ninevah Governorate to study the effect of residential factor on periodontal status (oral hygiene, gingival health, calculus assessment).

Materials and methods:-

The target population of the study was the primary school children in Ninevah Governorate for the academic year 2001-2002. The whole administration units in the Governorate were involved in the study there were seven Qadha' in addition to Mosul Qadha. The Mosul Qadha and because of its specificity which is related to several regards (area, population size, dental manpower, general and health services), so it decides to take it alone. The school children living in Mosul Qadha were divided into the following area according to the residential factors...

1) Urban school children: were considered as children living in the center city of Mosul Qadha, the city was divided into two zones, one on the right bank and the other on the left bank of Tigris River. Four primary schools were chose randomly from each zone, two for boys and two for girls. So we have eight primary schools in Mosul city center.

2) Peri-urban school children. Were considered as children living in the Nahia center. Four Nahia were randomly selected according to geographical location of Mosul city. Two primary schools were randomly selected from each Nahia center, one for boys and one for girls. So we have eight primary schools represent the peri-urban area in Mosul Qadha.

3) Rural school children: were considered as children living in the villages far away from the Qadha or Nahia center. One village was randomly chosen from each Nahia, so we have four villages. Two primary schools were randomly selected from each village, one for boys and one for girls. Also we have eight primary schools in the rural area.

While the other Qadha we dealt with them as follows:

Each administration unit is subdivided also in three areas:

1- Urban school children (Qadha center).

2- Peri-urban school children (Nahia center).

3- Rural school children (village area).

Two primary schools were randomly selected from each subunit or site, one for boys and one for girls, so we have six primary schools for each Qadha.

The children that were involved in the study were 6 and 12 years old according to the last birthday. It was decided to examine the first 20 children from the list of the class that met the age qualification for each age

group in each school (i.e. 40 children from each primary school). So the total number of samples that were examined was 2640 children (66 X 40), and it was equally divided into two age groups and gender.

The children examined in their classroom, seated on a chair and the examiner seated on another chair in front of the children. The two chairs were close to the window of the classroom to allow the natural day light to help us in our examination as light source for the examination.

Demographic information was obtained from each child before any dental examination was done regarding name, age, sex and personal oral hygiene.

Examination of periodontal status was performed using WHO periodontal probe. The indices used to assess the periodontal status are:

1- Oral hygiene: the oral cleanliness was assessed using Plaque Index (Pl.I) by Silness and Loe [11].

2- Gingival health: gingival condition was assessed using Gingival Index (G.I) by Loe and Silness [12].

3- Calculus assessment: Calculus in this study was assessed using simplified Oral Hygiene Index-Calculus Index (Cal. I) according to the criteria described by Green and Vermillion [13].

The index teeth selected for the assessment of this index were six teeth representing the six segments of the jaw [14], four surfaces in each index tooth were examined (buccal, lingual, mesial and distal).

The statistical analysis of the data includes the calculation of mean, standard error, percentage, one way analysis of variance (ANOVA) followed by Duncan's multiple range test was used to determine the significant differences among the different residential areas and F-test was used to determine the significant differences between girls and boys.

Results:

Table (1) illustrates the number and percentage of children examined by age, sex and area of residence.

Table (1): Distribution of 6 and 12 years old school children by sex and area of residence in Nineveh Governorate.

Area of residence	Boys		Girls		Total	
	No.	%	No.	%	No.	%
Urban	440	50	440	50	880	100
Periurban	440	50	440	50	880	100
Rural	440	50	440	50	880	100
Total	1320	50	1320	50	2640	100

Table (2) shows that the total 6 years old children examined, (63.1%) appeared to have a healthy gingiva, the percentage in urban children was (72.7%), in peri-urban was (62.5%) and in rural was (58.6%). Urban children appeared to have high percentage of healthy gingiva than that recorded for peri-urban and rural children and this difference was found to be statistically significant with rural children only. Of the total children

examined girls reported to have higher percentage of healthy gingiva (66.4%) than boys (59.8%) with no statistically significant difference between them.

Table (2): Number and percentage of healthy gingiva for (6 and 12) years old school children by sex and area of residence.

Area of residence	Sex	No.	Children with Healthy Gingiva			
			6-years old children		12-years old children	
			No.	%	No.	%
Urban	Boys	220	152	69.1	107	48.6
	Girls	220	168	76.4	8	39.1
	Total	440	320 A	72.7	193 A	43.9
Peri-urban	Boys	220	131	59.5	68	30.9
	Girls	220	124	56.4	51	23.2
	Total	440	275 B	62.5	119 B	27.0
Rural	Boys	220	112	50.9	41	18.6
	Girls	220	146	66.4	36	16.4
	Total	440	258 B	58.6	77 C	17.5
Total	Boys	660	395 *	59.8	216 *	32.7
	Girls	660	438	66.4	173	26.2
	Total	1320	833	63.1	389	29.5

-Capital letters compare between the different areas of residence.
* There was no significant difference between the (total boys) and (total girls).

For 12- years old, the percentage of children who have a healthy gingiva was (29.5%), and also the urban children reported the high percentage of healthy gingiva (43.9%) and it was significantly differ from peri-urban (27%) and rural children (17.5%). The boys reported high percentage of healthy gingiva (32.7%) than girls (26.2%) with no statistically significant difference between them.

Table (3) shows the periodontal status among 6-years old children. The mean Pl.I value for total group of 6-years was (0.83), the boys reported a higher mean (0.87) than girls (0.79), however there was no statistically significant difference between them. When compared between locations, the urban children have a lower significant mean Pl.I than peri-urban and rural children, while no statistical significant difference was found between peri-urban and rural areas.

Table (3): Periodontal status (Pl.I, G.I, Cal. I) for 6-years old school children by sex and area of residence.

Area of residence	Sex	No.	Pl.I		G.I		Cal.I	
			Mean	±S.E	Mean	±S.E	Mean	±S.E
Urban	Boys	220	0.74A	0.16	0.56A	0.08	0.04A	0.03
	Girls	220	0.60a	0.21	0.50a	0.04	0.02a	0.01
	T	440	0.67(a)	0.13	0.53(a)	0.04	0.03(a)	0.02
Peri-urban	Boys	220	0.96B	0.23	0.77B	0.08	0.04AB	0.02
	Girls	220	0.86b	0.23	0.66a	0.06	0.04a	0.02
	T	440	0.91(b)	0.16	0.71(b)	0.04	0.04(a)	0.01
Rural	Boys	220	0.93B	0.19	0.93B	0.14	0.08*B	0.04
	Girls	220	0.92b	0.28	0.79a	0.10	0.0a	0
	T	440	0.92(b)	0.17	0.87(b)	0.08	0.04(a)	0.01
Total	Boys	660	0.87	0.13	0.75	0.05	0.05*	0.01
	Girls	660	0.79	0.11	0.65	0.05	0.02	0.01
	T	1320	0.83	0.09	0.70	0.03	0.03	0.04

- Means with the same letters are statistically not significant (P>0.05).
- Capital letters compare between boys in different areas of residence.
- Small letters compare between girls in different areas of residence.
- Small letters between brackets compare between the total (boys and girls) in different areas of residence.
* There was a significant difference between the boys and girls.

The mean G.I value for the total group of 6-years old children was (0.70), the mean G.I for boys was higher (0.75) than girls (0.65) with no statistically significant difference between them. According to their locations, the urban children have significantly lower mean G.I than peri-urban and rural children. While no statistical significant differences were found between peri-urban and rural areas.

The mean Cal. I value for 6-years old children was very low (0.03). The mean Cal. I for boys was higher significantly (0.05) than girls (0.02). According to the geographical location no statistical significant differences were found between the urban, peri-urban and rural areas.

Table (4) demonstrates the periodontal status among 12-years old. The mean Pl.I value for the total group of 12-years old children was (0.86), the boys reported slightly lower mean (0.84) than girls (0.87). According to the locations the urban and peri-urban reported lower mean Pl.I than rural children with no statistical significant differences between them.

Table (4): Periodontal status (Pl.I, G.I, Cal. I) for 12-years old school children by sex and area of residence.

Area of residence	Sex	No.	Pl.I		G.I		Cal.I	
			Mean	±S.E	Mean	±S.E	Mean	±S.E
Urban	Boys	220	0.77A	0.19	0.69*A	0.05	0.14A	0.04
	Girls	220	0.95a	0.17	0.93a	0.08	0.07a	0.04
	T	440	0.86(a)	0.13	0.81(a)	0.05	0.11(a)	0.03
Peri-urban	Boys	220	0.79A	0.19	1.04B	0.06	0.16A	0.06
	Girls	220	0.77a	0.15	1.17ab	0.1	0.09a	0.04
	T	440	0.78(a)	0.12	1.11(b)	0.06	0.13(a)	0.04
Rural	Boys	220	0.97A	0.16	1.20B	0.21	0.23*A	0.07
	Girls	220	0.91a	0.20	1.36b	0.19	0.05a	0.02
	T	440	0.94(a)	0.12	1.28(b)	0.14	0.14(a)	0.04
Total	Boys	660	0.84	0.12	0.98	0.06	0.18*	0.04
	Girls	660	0.87	0.11	1.15	0.07	0.07	0.02
	T	1320	0.86	0.08	1.07	0.05	0.13	0.03

- Means with the same letters are statistically not significant (P>0.05).
- Capital letters compare between boys in different areas of residence.
- Small letters compare between girls in different areas of residence.
- Small letters between brackets compare between the total (boys and girls) in different areas of residence.
* There was a significant difference between the boys and girls.

The mean G.I value for total group of 12-years old children was (1.07), the boys recorded less mean (0.98) than girls (1.15) with no statistically significant difference between them. When compared between locations, the children in urban area reported a lower significant mean G.I than other areas, while no statistical significant differences were found between peri-urban and rural areas.

The mean Cal. I value for total group of 12-years old children was (0.13), the boys reported a higher significant mean (0.18) than girls (0.07). According to the geographical location, there was no statistical significant difference observed between the three areas.

Table (5) shows the frequencies of tooth brushing for 6 and 12-years old children by area of residence. The study has demonstrated that high percent of children aged 6-years old (60.53%) did not brush their teeth and (16.59%) claimed to brush their teeth regularly. For 12-years old children, only (28.56%) of them did not brush their teeth and (36.67%) brush their teeth regularly. According to the geographical location, the children in urban area brush their teeth more frequently than peri-urban and rural areas.

Table (5): Tooth brushing frequencies for (6 and 12) years old children by area of residence.

Area of residence	Frequency of tooth-brushing per day	6-years old children		12-years old children	
		No.	%	No.	%
Urban	0	237	53.86	84	19.11
	Infrequent	114	25.90	156	35.45
	1 time	60	13.64	110	25.00
	2-3 times	29	6.60	90	20.44
	Total	440	100	440	100
Peri-urban	0	242	55.02	124	28.18
	Infrequent	126	28.63	158	35.92
	1 time	48	10.90	94	21.36
	2-3 times	24	5.45	64	14.54
	Total	440	100	440	100
Rural	0	320	72.73	169	38.41
	Infrequent	62	14.09	143	32.5
	1 time	46	10.45	88	20
	2-3 times	12	2.73	40	9.09
	Total	440	100	440	100
Total	0	799	60.53	377	28.56
	Infrequent	302	22.88	459	34.77
	1 time	154	11.67	290	21.97
	2-3 times	65	4.92	194	14.70
	Total	1320	100	1320	100

Discussion:-

The present study was conducted among (6 and 12) years old primary school children in three different locations (urban, peri-urban and rural areas) in each administration unit in Nineveh Governorate, to evaluate the effect of geographical location on periodontal status. The study is considered as Governorate survey and it is quite representative for this age group, as (2640) primary school children have been selected from the total of 116471 primary school children aged 6 and 12 years old, according to a report from General Directorate of Education in Nineveh Governorate.

The importance of selecting these ages, for six year old children, it is the year of entering the school, having primary dentition and it is the time of erupting permanent teeth to record the changes that may happen during schooling years. For 12 year old, it is the end of primary school during which we can evaluate if any treatment and preventive program provided to them through school health services, also there are more data on this age group in WHO Global Data Band, so it is regarded as the global monitoring of disease trends.

The results of this study indicated that (36.9%) of 6-year old children had gingivitis and it increase

to be (70.5%) at age 12-years. This finding is in accordance with findings of other studies [8,15-17], while is less than many studies carried out in Iraq for children range from 6-13 years, the results decrease these studies reported the prevalence of gingivitis from 96-100% [10, 18-20].

According to the geographical location, the prevalence of gingivitis was higher in rural than peri-urban and urban children with statistically significant differences with urban children only for 6-years old children, and statistically significant for both areas for 12-year old children. These finding is in agreement with other studies [21-23]. These differences were noted between urban and rural children could be explained in terms of the better education and social conditions in urban areas. According to the sex differences there were no statistically significant differences between the boys and girls in prevalence of gingivitis. This is in accordance with other Iraqi studies [8, 10, 17, 24]. This is due to fact that there were no statistically significant differences in practice of oral hygiene between sexes. While other studies in developing countries recorded better gingival health in girls than boys because girls tend to practice better oral hygiene [5, 25, 26].

The urban children appeared to have a lower significant mean G.I score than peri-urban and rural areas. This finding is in agreement with the findings of other studies [8, 10, 23, 27]. The lower prevalence of gingivitis and lower mean of G.I for urban children may be attributed to high frequency of tooth brushing than the other two areas and better use of oral hygiene measures than peri-urban and rural areas.

Many epidemiological studies have shown that people living in urban centers have less periodontal problem than people living in rural areas. These differences could be attributed to differences in oral hygiene and dental care in the developed countries [28], while in developing countries the difference could be attributed to dietary habits [29,30]. These findings can not be clearly explained since dietary habits and other factors that may affect periodontal disease were not investigated in this study.

From the finding of the study, it is noticed that the prevalence of gingivitis increase from (36.9%) to (70.5%) and increase the mean G.I from (0.70) to (1.07) from 6-year to 12-years old. This confirms the finding of Parfitt [31], he found that 50-60% of 4-5 years old children have gingivitis and then increase the prevalence and severity of gingivitis to the peak at the age 11 and 13 years respectively and this findings is in agreement with the findings of other studies [32,33]. In spite of the increase the frequency of tooth brushing at the age group of 12-years old. This suggests that children's ability to control plaque effectively is impaired and there is need to improve the effectiveness of tooth brushing. It has been shown that gingival inflammation can be prevented with adequate oral hygiene. The children can be educated in effective and regular oral hygiene one could expect an improvement in their oral health.

The mean plaque score for the total sample of 6 and 12-years old children was (0.83 and 0.86) respectively. This mean is comparable with other studies carried out in Iraq [24,34]. According to the geographical locations, the children in urban and peri-urban areas have less mean Pl.I than rural areas with statistically

significant difference between children of urban and rural areas of 6- years old children only. This finding is in accordance with other studies [8,10, 23]. According to the sex difference, there were no significant differences between the boys and girls in oral hygiene condition. This is in accordance with other findings [9, 23, 35].

The mean calculus for total sample for 6-years old children was very low (0.03), and for 12-years old was (0.13). This mean was comparable with the findings of other Iraqi studies [8,10].

The rate of calculus formation between individuals is very variable and children form less calculus than adults. Only few studies were available concerning the presence or absence of calculus among children, however all these studies indicated a low percentage of children having calculus [36,38]. Hugoson et al [39], clarified that the amount of calculus deposition increased with age and this was attributed to physiological changes in the chemical composition of the saliva.

According to the geographical location, their mean was almost similar in different areas for both 6 and 12-years old children. This confirm the findings of other studies [8,10]. According to the sex differences, the girls reported lower mean calculus index than boys, with statistically significant differences between them. This finding is in accordance with findings with other studies [8, 10, 21,22].

The study shows that high percent of 6-years old children did not brush their teeth and this percent was reduced for children 12-years old. The reasons possible are due to high percent of parents did not brush their teeth [40-41], and do not teach their children tooth brushing habit, while many studies reported that school children learn the habit of tooth brushing from their school teachers, because young children copy the tooth brushing habit from their parents and teachers [42,43]. So the increase in percentage of children who brush their teeth at age of 12-years old is due to their teachers' role in advising and teaching them in the school. In spite of the increase of this percent, it is still less than that of children in developed countries, more than (80%) brush their teeth daily [44-46].

According to the geographical locations, the urban children are more frequently brushing their teeth than peri-urban and rural areas. This is in accordance with other studies [8, 47]. Most studies have also revealed that tooth brushing frequency increases with education, occupation and income level [44, 48,49].

The prevention and control of periodontal disease must be done through the control of dental plaque. This may be achieved either by the people who carry out oral hygiene procedure or by dental personnel carried professional cleaning. The oral hygiene behavior is so important in the prevention and control of chronic periodontal disease. If the children can practice oral cleaning regularly and effectively they can control periodontal disease [50]. Therefore an efficient dental health care instruction program should be constructed to achieve an acceptable standard of oral hygiene. So dental health education program for those school children is an essential activity for promoting, establishing and maintaining optimal oral health and preventing oral disease.

The most efficient way to prevent dental diseases is to control them in childhood. It is especially important to take advantage of the school setting program (School Health

Services), in this program it is possible to reach large number of school children at an age can establish a good dental behavior.

References:

1- Schenkein H: The pathogensis of periodontal disease. Journal of Periodontal 1999; 70:457-470.
2- Page RC: Gingivitis. J Clin Periodontal 1986; 13:345-555.
3- McDonald RE, Avary DR, Weddell JA: Gingivitis and periodontal disease. In: McDonald RE, David RA: Dentistry for child and adolescent. 6th ed., St Louis, Philadelphia 1994.
4- Carranza FA, Newman MG: Clinical periodontology, 8th edition, Saunders Company, Philadelphia WB 1996.
5- Sheiham A: The prevalence and severity of periodontal disease in Surrey school children. Dental Practitioner and Dental Record 1969; 19(7):232-238.
6- Al-Alousi WS, Jameson H, Legler D: Periodontal health of senior students in Iraq proceeding of the IADR and AADR, 59th General Session Chicago, Illinois 1981.
7- Mahmood MS: Oral health status and treatment needs among Iraqi school children aged 6-12 years, Baghdad, Iraq. M.Sc thesis, College of Dentistry, University of Baghdad, 1995.
8- Al-Azawi LA: Oral health status and treatment needs among Iraqi 5 years old and 15 years old students, Baghdad, Iraq. Doctor Degree thesis, College of Dentistry, University of Baghdad, 2000.
9- Makani LA: Oral hygiene and gingival health among adolescents and adults population (15-44) years old in Shakhan village, Ninevah, Iraq. Al-Rafidain Dent J 2001; 1:1-7.
10- Ali DN: Oral health status and treatment needs among 12-years old school children in urban and rural areas of Baghdad-Iraq. M.Sc. thesis, College of Dentistry, University of Baghdad, 2001.
11- Silness J, Loe H: Periodontal disease in pregnancy. Correlation between oral hygiene and periodontal condition. Acta Odontol Scand 1964; 22:121-135.
12- Loe H, Silness J: Periodontal disease in pregnancy. Acta Odontol Scand 1963; 21:535-551.
13- Green JC, Vermillion JR: The oral hygiene index: A method for classifying oral hygiene status. J Am Dent Assoc 1964; 61:172-179.
14- Ramfjord SP: Indices for prevalence and incidence of periodontal disease. J Periodontal 1959; 30:51-57.
15- Olsson B: Periodontal disease and oral hygiene in Arussi province, Ethiopia. Comm Dent Oral Epidemiol 1978; 6:139-143.
16- Gibson A, Gelbier S, Baatia J: Dental health and treatment needs of 5-years old children in health area of Lambeth Southwark and Lewisham, England. Comm Dent Oral Epidemiol 1981; 9:5-9.
17- Khamrco TY, Makani LA: Dental health status in Al-Sada and Bahwiza villages in Ninevah city-Iraq. Iraqi Dent J 1997; 20:2-23.
18- Al-Sayyab MA: Periodontal needs among Iraqi children living in two Iraqi villages, Sheha and Albuetha. J College of Dentistry 1995; 2:219-224.
19- Sadki MM, Al-Azawi LA: Gingival health status among children and teenagers in Badran village, Baghdad, Iraq. Iraqi Dent J 1997; 20:139-144.
20- Al-Dehan Z, Muhi Al-Deen L: Gingival health status among children and teenagers in Fingan village, Baghdad. Iraqi Dent J 1998; 32:97-107.
21- Abed-Rabbo H: Dental treatment needs and demand for dental care among preparatory school children in Charkia province. Ph.D thesis, Alexandria University, The Arab Republic of Egypt 1980.
22- Al-Sayabb MA: Oral health status among 15 years old school children in the central region of Iraq. M.Sc. thesis, College of Dentistry, University of Baghdad, 1989.
23- Khamrco TY: A comparative study of oral health status among urban and rural school students in Ninevah Governorate-Iraq. Al-Rafidain Dent J 2001; 1:7-15.
24- Khamrco TY, Al-Salman KA: Dental health status among 4th-8th school children in the center of Mosul. Iraqi Dent J 1998; 23:77-88.
25- Todd JE: Children dental health in England and Wales. Office of population census and surveys, HMSO, London, 1975.
26- Hansen BF, Gjermo P, Bergwit Z-Larsen KP: Periodontal bone loss in 15-years old Norwegians. J Clin Periodontol 1984; 11:125-131.
27- Yonemitsu M, Kawaguchi Y, Sasaki Y, Hirayame Y, Handa K: Study on the oral health status of school children in Korea. Kokubyo Gakkai Zasshi 1993; 60(2):288-295.
28- Russell AL, Ayers P: Periodontal disease and socioeconomic status in Brimingham,

Alabama. Am J Public Health 1960; 50:206-214.
29- Russel AL: Periodontal disease in well and malnourished populations. Arch Environ Health 1962; 5:132-136.
30- Waerhaugh J: Epidemiology of periodontal disease a review of literature. In "The dentist his practice, and his community". ed young w, Striffler D, 2nd ed, WB Saunders Company, 1966.
31- Parfitt GR: A five-year longitudinal study of the gingival condition of a group of children in England. J Periodontol 1957; 28:26-32.
32- Massler M: Periodontal disease in children. Int Dent J 1958; 8:323-326.
33- Stamm JW: Epidemiology of gingivitis. J Clin Periodontol 1989; 13:360-366.
34- Khamrco TY: Assessment of periodontal disease by using CPITN index in a population of rural area, Ninevah, Iraq. Eastern Med Health J 1999; 5(3):549-555.
35- Ali NA: A comparative study evaluating the effect of dental health education programs on the oral health status of 12 years old students in Baghdad. M.Sc Thesis, College of Dentistry, University of Baghdad, 1999.
36- Kuftinec MM: Oral health in Guatemala rural population. J Dent Res 1971; 50:559-563.
37- Holm AK: A longitudinal study of dental health in Swedish children aged 3-5 years. Comm Dent Oral Epidemiol 1975; 3:228-236.
38- Spencer AJ, Beighton D, Higgins TJ: Periodontal disease in five and six years old children. J Periodontal 1982; January: 19-22.
39- Hugoson A, Koch G, Bergendal T, et al: Oral health of individual aged 3-8 years in Jonkoping Sweden in 1973 and 1983. Swed Dent J 1986; 10:175-194.
40- Muhi Al-Deen LK: Dental knowledge behavior and attitude of mothers in Badran village. Iraq Dental J 1996 (Accepted for publication).
41- Khamrco TY, Makani LA, Al-Makhtar BS: Dental health knowledge, attitude and behaviour of mothers with young children in Alb-sit village, Ninevah city. J College of Dentistry 2001; 10:49-56.
42- Rayner J, Cohen LK: School dental health education in: Richard NP and Cohen LK (eds): Social sciences and dentistry. London, Federation Denature International 1971; pp275-307.
43- Blinkhorn A: Tooth brushing as part of primary socialization. Ph.D. Thesis, University of Manchester, U.K., 1976.
44- Honkala E, Freeman R: Oral hygiene behaviour and periodontal status in European adolescents. An overview. Comm Dent Oral Epidemiol 1988; 16(4): 194-198.
45- Honkala E, Kannas L, Rise J: Oral health habits of school children in European countries. Int Dent J 1990; 40(4): 21-27.
46- Honkala E: Oral health promotion with children and adolescents. In: Oral health promotion, (ed) shout, Blinkhorn A, Oxford University Press, Oxford 1993, pp 669-687.
47- Salbi ZD: A comparison of oral health status among 13-14 years old school students from two distinct social status area in the city of Baghdad. M.Sc Thesis, College of Dentistry, University of Baghdad 1999.
48- Schou L, Currie C, Queen D: Using a "life style" perspective to understand tooth brushing behaviour in Scottish children. Comm Dent Oral Epidemiol 1990; 18:230-234.
49- Chen M, Andersen R, Barmes M, Leclereq M, Lyttle: Comparing oral health care system, a second international collaborative studies. World Health Organizaiton, Geneva, 1997.
50- Loe H, Anerud A, Boysen H, Smith M: The natural history of periodontal disease in man. The rate of periodontal destruchtion before 40 years of age. J periodontal 1978; 49:607-620.