

The effect of residential factor on dental caries prevalence and treatment needs among the primary school children in Ninevah Governorate/Iraq.

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Abstract:

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. The purpose of the study was to determine the effect of residential factor on the prevalence of dental caries and their treatment need.

Clinical criteria for the diagnosis of dental caries and treatment needs followed the WHO (1997) guidelines using decayed, missing and filled teeth (dmft and DMFT) indices for primary and permanent teeth respectively.

The results showed that the percentage of caries free children for 6 year old was (18.2%) and in (urban, peri-urban and rural) areas was (16.8%, 18.2%, and 19.5%) respectively, while for 12 year was (23%) and for different areas were (17.7%, 24.5% and 26.8%) respectively. The children in rural area were higher significant caries free children than urban children.

The mean dmft for 6 year old children was (4.14) and for 12 year old children was (0.90), while the mean DMFT was (0.86 and 2.63) for 6 and 12 years old respectively. The mean dmft for boys was higher significantly than girls, while the mean DMFT was higher significantly in girls than boys. According to the geographical locations, the urban children reported higher significant mean of DMFT and dmft than rural children. According to the treatment needs the study indicated that the majority of dental treatment was one surface restoration followed by two or more surface restoration.

Key words:

Dental caries, treatment need, residential factors, school children.

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Introduction:

Dental caries and periodontal diseases are still very important public health problems, and they remain the most common and widely spread diseases affecting children, adolescents, adults as well as elderly people especially in developing countries⁽¹⁻⁵⁾. Their importance is related to their highly prevalence, the effect on individual and society and effect on the quality of life, in addition, the financial effect on individuals and community is very high^(6,7).

The prevalence and severity of dental caries show a wide variation from one geographical location to another and they are affected by residential and its related factors⁽⁸⁻¹¹⁾.

Heloe et al⁽¹²⁾ have demonstrated that modernization and urbanization have led to a steady rise in dental caries prevalence among communities. Also Al-Naimi⁽¹³⁾, in her study found that there was a statistically significant difference in dental caries prevalence between urban and rural students.

The purpose of this study was to conduct an epidemiological study among primary school children aged 6 and 12 years in Ninevah Governorate in Iraq to study the effect of residential factor on dental caries prevalence and their treatment need.

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.

Examination of dental caries was performed with the use of plan mouth mirrors and CPI probe. The criteria for diagnosis of dental caries and treatment needs recorded according to the WHO 1997⁽¹⁴⁾. The DMFT and dmft indices were used to measure the prevalence of dental caries.

The statistical analysis of the data include the calculations of mean, standard error, percentage, one way analysis of variance (ANOVA) followed by Duncan's multiple range test was used to determine the significant difference 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	Male		Female		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 the percentage of caries free children for 6 and 12 years old children. Results showed that (20.7%) of the total sample was caries free. The percentage of caries free children was found to be (18.2%) at 6 year of age, and there were significant difference between urban and rural children only. While for 12 years the

urban children reported lower percentage than periurban and rural children with significant difference between them. For 6 year old, girls reported more caries free than boys with no significant difference between them, while for 12 year old girls reported a lower significant caries free than boys.

Table (2): number and percentage of caries-free for (6 and 12) years old school children by sex and area of residence.

Area of residence	Sex	No.	Caries-Free Children			
			6-year old children		12-year old children	
			No.	%	No.	%
Urban	Male	220	40	18.2	84	21.8
	Female	220	34	15.5	30	13.6
	Total	440	74 A	16.8	78 A	17.7
Periurban	Male	220	36	16.4	54	24.5
	Female	220	44	20	54	24.5
	Total	440	80 AB	18.2	108 B	24.5
Rural	Male	220	38	17.3	68	30.9
	Female	220	48	21.8	50	22.7
	Total	440	86 B	19.5	118 B	26.8
Total	Male	220	114	17.3	170 *	25.7
	Female	220	126	19.1	134	20.3
	Total	440	240	18.2	304	23.0

- Capital letters compare between the different areas of residence.

* There was a significant difference between the (total males) and (total females) for 12-year old children.

Table (3) shows the mean dmft by sex and area of residence for 6 year old children. The mean dmft was (4.14) for the total group, the boys reported a higher mean (4.73) than girls (3.55) with a statistically significant difference between them. When compared between locations, the urban children reported higher mean dmft and it was significant only with rural children, also periurban children

reported high significant difference with rural children.

The study revealed that the major component of dmft was the decay component (97.3%). The (dt) component has the same trend of dmft for their difference to area of residence and for girls and boys.

Table (3): Mean dmft and its components by sex and area of residence for 6-year old school children.

Area of residence	Sex	No.	dmft		dt		mt		ft	
			Mean	± S.E	Mean	± S.E	Mean	± S.E	Mean	± S.E
Urban	M	220	5.95* ^B	0.56	5.90* ^B	0.56	0 A	0	0.05 B	0.05
	F	220	4.15 b	0.59	4.15 b	0.59	0 a	0	0 b	0
	T	440	5.05 (b)	0.43	5.03 (b)	0.42	0 (a)	0	0.03 (b)	0.03
Periurban	M	220	4.68 AB	0.54	4.68 AB	0.54	0 A	0	0 A	0
	F	220	4.15 b	0.57	3.75 ab	0.52	0.40 a	0.25	0 a	0
	T	440	4.42 (b)	0.39	4.21 (b)	0.38	0.20 (a)	0.12	0 (a)	0
Rural	M	220	3.55 A	0.59	3.55 A	0.59	0 A	0	0 A	0
	F	220	2.35 a	0.65	2.35 a	0.65	0 a	0	0 a	0
	T	440	2.95 (a)	0.45	2.95 (a)	0.45	0 (a)	0	0 (a)	0
Total	M	660	4.73*	0.35	4.71*	0.35	0	0	0.02	0
	F	660	3.55	0.37	3.35	0.35	0.20	0.12	0	0
	T	1320	4.14	0.26	4.03	0.25	0.10	0.06	0.01	0.01

- Means with the same letters are statistically not significant ($P > 0.05$).
- Capital letters compare between males, small letters compare between females in different areas of residence.
- Small letters between brackets compare between the total (males and females) in different areas of residence.

* There was a significant difference between the males and females.

Table (4) illustrates the mean DMFT by sex and area of residence for 6 year old children. The mean DMFT for total group was (0.86), the mean DMFT value for boys was (0.67) lower than girls (1.05) with a statistically significant difference between them.

When compared between locations for the total group, the urban children had a higher mean of DMFT than periurban and rural children with significant difference between them, also there was a statistical significant difference between periurban and rural children.

Table (4): mean DMFT and its components by sex and area of residence for 6-year old school children.

Area of residence	Sex	No.	DMFT		DI		MT		FT	
			Mean	± S.E	Mean	± S.E	Mean	± S.E	Mean	± S.E
Urban	M	220	1.30* C	0.39	1.30* C	0.39	0 A	0	0 A	0
	F	220	2.25 c	0.66	2.25 c	0.66	0 a	0	0 a	0
	T	440	1.78 (c)	0.38	1.78 (c)	0.38	0 (a)	0	0 (a)	0
Periurban	M	220	0.45 B	0.21	0.45 B	0.21	0 A	0	0 A	0
	F	220	0.60 b	0.30	0.60 b	0.30	0 a	0	0 a	0
	T	440	0.53 (b)	0.18	0.53 (b)	0.18	0 (a)	0	0 (a)	0
Rural	M	220	0.25 A	0.15	0.25 A	0.15	0 A	0	0 A	0
	F	220	0.30 a	0.14	0.30 a	0.14	0 a	0	0 a	0
	T	440	0.28 (a)	0.10	0.28 (a)	0.10	0 (a)	0	0 (a)	0
Total	M	660	0.67*	0.14	0.67	0.14	0	0	0	0
	F	660	1.05	0.21	1.05	0.21	0	0	0	0
	T	1320	0.86	0.13	0.86	0.13	0	0	0	0

- Means with the same letters are statistically not significant ($P > 0.05$).
- Capital letters compare between males, Small letters compare between females in different areas of residence.
- Small letters between brackets compare between the total (males and females) in different areas of residence.

* There was a significant difference between the males and females.

According to DMFT components, the study indicated there was no filling or missing permanent teeth due to caries in three locations, so only decay teeth were found.

Table (5) shows the mean dmft value for 12 year old children. The mean dmft for the total group was

(0.90), the mean value for boys was higher (1.15) than girls (0.65) with a statistically significant difference between them. According to the geographical location, no statistical significant difference was found between urban, periurban and rural areas.

Table (5): Mean dmft and its components by sex and area of residence for 12-year old school children.

Area of residence	Sex	No.	dmft		dt		int		f	
			Mean	± S.E	Mean	± S.E	Mean	± S.E	Mean	± S.E
Urban	M	220	1.17* AB	0.25	1.17* AB	0.25	0 A	0	0 A	0
	F	220	0.78 a	0.23	0.78 a	0.23	0 a	0	0 b	0
	T	440	0.98 (a)	0.17	0.98 (a)	0.17	0 (a)	0	0 (a)	0
Periurban	M	220	1.23* B	0.26	1.23* B	0.26	0* A	0	0 A	0
	F	220	0.67 a	0.19	0.62 a	0.18	0.05 b	0.04	0 a	0
	T	440	0.95 (a)	0.17	0.93 (a)	0.16	0.03 (b)	0.02	0 (a)	0
Rural	M	220	1.05* A	0.24	0.98* A	0.24	0.03 B	0.3	0.03 A	0.03
	F	220	0.49 a	0.12	0.37 a	0.11	0 a	0	0.13 c	0.08
	T	440	0.78 (a)	0.13	0.68 (a)	0.14	0.02 (b)	0.02	0.08 (b)	0.04
Total	M	660	1.15*	0.14	1.13*	0.14	0.01	0.01	0.01	0.01
	F	660	0.65	0.11	0.59	0.11	0.02	0.01	0.04	0.03
	T	1320	0.90	0.09	0.86	0.09	0.01	0.01	0.03	0.01

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

The highest mean (0.86) and percentage (95.6%) component, of dmft was (dt). The (dt) component has the same trend of dmft for three areas of location and for the two sexes. The mean missing teeth for total sample was (0.01) only and mean (ft) was (0.03).

Table (6) illustrates the mean DMFT value for 12 year old children. The mean for the total group was (2.63), the mean value for boys was lower (2.26) than girls (3.00) with a statistically significant difference between them. When compared

between geographical locations, the urban locations, the urban children reported high mean DMFT with a statistical significant difference with children in periurban and rural areas. While no statistical significant difference was found between periurban and rural children. Also the decay component (DT) have higher ratio of all components (95.4%), missing tooth was (2.7%), while filling tooth was (1.9%) only. The trend of the (DT) is similar to the DMFT for the different location and for sex.

Table (6): mean DMFT and its components by sex and area of residence for 12-year old school children.

Area of residence	Sex	No.	DMFT		DT		MT		FT	
			Mean	± S.E	Mean	± S.E	Mean	± S.E	Mean	± S.E
Urban	M	220	3.21 AB	0.23	3.21AB	0.23	0 A	0	0 A	0
	F	220	3.87 b	0.21	3.87 b	0.21	0 a	0	0 a	0
	T	440	3.54 (b)	0.16	3.54 (b)	0.16	0 (a)	0	0 (a)	0
Periurban	M	220	1.60* B	0.34	1.45* A	0.34	0.05 C	0.28	0.10 A	0.07
	F	220	2.91 b	0.36	2.60 ab	0.86	0.08 a	0.04	0.23 b	0.09
	T	440	2.26 (a)	0.26	2.03 (a)	0.26	0.07 (a)	0.02	0.17 (a)	0.06
Rural	M	220	1.97 A	0.25	1.70 A	0.25	0.27 A	0.07	0 A	0
	F	220	2.23 a	0.23	2.23 a	0.23	0 a	0	0 a	0
	T	440	2.1 (a)	0.17	1.97 (a)	0.17	0.14 (a)	0.14	0 (a)	0
Total	M	660	2.26*	0.27	2.12*	0.84	0.11	0.07	0.03	0.93
	F	660	3.00	0.26	2.90	0.16	0.03	0.03	0.08	0.80
	T	1320	2.63	0.37	2.51	0.34	0.07	0.04	0.05	0.05

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

Table (7) demonstrated the number of teeth, the percentage of children and mean number of teeth per child in each category of treatment needs for 6 year old. For the total sample, the need of simple one surface restoration was (2.97) teeth per child, followed by need of two or more surface restoration with a mean of (1.31) teeth per child, mean number of teeth per child in need of pulp treatment, extraction and space

maintainer was (0.38), (0.24) and (0.05) respectively. While the mean number of teeth per child in need of fissure sealant was (1.15). The boys reported higher mean per child in need for all categories than girls. According to the location the children in rural area reported lower mean in all categories than the urban and periurban children except the mean for fissure sealant was higher than children in urban children.

Table (7): Treatment needs of dentition status (number and mean per child) for 6-year old students by sex and area of residence.

Area of residence	Sex	No.	Categories of Treatment Needs											
			1		2		3		4		5		6	
			No. of teeth	Per child	No. of teeth	Per child	No. of teeth	Per child	No. of teeth	Per child	No. of teeth	Per child	No. of teeth	Per child
Urban	M	220	202	0.92	904	4.11	504	2.29	116	0.52	64	0.29	14	0.06
	F	220	202	0.92	821	3.73	489	2.22	85	0.38	80	0.36	14	0.06
	T	440	404	0.92	1725	3.92	993	2.25	205	0.45	144	0.32	28	0.06
Periurban	M	220	356	1.62	647	2.94	341	1.55	90	0.41	54	0.24	8	0.04
	F	220	268	1.22	628	2.85	215	0.98	75	0.34	40	0.18	12	0.05
	T	440	624	1.42	1275	2.89	556	1.26	165	0.37	94	0.21	20	0.05
Rural	M	220	376	1.71	538	2.44	106	0.48	72	0.32	48	0.22	16	0.07
	F	220	226	1.03	382	1.73	73	0.33	60	0.27	37	0.17	00	0.00
	T	440	602	1.37	920	2.09	179	0.40	132	0.30	85	0.19	16	0.03
Total	M	660	837	1.27	2089	3.16	951	1.44	283	0.43	166	0.25	38	0.06
	F	660	692	1.05	1831	2.77	777	1.17	220	0.33	157	0.23	26	0.04
	T	1320	1529	1.15	3920	2.97	1728	1.31	503	0.38	323	0.24	64	0.05

1= teeth need fissure sealant treatment.

2= teeth need one surface restoration.

3= Teeth need two or more surface restorations.

4= Teeth need pulp care treatment.

5= Teeth need extraction.

6= Teeth need space maintainer.

Table (8) illustrates the number of teeth and the mean number of teeth per child in each categories of treatment need for 12 year old. The study indicated that the need of simple one surface restoration was (2.19) teeth per child followed by need for extraction (0.47) teeth per child. The

mean need in boys and girls for all categories of treatment need were almost equal. According to the geographical location, the children in rural and periurban area reported lower mean in (fissure sealant, two or more surface restoration and pulp treatment) than urban children.

Table (8): Treatment needs of dentition status (number and mean per child) for 12-year old students by sex and area of residence.

Area of residence	Sex	No.	Categories of Treatment Needs											
			1		2		3		4		5		6	
			No. of teeth	Per child	No. of teeth	Per child	No. of teeth	Per child	No. of teeth	Per child	No. of teeth	Per child	No. of teeth	Per child
Urban	M	220	270	1.2	576	2.61	146	0.66	64	0.29	180	0.82	16	0.07
	F	220	276	1.5	598	2.72	170	0.77	87	0.39	168	0.76	4	0.01
	T	440	546	1.4	1174	2.66	316	0.72	151	0.34	348	0.74	20	0.04
Periurban	M	220	182	0.83	414	1.88	68	0.31	39	0.17	70	0.32	18	0.08
	F	220	202	0.92	486	2.21	72	0.32	51	0.23	73	0.33	12	0.05
	T	440	384	0.88	900	2.04	140	0.31	90	0.20	143	0.32	30	0.07
Rural	M	220	170	0.77	428	1.94	64	0.29	22	0.10	73	0.33	18	0.08
	F	220	286	1.30	398	1.79	69	0.31	36	0.16	65	0.29	0	0.00
	T	440	456	1.04	826	1.87	133	0.30	58	0.13	138	0.31	18	0.04
Total	M	660	597	0.90	1418	2.15	278	0.42	125	0.19	323	0.49	52	0.08
	F	660	748	1.13	1482	2.24	311	0.47	174	0.26	306	0.46	16	0.02
	T	1320	1345	1.02	2900	2.19	589	0.44	299	0.22	629	0.47	68	0.05

1= teeth need fissure sealant treatment.

2= teeth need one surface restoration.

3= Teeth need two or more surface restorations.

4= Teeth need pulp care treatment.

5= Teeth need extraction.

6= Teeth need space maintainer.

Discussion:-

The present study was conducted among (6 and 12) years old primary school children in three different locations (urban, periurban and rural areas) in each administration unit in Nineveh Governorate, to evaluate the effect of geographical location on caries prevalence and treatment need. 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 study shows that the percentages of caries free children were (18.2%) and (23%) for 6 and 12

year old respectively, that means the prevalence of dental caries for 6 year was (81.8%) and for 12 year was (77%). The prevalence of dental caries in this study was higher than that reported in some of developed countries as in Italy⁽¹⁵⁾, France⁽¹⁶⁾, Netherlands⁽¹⁷⁾, and Sweden⁽¹⁸⁾, while it was lower than other studies carried out in Hungary⁽¹⁹⁾ and in Brazil⁽²⁰⁾.

When comparing with the studies conducted in Iraq, the percentage was nearly similar with other studies^(21, 22), while lower than the other^(23, 24).

According to the geographical location, the prevalence of caries free children for rural area was higher significantly than urban children for both 6 and 12 years old children, while slightly higher than periurban children with no statistically significant difference between them. This finding is in agreement with the findings of other studies^(11, 24, 25).

According to the sex variation, the prevalence of caries free children was slightly higher in girls than boys for 6 year old children, while it is higher in boys than girls for 12 year old children with statistically significant difference between them. This finding for 12 year old is in accordance with other studies^(24, 25).

The goal of WHO/FDI for the year 2000 is that (50%) of 5 to 6 years old children will be caries free. The result of this study regarding 6 year old

children is much lower than this goal, however, many developed countries achieved this goal^(16, 17, 26), probably are due to cumulative effect of various preventive measures used in these countries⁽²⁷⁻²⁹⁾.

Caries experience in present study was recorded using DMFT/dmft indices and their components. These indices may allow the measurement of the past caries experience indicated by "missing" and "filled" component and caries at the present as recorded by "decay" component. The mean dmft for 6 year old children was (4.14), this mean is higher than other studies carried out in Iraq as study by Mahmood⁽²¹⁾ in Baghdad (3.4), Khamroo and Salman⁽²³⁾ (3.7) for 6 year old children, Al-Azawi⁽²⁵⁾ for 5 year old in different Governorates of Iraq (2.49), and it was more than that reported for Jordan children⁽³⁰⁾ (2.73), although much higher than many well developed countries⁽³¹⁾, while less than that reported for Syrian children⁽³²⁾ aged 5 year old (4.65) and for 5 year old children in Baghdad⁽³³⁾ (4.6).

The mean dmft for 12 year old children was (0.90), this mean was lower than that reported by Khamroo and Salman⁽²³⁾ (2.42), while higher than that reported by Ali⁽²⁴⁾ (0.65). According to the geographical locations, the mean dmft for 6 year old children in rural area was lower significantly (2.45) than the periurban (4.42) and urban children (5.05), while

no statistically significant difference between the urban and periurban children. Also the mean dmft for 12 year old children in rural children was lower (0.78) than the periurban (0.95) and urban (0.98), with no statistically significant difference between them. These findings are in agreement with other studies^(24, 25).

The mean DMFT for 6 year old children was (0.86), this mean is higher than that of other Iraqi studies^(21, 23), while for France children⁽¹⁶⁾ and Madagascar children⁽³⁴⁾, the mean DMFT for 12 year old children was (2.63). This mean is lower than many studies carried out in Iraq^(22, 23, 25), when comparing with other countries, the mean of this study was higher than in Uganda (0.40), Pakistan (0.9), Tunis (1.3), Jordan (1.7) and Sudan (1.8)⁽³⁵⁾, while it is less than Lebanon⁽³⁵⁾ (5) and Saudi Arabia⁽³⁶⁾ (4.7).

According to the geographical locations, the mean DMFT for 6 and 12 year old children in rural children were lower significantly than periurban and urban children, also there was statistically significant difference between periurban and urban children. These findings are in agreement with other studies^(11, 24, 25, 37). Hele et al⁽¹²⁾ have led to steady "rise" in dental caries prevalence among communities. These variations in prevalence of dental caries between different geographical locations could be attributed to the interaction of several

factors among which are water, trace elements in soil culture, tradition, occupation, education, economic levels and dietary habits. However, it is difficult to assess which of these factors are responsible for the variation in caries experience in different geographical regions.

It is noticed that the other goal of WHO/FDI for the year 2000 that the mean of DMFT for 12 year old is less than (3). The finding of this study met this goal.

Concerning sex comparison, the mean dmft, the girls reported less significantly than boys. While for permanent dentition the girls reported higher mean significantly than boys. These findings for permanent dentition are in accordance with other studies^(30, 38, 39), while disagreement with other studies who found no statistically significant difference between boys and girls^(21, 40, 41). This sex difference is probably because of earlier tooth eruption pattern in girls than in boys of the same age group, thus exposed longer to the oral environmental factors and subjected earlier to caries attack^(24, 25). While the shedding of primary teeth and early eruption of permanent teeth for 12 year old may explain the lower caries experience in primary dentition in girls compared to boys. For primary dentition Watt et al⁽⁴²⁾ found in their study on preschool children that boys tended to consume larger quantities of sweeter drinks than

girls, and Milen et al⁽⁴³⁾ found that the boys lost more primary teeth due to decay than girls.

When comparing the mean DMFT of this study for 6 and 12 years old with other Iraqi studies carries out in 1970s and 1980s and early of 1990, it shows that the mean DMFT is decreased, this may be due to decrease availability of sugar due to embargo imposed on Iraq. In addition to that this difference may be due to the alteration in diet after the embargo that important during pre-eruptive stage resulting in a change in the caries susceptibility of the teeth⁽⁴⁴⁾. This finding is in agreement with other studies carried out from the mid-nineties among different young age group in Iraq^(4, 21, 45). This encouraging evidence of a farther marked decline in mean of caries and percentage of children with caries in the future by decrease the amount and frequency of eating sugary foods and drinks.

Results of the study show that the decay component for both primary and permanent teeth was more than (95%). This mean high percent of carious teeth not treated and a very low proportion of filled teeth. This was in accordance with other studies in developing countries as in South Africa⁽⁴⁶⁾, South Sudan⁽⁴⁷⁾, Tanzania⁽¹⁵⁾, and Iraq^(4, 23, 45). While in contrast to the results reported in developed countries, when the majority of DMFT index was formed of filled teeth^(48, 49).

The high proportion of decay primary teeth for this sample may reflect an unawareness of importance of the primary teeth or negative attitude of the parents toward dental treatment of deciduous teeth since there is a general concept among parents that these teeth are temporary and fall out any way and in turn back of cooperation of children. The very low percent of filling dentistry for school children was very restricted, in spite of some school are involved in Systemic School Health Care (school health services) and the availability of dental services especially in urban and periurban areas. So the systemic school Health services in Iraq are inadequate to fulfill the needs of primary school age population. This findings is in agreement with other study evaluates the Systemic School Health Services in Iraq⁽²³⁾.

According to the geographical locations, there was no difference in missing and filled teeth between the different locations, while the decay teeth follow the same trend of DMFT/dmft in different locations. This finding is in agreement with findings of other studies^(30, 50, 51). While disagreement with other studies, who found children in rural areas, had less restorative treatment, this may be attributed to the limitation in availability and accessibility to dental services in the rural than urban areas^(11, 36, 52).

As for preventive measures carried out for children, the study revealed that only five children out of 2640 school children examined had permanent molar fissure sealant. This finding is in accordance with finding of other study in Iraq⁽⁴⁾, who found only one child out of 1200 children examined had fissure sealant in their teeth, while in contrast to the studies in developed countries as in USA (18.5%) of children and youth had one or more sealant in permanent teeth⁽⁵³⁾, and in UK⁽⁵⁴⁾ reported (22%) of the English children had fissure sealant on their teeth in contrast to only two Jordanian children.

According to the treatment needs, the study revealed that the majority of dental treatment for dental caries, was one surface restoration for both ages, followed by two or more surface restoration for 6 year old and need for extraction for 12 year old. According to geographical, the rural areas reported lower mean per child need treatment in all categories than the urban area. Which mean that the treatment need for different geographical locations and for both sexes reflect the prevalence of dental caries in those children.

The high mean of dental treatment per child in this study is one surface restoration, this finding was in contrast with the findings of other Iraqi studies^(21, 23), they found that the mean for two or more surfaces restoration

was higher than for one surface restoration, and the need of extraction teeth is more than the pulp treatment. This reflects the findings of this study that the prevalence and severity of dental caries is reduced. Also the finding of this study is disagreement with the finding of Al-Azawi⁽¹⁾. According to the locations and treatment needs, she found that the children in rural areas have the mean for treatment need in different categories was slightly higher in rural and periurban areas than urban areas.

In spite of difference in the availability of dental services in different geographical location and the difference in the supply of dental manpower, in addition to the difference in the distance of these locations from the Mosul Qadha, the study indicated that there was no effect of these variables on the treatment carried out for these school children, while the prevalence and severity of dental caries differ in different geographical locations. This may be due to the dietary habits, socioeconomic factor and education level of their parents, water source, soil, knowledge and behavior of children to dental health.

References:-

- 1- Pitts NB, Evans DJ, Pine C: British Association for the Study of Community Dentistry (BASCD) diagnostic criteria for caries prevalence surveys, 1996/97. *Comm Dent Hlth* 1997; 14 (suppl): 6-9.
- 2- AKpata ES: Dental caries In: AKpata ES. A textbook of operative dentistry, 1.st ed 1997; London.
- 3- Truin GJ, Koning KG, BronKhorst EM, et al: Time trends in caries experience of 6-12 years old children of different socioeconomic status in Hague. *Caries Res* 1998; 32: 1-14.
- 4- Al-Naimi RJ, Khamroo TY: Oral health status and treatment needs in 13-15 years old students in Mosul city, Iraq. *J College of Dentistry* 1999; 5:91-100.
- 5- Khamroo Ty, Al-Sayigh GD: Prevalence of root surface caries in adult population 30-70 year old in Mosul City, Iraq. *J College of dentistry* 2000; 7:139-145.
- 6- Bowling A: What things are imported in people's lives? A survey of the public's judgement to inform scales on health related quality of live. *Soc Sci in Medicine* 1995; 10: 1447-1462.
- 7- Gift HG, Atchison KA, Dayton CM: Conceptualizing oral health- related quality of live. *Soc Sci in Medicine* 1997; 44: 601-608.
- 8- Peng B, Petersen PE, Fan MW, Tai BJ: Oral health status and oral health behavior of 12 years old urban school children in the people's Republic of China. *Comm Dent Hlth* 1997; 14 (4): 238-244.
- 9- Irigoyen ME, Maupome G, Mejia AM: Caries experience and treatment needs in 6-12 years old urban population in relation to socioeconomic status. *Comm Dent Hlth* 1999; 16 (4): 245-249.
- 10- Brindle R, Wilkinson D, Harrison A, Connolly C: Oral health in Hlabisa, Kuzulu/ Natal- a rural school and community survey. *Int Dent J* 2000; 50: 13-20.
- 11- Khamroo 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.
- 12- Heloe L, Aoral, Saggiard A: Dental health practices in Norwegian adults. *Comm Dent Oral Epidemiol* 1982; 10: 308-312.
- 13- Al-Naimi RJ: Dental caries experience of rural and urban school children in Ninevah

- province. A comparative study. *Al-Rafidain Dent J* 2001; 1: 18-23.
- 14- World Health Organization: Oral health survey, basic methods. Fourth edition WHO, Geneva, Switzerland 1997.
 - 15- Frecken JE, Kalsbeek H, Verrips GH: Has the decline in dental caries been halted? Changes in caries prevalence among 6 and 12 years children in Friesland, 1973-1988. *Int Dent J* 1990; 40 (4): 225-230.
 - 16- Cohen PM, Turlot JC, Frank RM, Otry-Masset AM: National survey of caries prevalence in 6-15 years old children in France. *J Dent Res* 1989; 68:64-68.
 - 17- Train GJ, Konig KG, Kalsbeek H: Trends in dental caries in the Netherland. *Adv Dent Res* 1993; 7: 15-18.
 - 18- Sundberg H: Changes in the prevalence of caries and adolescents in Sweden 1985-1994. *Eur J Oral Sci* 1996; 104: 470-471.
 - 19- Mandel ID: The caries decline. A comment *Eur J Oral Sci* 1996; 104: 423-426.
 - 20- Dini E, Foschini A, De-Mendonca F, De-Nardo G, Abbad G, Fraix R: changes in dental caries prevalence of school children in Araraquara, Brazil. *Int Dent J* 1996; 46 (2): 82-85.
 - 21- Mahmood MS: Oral health status and treatment needs among Iraqi school children aged 6-12 years, Baghdad, Iraq. M.Sc thesis, Collage of Dentistry, University of Baghdad 1995.
 - 22- Khamroo Ty, Al-Salman KA: Dental health status among 4th-8th school children in the center of Mosul. *Iraqi Dent J* 1998; 23: 77-88.
 - 23- Khamroo Ty, Salman FD: Prevalence of dental caries among primary school children age 6-12 years old in Mosul City center/Ninevah. *Iraqi Dent J* 2001; 27: 65-82.
 - 24- Ali DN: Oral health status and treatment needs among 12 year old school children in urban and rural areas of Baghdad- Iraq. M.Sc thesis, Collage of Dentistry, University of Baghdad 2001.
 - 25- Al-Azawi LA: Oral health status and treatment needs among Iraqi 5 years old and 15 years old students, Baghdad, Iraq. PHD thesis, Collage of Dentistry, University of Baghdad 2000.
 - 26- Athanassouli I, Mamai-Homata E, Panagopoulos H, et al: Dental caries change between 1982 and 1991 in children aged 6-12 in Athens. *Caries Res* 1994; 28: 378-382.
 - 27- Depaolo PF, Soparkar PM, Tavares M, et al: A dental survey of Massachusetts school children. *J Dent Res* 1982; 16: 1356-1360.
 - 28- Nadanorsky P, Sheihar A: The relative contribution of dental services to the changes in caries levels of 12 year old in 18 industrialized countries in the 1970s and early 1980s. *Comm Dent Oral Epidemiol* 1995; 23: 231-239.
 - 29- Petersson GH, Brattbal D: The caries decline: a review of reviews. *Eur J Oral Sc* 1996; 104: 436-443.
 - 30- Hamden MA: Caries experience among 6 and 12 years old school children in Jordan District. *Medical and Biological Sciences J* 1997; 24:112-120.
 - 31- Murray JJ: Comments on results reported at the second international conference "changing in caries prevalence". *Int Dent J* 1994; 44: 457-458.
 - 32- Taifour D, HaKKI O, Mahdi ASB: The prevalence of dental caries among 3-5 years old children in Syria. Activities report 1991-1995, regional demonstration, training and research center for oral health in collaboration with WHO 1991.
 - 33- Al-Weheb A: Dietary habits and its relation to caries experience among preschool children in Baghdad. M Sc thesis, Collage of Dentistry, University of Baghdad 1991.
 - 34- Petersen PE, RaZanmiheja NC: Oral health status of children and adults in Madagascar. *Int Dent J* 1996; 46: 41-47.
 - 35- WHO (1995): Report on the consultation on development of oral health human resources and training needs in EMR countries. World Health Organization, Regional Office for the Eastern Mediterranean. Alexandria, Egypt.
 - 36- Al-Shammery A, Quite EF, Al-Backry M: An oral health survey in the central province of

- Saudi Arabia. Phase 1. *EMR Hlth serv J* 1991; 10: 20-24.
- 37- Irigoyen ME, Luengas IF, Yashine A, Majia AM: Dental caries experience in Mexican school children from rural and urban communities. *Int Dent J* 2000; 50: 41-45.
- 38- Gonzalez Z M, Cabrera R, Grossi SG, France F, Aguirre A: Prevalence of dental caries and gingivitis in a population of Mexican school children. *Comm Dent Oral Epidemiol* 1993; 21: 11-14.
- 39- Al-Beiruti N, Taylor MD, Boules W: The prevalence of dental caries among 5, 15 years old children in Syria. *Activities reports 1991-1995, regional demonstration, training and research center for oral health in collaboration with WHO.*
- 40- Salapata J, BlinKhorn AS, Ahwood O: Dental health of 12 years old children in Athena. *Comm Dent Oral Epidemiol* 1990; 18: 80-81.
- 41- Liny YT, Chu KC: A survey on dental caries in school children on Lanyo Island. *Chang Keny I Hsueh* 1997; 20: 280-285.
- 42- Watt RG, Dykes J, Sheiham A: Preschool children's consumption of drinks: implication for dental health. *Comm Dent hlth* 1999; 17: 8-13.
- 43- Milen A, Hausen H, Heinomen op, Paunio I: Caries in primary dentition related to age, sex, social status and country of residence in Finland. *Comm Dent Oral Epidemiol* 1981; 9: 83-86.
- 44- Welker AR, Cleaton-Jones P: Sugar intakes and dental caries where do we stand. *J Dent for child* 1989; Jan-Feb: 30-35.
- 45- Khamrco Ty, Makani LA, Jazrawi KH: Dental caries changes between (1989/ and (2001) in children aged (3-14) years in Kasa Fakhara and Al-Shamsiet villages, Ninevah Governorate-Iraq. *Al-Rafidein Dent J* 2002; 2 (special issue): 269-278.
- 46- Hirschowitz AS, Rashid SA, Cleaton-Jones PE: Dental caries, gingival health and malocclusion in 12 years old urban black school children from Soweto, Johannesburg. *Comm Dent Oral Epidemiol* 1981; 9: 87-90.
- 47- Dowty A: Oral health in children in Southern Sudan. *Comm Dent Oral Epidemiol* 1982; 10: 82-85.
- 48- Pitts NB, Palmer JD: The dental caries experience of 5-12 and 14 years old children in Great Britain surveys coordinated by the British Association for the Study of Community Dentistry in 1990/91, 1991/92 and 1992/93. *Comm Dent Hlth* 1994; 11:42-52.
- 49- Pitts NB, Evan DJ, Nugent NZ: The dental caries experience of 14 year old children in the United Kingdom Survey coordinated by the British Association for the Study of Community Dentistry in 1998/1999. *Comm Dent Hlth* 2000; 17: 48-53.
- 50- Normark S: Social indication of dental caries among Sierra Leonean school children. *Scand J Dent Res* 1993; 101: 121-129.
- 51- Zerfowski M, Koch MJ, Nickusch U, Stachie HJ: Caries prevalence and treatment needs of 7-10 years old school children in South Western Germany. *Comm Dent Oral Epidemiol* 1997; 25: 384-391.
- 52- Parajas IL: Sugar content of commonly eaten snack foods of school children in relation to their dental health status. *J Philip Dent Assoc* 1994; 51: 4-12.
- 53- Selwitz RH, Winn DM, Kingman A, Zion GR: The prevalence of dental sealants on the US population. Findings from NHNAES III, 1988-1991. *J Dent Res* 1996; 75: 652-660.
- 54- Hamdan MA, Rock WP: Dental caries experience in Jordanian and English school children. *Comm Dent Hlth* 1993; 10: 151-157.