

## Longitudinal study of dental caries experience and pattern among a group of children in Baghdad

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### Abstract

The most dramatic increase in dental decay is thought to have occurred during the last part of the 19<sup>th</sup> and the beginning of the 20<sup>th</sup> centuries. The aim of this study was to investigate the caries experience and pattern in primary and permanent teeth in a longitudinal study. Dental caries of 166 kindergarten children of 4-5 years old was recorded. Only 122 of the children were re-examined when their ages became 10-11. The third examination of 118 children was done when their ages became 13-14. Dental caries registration was done following the criteria of WHO (1987). Dental prevalence was increased by age reaching 94.9 percent at 13-14 years old. No sex differences were observed among the three examinations except in DMFT. The DMFT incidence after 6 years was 4.3 and after 3 years was 1.8, while DMFS incidence was 6.4 and 2.2 respectively. The D/d component was the highest mean value. Although dental caries was significantly higher in posterior than in anterior teeth, there were no jaw differences. Occlusal and proximal surfaces were the predominate surfaces affected among permanent and primary teeth respectively. Coinciding with the incline in caries experience observed among children, changes in the distribution and progression rate of the disease have been found.

**Keywords:** Dental caries experience, pattern, longitudinal study.

### Introduction:

Dental caries is a wide world oral health problem. It starts early in life and advances with age due to its irreversibility and accumulative nature<sup>(1)</sup>. Fourth year of life was described as a critical year<sup>(2)</sup>, while the FDI considered the five year old as a target group<sup>(3)</sup>, in which the key-risk teeth (first molars) are erupted and they had a higher risk of developing oral diseases<sup>(3, 4)</sup>. The highest priority key-risk age group is 11 to 14 year olds, from the age the second molars start to erupt in girls until they are fully erupted in boys<sup>(4)</sup>. The risk and pattern of dental caries in primary and permanent teeth vary greatly according to the patient's chronologic age, type of

tooth and surface<sup>(4, 5)</sup>. Caries-preventive measures must be integrated and based on predicted risk from age groups down to the individual tooth surfaces<sup>(4)</sup>.

Many Iraqi cross-sectional studies were directed to estimate caries experiences<sup>(6, 7, 8, 9, 10, 11)</sup> and pattern<sup>(12, 13)</sup>, but there is only one Iraqi longitudinal study<sup>(14)</sup> investigated caries increment in primary teeth in one year interval. In some cases, cross-sectional studies had less validity<sup>(15)</sup>, beside a fewer knowledge about this subject in a longitudinal point of view, this longitudinal study was conducted to estimate the dental caries incidence and pattern among primary, mixed and permanent dentitions.

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## Materials and methods

The sample consisted of 166 kindergarten children of 4-5 years who were randomly selected. Dental caries examination was done in their class rooms following the basic methods of the WHO <sup>(16)</sup> using mouth mirrors and caries explorers. After 6 years, 122 children were re-examined when their ages became 10-11 years. The third examination of 118 children was done after three years when the children ages became 13 -14 years. The others were missed during the last two examinations. The data obtained was statistically analyzed using Student's t-test at a level of significance 0.05.

## Results

Table 1 illustrates the percentages of caries free children (dmfs and/or DMFS). Caries experience in relation to gender is revealed in Table 2. Statistically, no gender differences were observed among the three examinations ( $P>0.05$ ) except for DMFT in the second and third

examinations. Dental caries increases with age in permanent teeth and decreases in primary teeth. The reduction in mean dmfs between the first and the second examinations was 4.9, while the incidence of DMFS between the first and the second was 3, and between the second and the third examinations were 2.2.

Table 3 demonstrates DMF/dmf components. It was found that D/d component was the highest mean value. Posterior teeth caries experience was significantly higher than that of anterior teeth. While, statistically, no significant difference was found in caries experience between the upper and lower jaws ( $P>0.05$ ) (Table 4). Figure 1 illustrates the caries experience in relation to tooth surface. Occlusal surface of permanent teeth was the predominate surface affected by dental caries, while, approximal surface was the predominate surface among the primary teeth. Buccal and lingual surfaces caries experiences were higher in permanent than in primary dentition.

Table (1): Caries free children (dmfs and/or DMFS)

Age Group	Index	No.	Caries Free	
			No.	%
4-5	dmfs	166	32	19.3
	DMFS	60	60	100
	Both	166	32	19.3
10-11	dmfs	30	8	26.7
	DMFS	122	14	11.5
	Both	122	12	9.8
13-14	DMFS	118	6	5.1

Table (2): Caries experience by gender

Gender	4-5				10-11				13-14	
	No.	dmft Mean±SE	No.	DMFT Mean±SE	No.	dmft Mean±SE	No.	DMFT Mean±SE	No.	DMFT Mean±SE
Males	72	5.5 0.43	22	0	18	1.6 0.35	56	4.9 0.36*	58	6.7 0.5**
Females	94	5.0 0.48	38	0	12	1.8 0.37	66	3.9 0.34	60	5.5 0.39
Both	166	5.2 0.32	60	0	30	1.7 0.25	122	4.3 0.25	118	6.1 0.30
	No.	dmfs Mean±SD	No.	DMFS Mean±SD	No.	dmfs Mean±SD	No.	DMFS Mean±SD	No.	DMFS Mean±SD
	Males	72	7.8 0.78	22	0	18	2.5 0.57	56	7.1 0.65	58
Females	94	7.9 0.93	38	0	12	3.8 0.65	66	5.8 0.58	60	7.9 0.73
Both	166	7.9 0.62	60	0	30	3.0 0.43	122	6.4 0.41	118	8.6 0.57

\* P&lt;0.05 t = 2.03 d.f = 120

\*\* P&lt;0.05 t = 2.55 d.f = 116

Table (3): DMF/dmf components

Ages	4-5		10-11		13-14			4-5		10-11		13-14	
Comp.	Mean±SE		Mean±SE		Mean±SE		Comp.	Mean±SE		Mean±SE		Mean±SE	
dt	4.90	0.31	1.43	0.25	-	-	ds	6.80	0.52	2.37	0.40	-	-
mt	0.20	0.03	0	0	-	-	ms	0.97	0.15	0	0	-	-
ft	0.009	0.03	0.25	0.10	-	-	fs	0.10	0.04	0.62	0.28	-	-
DT	0	0	3.93	0.25	5.59	0.30	DS	0	0	5.45	0.38	7.50	0.49
MT	0	0	0.009	0.03	0.13	0.03	MS	0	0	0.49	0.15	0.65	0.17
FT	0	0	0.311	0.07	0.34	0.09	FS	0	0	0.42	0.11	0.47	0.13

Table (4): Caries experience DMFS/dmfs in relation to the jaw and segment.

Ages	Index	No.	Anterior Mean ± SE		Posterior Mean ± SE		Upper Mean ± SE		Lower Mean ± SE	
4-5	dmfs	166	2.8	0.34	5.3	0.40*	4.1	0.37	3.9	0.36
10-11	dmfs	30	0	0	3.2	0.43**	1.6	0.34	1.5	0.31
	DMFS	122	0.3	0.14	5.9	0.35 <sup>Δ</sup>	2.9	0.24	3.3	0.21
13-14	DMFS	118	0.3	0.16	8.3	0.51 <sup>ΔΔ</sup>	4.1	0.3	4.4	0.31

\* t = 4.7 P&lt;0.0001 d.f = 330

<sup>Δ</sup> t = 14.6 P<0.0001 d.f = 242

\*\* t = 7.4 P&lt;0.0001 d.f = 58

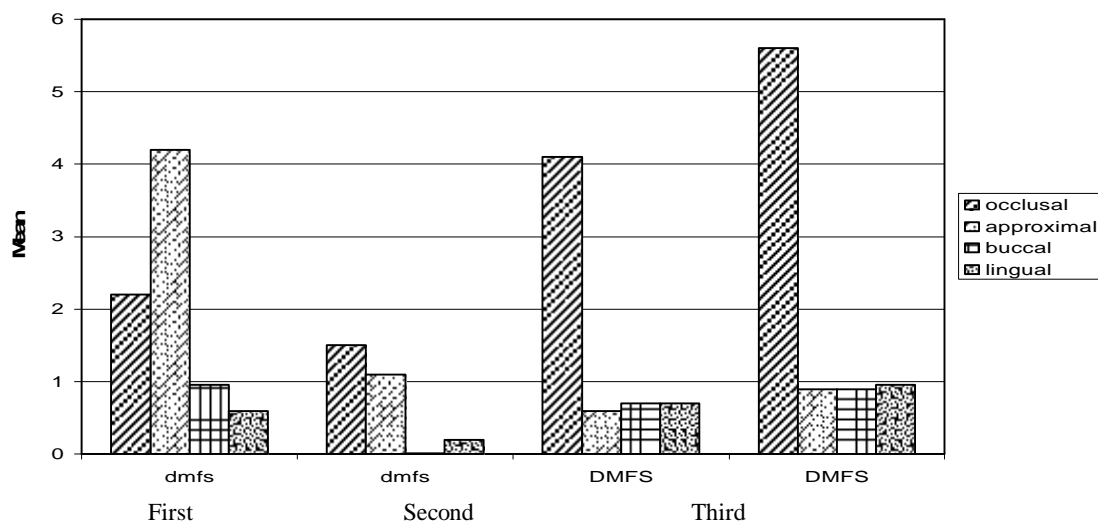
<sup>ΔΔ</sup> t = 14.8 P<0.0001 d.f = 234

Figure (1): Caries experience (DMF/dmf) in relation to tooth surface

## Discussion

The data revealed that the percentage of children with caries free primary teeth was higher than that for permanent teeth except for the first examination. Dental caries increased with age for permanent dentition which may be attributed to the accumulative nature of the disease<sup>(1)</sup>, and decreased with age for primary teeth which may be due to the teeth exfoliation. This finding is in agreement with many cross-sectional studies<sup>(6, 7, 9, 13, 17)</sup>, the latter demonstrated that caries experience for primary teeth declined after an inclination up to the age of 8. Thirty – seven percent of

the children who were caries-free in primary dentition remained so in the mixed dentition, which was much lower than that reported by Greenwell et al<sup>(18)</sup>.

After about 5 years of teeth eruption for both dentitions, the higher caries experience in primary than in permanent teeth may be related to the complete eruption of primary teeth full set and the morphological differences between the two dentitions<sup>(5)</sup>. This result agrees with Mortimer study<sup>(19)</sup> that attributed it to the thinner thickness of primary teeth enamel than that found in permanent teeth and when caries lesions were present, extensive cavitation and involvement of decay were usually found, besides, the prenatal enamel was less mineralized than postnatal one. Although, males had a significantly higher mean DMFT than females at the second and third examinations, gender differences in relation to caries experience among the three examinations were not significant. This result is in accordance with other previous studies<sup>(7, 9)</sup>.

The mean DMFT increased from 0 to 4.3 after 6 years which means almost four carious teeth incidences

and from 4.3 to 6.1 after the latter three years, which means almost two carious teeth incidences. While incidence of DMFS caries experience was 6.4 and 2.2 carious surface after six and three years respectively. That means approximately one carious surface per year. The caries increment averaged 2.2 DMFS over the three years was near to that reported by Burt et al<sup>(20)</sup>. The reductions in dmft and dmfs were 3.5 carious teeth and 4.1 carious surfaces after 6 years. The highest d/D component mean value is in agreement with many studies<sup>(8, 11, 12, 13)</sup> which indicates the negligible dental treatment. The FT component was higher than MT, while vice versa regarding primary teeth, which may be due to the lesser dental care concerning primary teeth.

Dental caries in posterior teeth was significantly higher than that in anterior teeth for both dentitions. This finding is in accordance with some studies<sup>(8, 12, 13)</sup>. The differences in the morphology of pits and fissures in posterior teeth may explain this result<sup>(5)</sup>. Dental caries experience in anterior segment was more in primary than in permanent teeth. This result agrees with other studies<sup>(11, 12, 13)</sup>, which may be attributed to the occurrence of rampant type of caries as early as in the first year of life affecting the labial and palatal surfaces of the incisors. Besides, the incisal papilla is situated close to the mesiolingual aspects of those teeth, which gives rise to increased accumulation of plaque<sup>(5)</sup>. Although statistically there were no jaw differences in caries experience, dental caries in the upper jaw of primary teeth was higher than that for the lower jaw. This result is in agreement with El-Samarrai study<sup>(8)</sup> and may be due to that the most commonly attacked primary teeth were the molars and upper anterior teeth, while the lower anterior teeth seldom

show sign of dental caries<sup>(5, 8, 21)</sup>. The opposite picture regarding permanent teeth, which may be attributed to the early eruption of the lower teeth<sup>(5)</sup>.

Occlusal surface of permanent teeth was the most affected by dental caries, while the proximal surface of primary teeth was the most affected. This result is in agreement with some studies<sup>(13, 22)</sup> and in disagreement with Grindejford et al<sup>(23)</sup> and may be due to the fact that in the primary teeth less pronounced fissure systems are found than in the permanent teeth. Also, the high frequency of spacing in the molar areas in the primary teeth of young preschool children reduces the number of proximal caries. With increasing age, proximal contacts are established which may give rise to an increase of proximal caries in primary teeth at the age of 5 to 6<sup>(5)</sup>. Kidd and Pitts<sup>(24)</sup> showed that at least half of the proximal lesions in primary molars of children aged 3-7 years would not be detected without radiograph. Children developed 1.5, 0.3, 0.2 and 0.26 new lesions for occlusal, proximal, buccal and lingual permanent teeth surfaces respectively during the last three years. The difference in the means of surfaces with caries was largest for pit and fissure surfaces. This agrees with Li et al study<sup>(25)</sup>. The increase in the proximal caries among permanent teeth by age was more than smooth surface caries because the latter is self cleansing. In addition, the proximal surfaces of the newly erupted posterior teeth are most caries susceptible during the first 11 to 14 years<sup>(4)</sup>. Such variations in surface "susceptibility" reflect variations in the intra-oral environment, and do not reflect any known variations in composition of the tooth surfaces<sup>(15)</sup>.

It is important to motivate and encourage individuals to assume responsibility for their own oral health. A preventive program should be

tailored and integrated to reflect trends in the pattern of dental caries in our country.

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