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Evaluation of Dental Caries Prevalence among Kindergartens' Children in Mosul City Center

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ABSTRACT

Aims: This study aims to determine dental caries prevalence and pattern in preschool children in Mosul City Center, and to evaluate caries according to d_1–d_3 criteria, which have not been widely adopted for caries diagnosis in the primary dentition. **Materials and Methods:** Examination was conducted on 762 preschool children aged 4–5 years old selected randomly from 20 kindergartens in Mosul City Center from different socioeconomic and education levels. Caries was recorded in terms of decayed, missing and filled teeth (dmft) index, and the d_1–d_3 scale. The criteria for caries diagnosis included non–cavitated (d_1 and d_2) lesions and cavitated (d_3) lesions.**Results:** Dental caries was recorded to be high (mean dmft for the total sample= 6.82), with only 16.87% of children were caries free. Distribution of caries (dt component) was slightly higher in the upper arch and the left side, with the second molars were recorded to be the most affected and the canines to be the least. The d_1–d_3 criteria of caries for the total sample clearly showed that d_2 lesions were the most common (47.24%), followed by d_3 and d_1 lesions (33.33% and 19.43% respectively).**Conclusions:** The high rate of dental caries recorded in this study for this young age has strongly emphasized the necessity of community–based preventive programs and professional care that should begin in the early childhood life. Also, the benefits of d_1–d_3 diagnostic criteria cannot be neglected.

Key Words: Caries prevalence, preschool children, d_1–d_3 criteria.

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INTRODUCTION

According to the World Health Organization (WHO) report, dental caries remains a major public health problem in most industrialized countries, affecting 60–90% of school children and the vast majority of adults. It is also the most prevalent oral disease in several Asian and Latin American countries.[1] Epidemiological surveys have shown that, in the last decade, caries experience in the primary dentition has ceased to decline in industrialized countries.[2–5]

Dental caries prevalence in some Middle Eastern countries showed staggering results. For example, in Saudi Arabia, in 73% of children aged 2–5 years caries was diagnosed;[6, 7] while in Damascus (Syria), only 10% of children aged 3–5 years showed evidence of baby bottle tooth decay.[8]

In Iraq, there is a marked deficiency of dental information on kindergartener. Most of the studies carried out were in the early 1980s and constricted to the Capital City. Only two studies carried out in Mosul City by Khamrco[9, 10] in the previous decade reported that more than 45% of children between 36–42 months develop caries.

During the last 10 years, there has been a great deal of discussion in the dental literature about the use of more sensitive diagnostic criteria for studies of dental caries that recognize dental caries as a process such that carious lesions are categorized into stages.[11, 12] Specifically, these discussions have emphasized the need for including what are termed "pre–cavitated" or "non–cavitated" lesions in caries criteria,[13, 14] and to that end, more sensitive criteria have been developed.[13, 15] These criteria, sometimes referred to as the D_1–D_3 scale[16] reflecting

the different "stages" of the caries process, were originally developed by WHO[15] and subsequently modified by Pitts[17] and Ismail.[13, 14] However, there have been paucity in published studies of the primary dentition using the d_1–d_3 criteria, so that little is known about the different stages of the caries process in the primary dentition.[11, 12]

This study was designed to determine the prevalence of caries in a random sample of children attending kindergartens in Mosul City, to assess caries pattern in the primary dentition and to evaluate caries according to d_1–d_3 criteria.

MATERIALS AND METHODS

A random sample of children was drawn from 4–5 years old attending kindergartens in Mosul City during the academic year 2001–2002. Approval for the study was obtained from the local authorities in the city and from the authorities of the kindergartens.

A total of 20 kindergartens (15 public and 5 private) was selected randomly from the two sides of the river Tigris, and they were from different socioeconomic and educational levels.

The parents of each child were sent detailed explanatory letters concerning the aims of the study and including their approval about participation. The letters also included questions about the child's exact birthday and his/her medical health. Each child, whom parents refused to participate or had a medical problem, was excluded from the study. So, the total sample consisted of 762 (403 males and 359 females).

Clinical examination was carried out in the classroom of each kindergarten under natural daylight. Caries was recorded in terms of decayed, missing and filled teeth index (dmft), using WHO recommendations for oral health surveys,[15] and the d_1–d_3 scale[16] for the decayed component of the index. The criteria for this scale included lesions with evidence of demineralization, but no loss of enamel structure (the d_1 classification); lesions with loss of enamel structure that are confined to the enamel layer only (the d_2 classification); and lesions with loss of enamel structure that penetrate into dentin; i.e., cavitation (the d_3 classification).[16]

Each child was examined supine by the researcher and data recorded by a trained assistant. Diagnosis was visualwith drying of the teeth by cotton rolls, minimal explorer probing by sickle–shaped caries explorer, and careful examination of enamel surface texture by plane mouth mirror and caries explorer. Rampant caries was defined as occurring when caries affected smooth surfaces of two or more maxillary incisors.[18]

Data were entered using Statistical Package for Social Sciences (SPSS) Data Entry software version 11.5 loaded on Pentium IV PC, and descriptive statistics were generated as frequencies and percentages.

RESULTS

From 762 children who participated in the study, only 15 (1.97%) refused to be examined. So, 747 children (396 males and 351 females) were actually represented the sample of the present study. The distribution of the sample according to gender was illustrated in Table (1), with mean age of the total sample being 4.51 years ($\pm$ 0.481 years).

Table (1): Distribution of the sample and mean age regarding gender

Gender	No. (%)	Mean Age (Years)	$\pm$ Standard Deviation
Male	396 (53.01)	4.523	0.485
Female	351 (46.99)	4.496	0.479
Total	747 (100)	4.510	0.481

The estimates of sample mean dmft and its components for males, females and the entire sample were depicted in Table (2). From which, it clearly noticed that the dt

component comprised the vast majority of the dmft index (dt/dmft= 0.990 for males and 0.979 for females), followed by mt component for males (mt/dmft= 0.007) and ft component for females (ft/dmft= 0.015).

Table (2): Mean dmft and its components for males, females and the total sample

Gender	Mean ± Standard Deviation						
	dmft	**dt**	**mt**	**ft**	**dt/dmft**	**mt/dmft**	**ft/dmft**
Male	6.92 ± 4.016	6.83 ± 3.935	0.07 ± 0.331	0.03 ± 0.172	0.990 ± 0.041	0.007 ± 0.031	0.002 ± 0.016
Female	6.69 ± 3.829	6.56 ± 3.838	0.04 ± 0.241	0.09 ± 0.507	0.979 ± 0.085	0.005 ± 0.031	0.015 ± 0.080
Total	6.82 ± 3.928	6.70 ± 3.890	0.06 ± 0.292	0.06 ± 0.370	0.985 ± 0.065	0.006 ± 0.031	0.008 ± 0.056

The mean dt component was slightly higher in the upper arch (3.76) than in the lower (2.94). The reverse is true for the mean ft component (0.02 and 0.04 for the upper and lower arches, respectively). This was clarified in Table (3).

Table (3): Mean dmft and its components for the total sample regarding upper and lower dental arches

Arch	Mean ± Standard Deviation						
	dmft	**dt**	**mt**	**ft**	**dt/dmft**	**mt/dmft**	**ft/dmft**
Upper	3.81 ± 2.677	3.76 ± 2.646	0.03 ± 0.208	0.02 ± 0.199	0.989 ± 0.067	0.004 ± 0.032	0.007 ± 0.058
Lower	3.00 ± 1.681	2.94 ± 1.673	0.03 ± 0.165	0.04 ± 0.259	0.982 ± 0.085	0.008 ± 0.044	0.010 ± 0.069

In the same way, the left side showed slightly higher mean dt and ft components

than the right side, as shown in Table (4) (3.29 and 0.02 in the right side, and 3.41 and 0.04 in the left side for the dt and ft components, respectively).

Table (4): Mean dmft and its components for the total sample regarding right and left sides

Side	Mean ± Standard Deviation						
	dmft	dt	mt	ft	dt/dmft	mt/dmft	ft/dmft
Right	3.35 ± 2.002	3.29 ± 1.999	0.03 ± 0.188	0.02 ± 0.199	0.984 ± 0.089	0.007 ± 0.042	0.009 ± 0.079
Left	3.47 ± 2.080	3.41 ± 2.061	0.03 ± 0.165	0.04 ± 0.243	0.984 ± 0.073	0.007 ± 0.038	0.009 ± 0.062

The pattern of dmft distribution (Figures 1, 2 and 3) revealed that second molars were the most affected teeth, followed by the first molars, whereas canines were the least affected. For the dt component, the second molars showed the highest score, followed by the lower first molars molars, upper centrals and upper first molars. On the other hand, the pattern of mt and ft components distribution revealed the molars to be the only involved teeth.

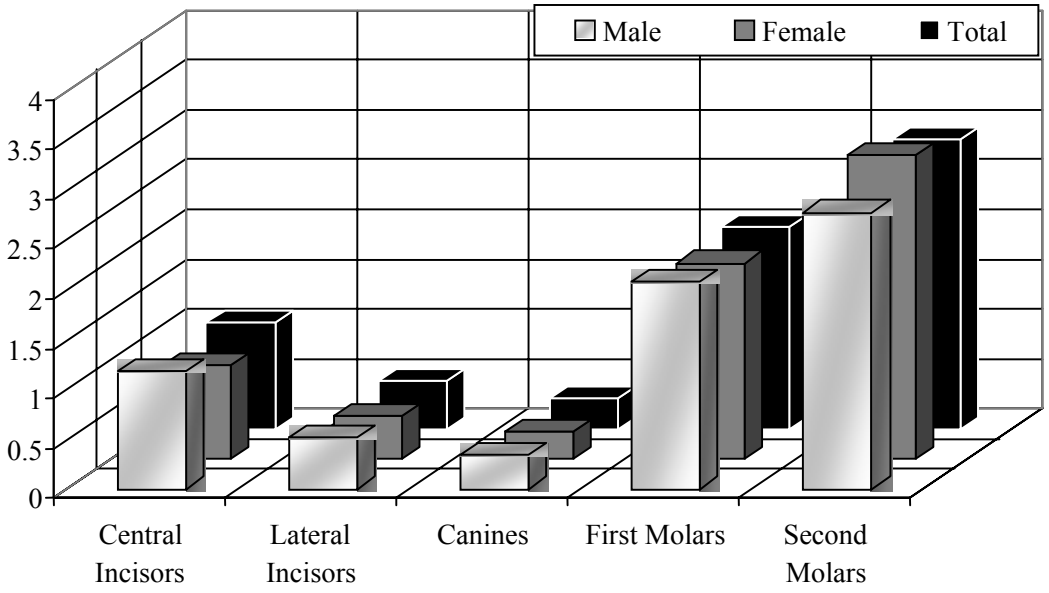

Figure (1): dmft for the total sample

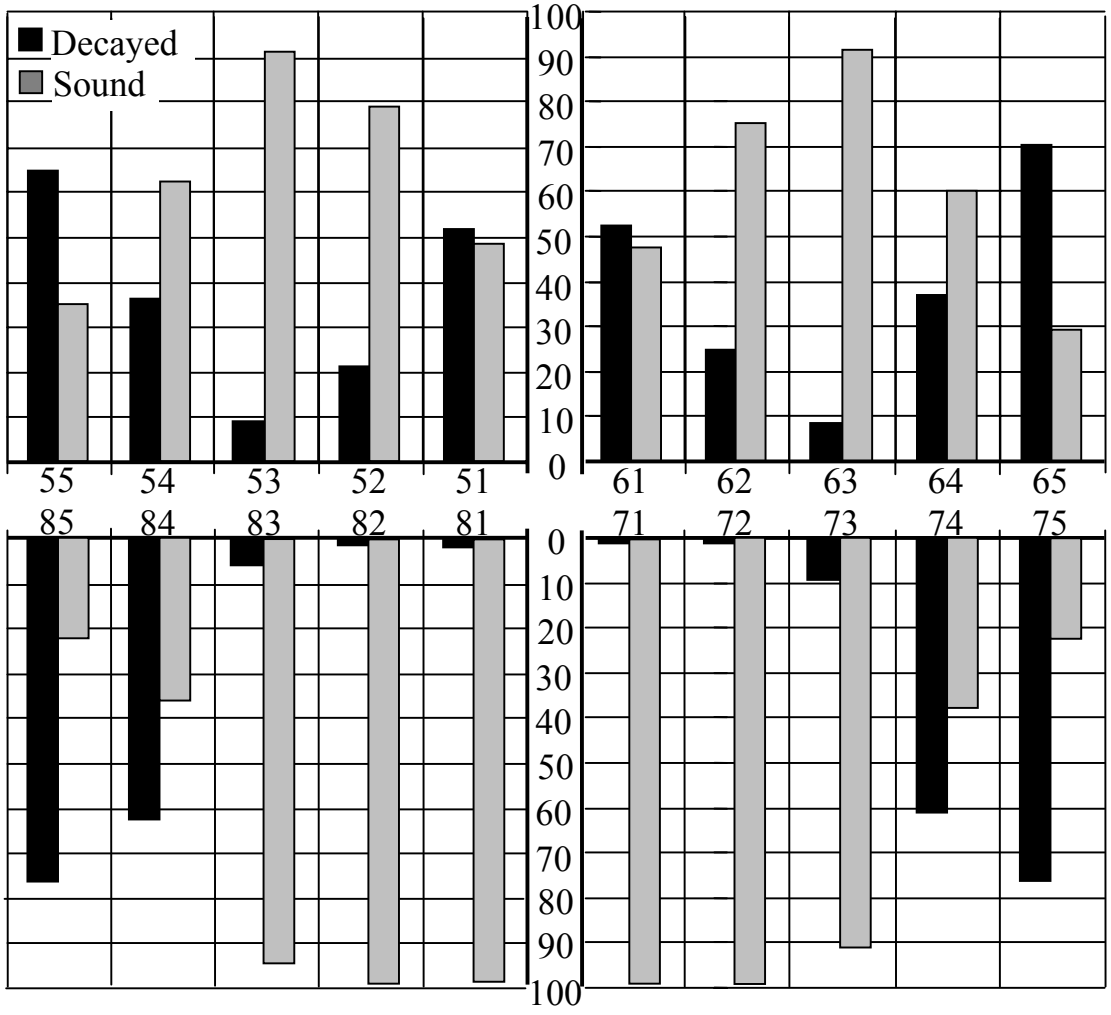

Figure (2): Percentage of decayed and sound teeth for the total sample

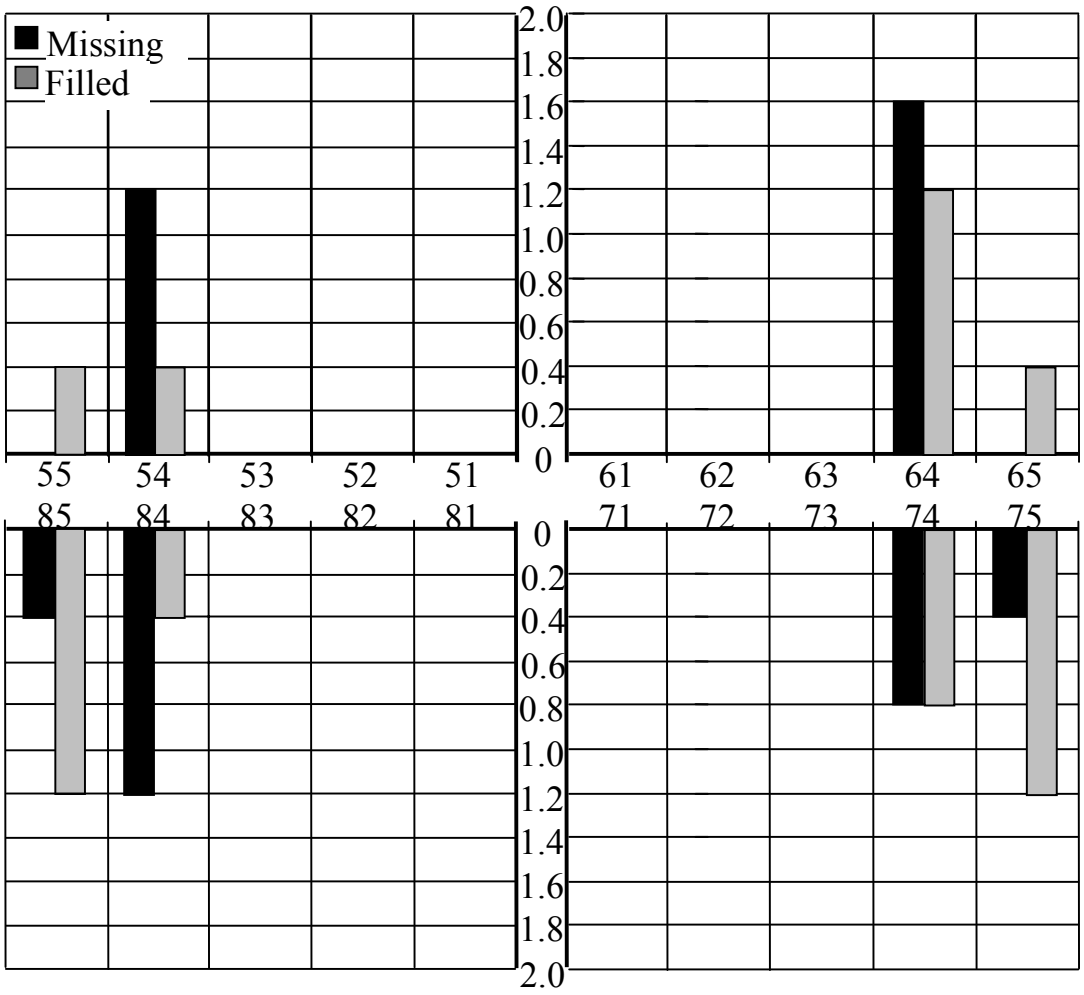

Figure (3): Percentage of missing and filled teeth for the total sample

Table (5) depicted the mean d_1, d_2 and d_3 lesions experience by both genders. For the total sample, d_2 lesions were most common (3.16), followed by d_3 (2.23) and d_1 lesions were the least (1.3).

Table (5): Mean and standard deviation of decayed criteria for males, females and the total sample

Lesion Criteria	Males	Females	Total
	Mean ± Standard Deviation		
d_1	1.33 ± 1.557	1.26 ± 1.331	1.30 ± 1.455
d_2	3.21 ± 2.425	3.11 ± 2.352	3.16 ± 2.390
d_3	2.28 ± 2.681	2.18 ± 2.918	2.23 ± 2.793

Figure (4) illustrated the prevalence of d_1, d_2 and d_3 lesions experience by individual primary teeth expressed as percentages. As a whole, d_2 lesions were the most com-

mon (47.24%), followed by d_3 lesions (33.33%), with d_1 lesions experienced the least common (19.43%).

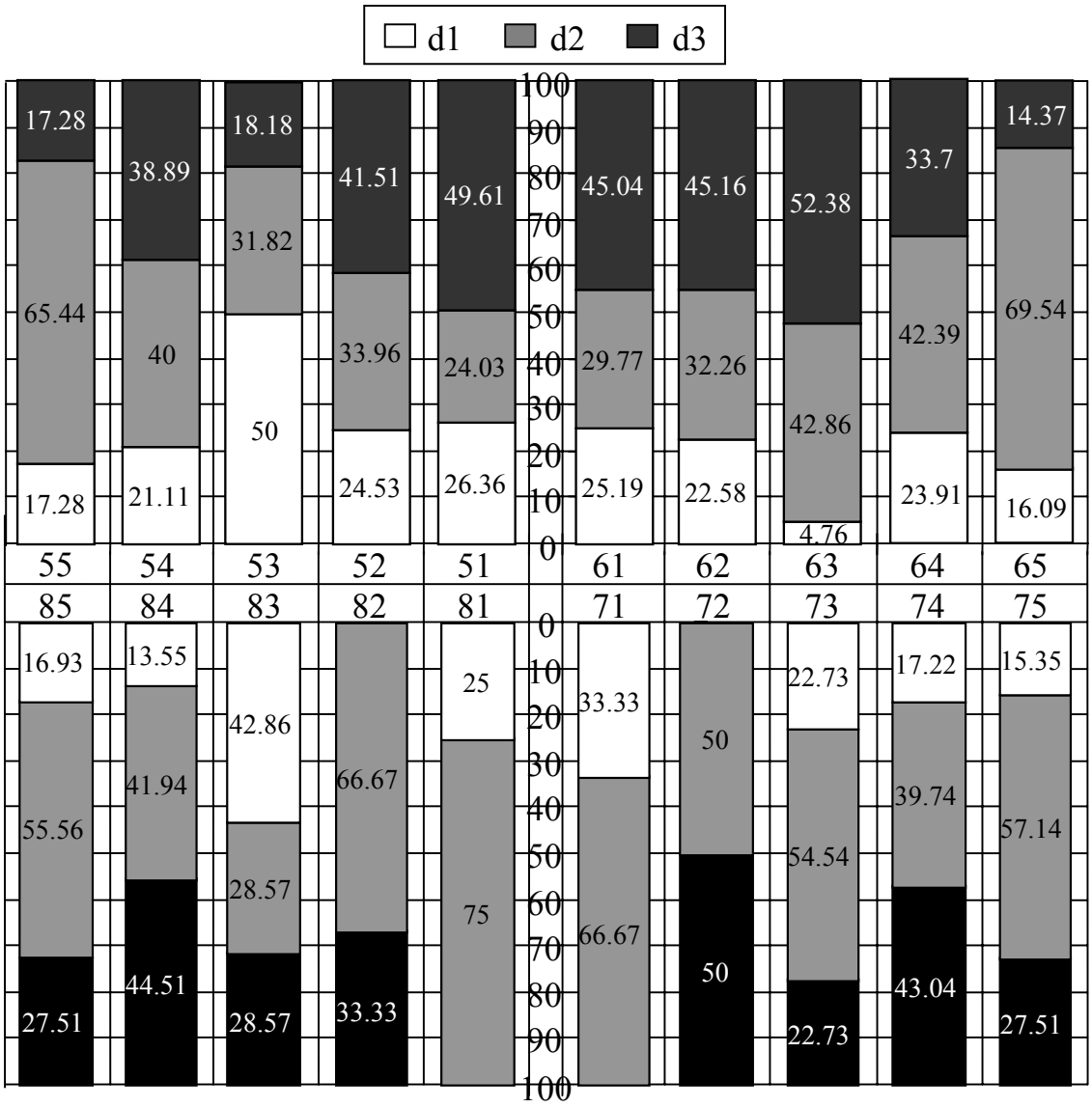

Figure (4): Percentage of d_1, d_2 and d_3 lesions by individual primary teeth

Finally, the percentage of caries–free children was 16.87% (i.e., 83.13% of children had caries), and that of children with rampant caries was 9.64%. These results were presented in Table (6).

Table (6): Numbers and percentages of caries–free children and those with rampant caries formales, females and the total sample

Children With		Males	Females	Total
Caries Free	**No.**	72	54	126
	%	18.18	15.39	16.87
Rampant Caries	**No.**	39	33	72
	%	9.85	9.40	9.64

DISCUSSION

This study documented widespread neglect of the oral health of preschool children in Mosul City. Untreated decayed teeth dominated the dmft score among the children in this study, indicating a high rate of unmet treatment needs. Additionally, this study provided information on the caries status of preschool children in age group not included in the national surveys.[19]

The results of this study (83.13% of children had caries) were comparable to other studies carried out in other countries. For example, a study carried out in the Philippines among 5–6–year–old children in 1992 found that the prevalence of dental caries was 95% and 94% in 1998.[19] In Thailand, the proportion of caries–free children was 12.5% in 2001.[20]

Further studies showed different results, as those carried out in Zimbabwe[21] and Madagascar,[22] which found the prevalence rate to be ranged between 25% to 85%, respectively. In Uganda, a previous study conducted in 1999 reported caries prevalence among 5–7 years old children to be 5.95,[23] and a more recent study recorded 62–64% caries rate among 3–5 years old children.[24]

On the other hand, the results of the present study were in contrast to those reported by Khamrco[9, 10] (as he reported that more than 45% of children between 36–42 months developed caries). The main reason was the difference in the index used to assess the prevalence of dental caries (def index was used in Khamrco's studies and dmft index in the present study). In addition to that, the age of children in Khamrco's studies (36–42 months) was younger than the age of children represented the present study.

The results of this study strongly supported the existence of patterns of caries in the primary dentition of preschool children. Other studies,[11, 25] which demonstrated that the greatest caries experience on the second molars were in accordance with those of the present study. The difference between first and second molars caries pattern may be related to the anatomical differences between these teeth which may create a slight differential susceptibility to caries, and this also may be an operative factor in differences between upper and lower molars observed in this study.[26]

Because of the limited number of studies assessing dental caries prevalence in the primary dentition, particularly studies that included non–cavitated lesions, making comparisons to other studies difficult. Pitts *et al*.[25] found that 47% of 4–year–olds had d_1 caries, a considerably greater percentage than in the present study (19.43%). Also, a study using different gradients of caries diagnostic criteria in 5–year–olds in Norway[27] reported much greater caries experience than in the present study, but the Norwegian study utilized radiographs and somewhat different criteria, so that comparisons must be made with caution. In contrast, Warren *et al*.[11] reported a comparable results with the present study as they demonstrated that 22% of 4–5 years old children had d_1 lesion.

The d_1–d_3 criteria advocate many advantages over the caries criteria used in the past. These include a better means of estimating the need for and recommending appropriate preventive and restorative treatment measures, a more sensitive measure of assessing change in caries status and better means of predicting future caries.[11, 13, 17, 25]

As a general, the high rate of unmet unmet treatment needs among preschool children observed in this study has been attributed to (a) a lack of community awareness and understanding that prevention and treatment of caries should begin in early childhood, and (b) parental indifference and belief that the primary teeth are replaceable by permanent teeth.[19]

CONCLUSION

The results of the present study clearly demonstrated that caries prevalence is high in preschool children in Mosul City Center, indicating the need for improvement in the public oral health system, including accessibility to preventive and treatment services for preschool children.

This study also evaluated the informative and usefulness of d_1–d_3 diagnostic criteria for assessing dental caries in the primary

dentition. The d_1–d_3 criteria have promise for future studies in that these more sensitive criteria offer several advantages described earlier.

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