

# Caries prevalence, severity and pattern in pre-school children

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## ABSTRACT

**Objectives:** To determine the prevalence, severity and pattern of caries in preschool children of Al-Ahsa, Kingdom of Saudi Arabia.

**Methods:** Three hundred and twenty two randomly selected pre-school children were examined in kindergartens of Al-Hasa, Kingdom of Saudi Arabia for dental caries using World Health Organization criteria for the diagnosis of caries. The study was completed in 2000.

**Results:** The mean decayed missing and filled teeth score in the 322 pre-school children examined was 2.92 (standard deviation 3.51) with decay component as the major contributor in the decayed missing and filled teeth score. The difference between mean decayed missing and filled teeth scores was not significant in relation to gender, type of kindergarten (government or private) and area (urban or rural). The difference between mean decayed missing and filled teeth scores of 4-year-old and 5-year-old children was statistically significant. Of the 322 children examined, 202 (62.7%) were caries positive.

There was no significant difference for caries prevalence in relation to gender, type of kindergarten and area. But, the difference in caries prevalence between various age groups was statistically significant. The mandibular first molars were the most carious teeth followed by mandibular 2nd molars and maxillary central incisors. The least affected teeth were mandibular central incisors.

**Conclusion:** The mean decayed missing and filled teeth score and caries prevalence in the studied pre-school children is high as compared with children from developed countries. A major decay component indicates a high percentage of untreated caries. A high percentage of carious maxillary incisors indicate a nursing caries pattern.

**Keywords:** Caries, prevalence, severity, pattern, pre-school children.

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The reports on dental caries in Saudi adults and school children have been published recently,<sup>1,2</sup> but there is a scarcity of similar information in pre-school children. This is probably related to difficulty of access to the pre-school age group. Moreover, most dental professionals perceive the dental examination of pre-school children as a challenging task. However, the need for data on dental health of pre-school children remains important. The pre-

school caries prevalence studies were initially carried out in the United Kingdom.<sup>3,4</sup> Since then, prevalence studies had been carried out in most parts of the developed countries.<sup>5,6</sup> Reports from developed countries indicate a low prevalence and severity of dental caries. In Germany, Grindejford et al<sup>7</sup> reported a prevalence of 11.7% in 30-month-old children. In England, Hinds and Gregory<sup>8</sup> had reported a

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prevalence of 17% in 2 1/2 to 4 1/2 year-old children with an average decay of 1.3. There are few pre-school caries studies in the developing countries as compared with the developed countries.<sup>9-11</sup> The studies in developing countries mostly report a high prevalence of caries in pre-school children. Stephen<sup>12</sup> in his worldwide review has summarized the prevalence of caries in young children in various parts of the world. It can be noted from his review that studies from the majority of the developing countries report a caries prevalence of higher than 50%. In the Middle East Region, several studies had been reported on caries in pre-schoolers. Al-Mughery et al<sup>13</sup> in a study of 5-year-olds in the United Arab Emirates reported a caries prevalence of 78% with mean decayed missing and filled teeth (dmft) score of 5.1. Janson and Fakhouri<sup>14</sup> reported a caries prevalence of 72% in Jordanian 3 to 6-year-olds, with 50% of the children with a dmft of 4.0 or above. In the Kingdom of Saudi Arabia (KSA), Nainar and Wyne<sup>15</sup> in their study of caries pattern in high dmft pre-schoolers concluded that caries pattern in these children was predominantly of maxillary incisor caries type with posterior decay. Wyne et al<sup>16</sup> in their study of caries prevalence and pattern in Saudi pre-schoolers of Riyadh, KSA area had reported a caries prevalence of 74.6% with a dmft of 5.28. Nursing caries pattern was present in 9.2% children. There have been no reports on the dental caries in pre-school children of Al-Ahsa, KSA area. The objective of the study was to determine the prevalence, severity and pattern of caries in preschool children of Al-Ahsa, KSA.

**Methods. Sampling procedure.** According to the 1972 Census Report, the population of 3 to 5-year-old children in Al-Ahsa, KSA, was 26,110.<sup>17</sup> At the time of the study, a summary report of 1993 census was also available showing the total population of various administrative regions and big cities categorized by gender.<sup>18</sup> Utilizing the 1972 and 1993 information, a population growth rate of 3.1% was determined for Al-Ahsa area. Applying the above growth rate, the population of 3 to 5-year-old was estimated to be 50,763. A study by Wyne et al<sup>16</sup> has reported a mean dmft of 5.28 [standard deviation (SD) 4.8] in pre-school children of Riyadh, KSA region. This was the only and most recent study found in literature for Saudi pre-school children. Therefore, the SD of this study was used to determine the sample size for Al-Ahsa area. Using the sample size formula for mean,<sup>19</sup> the sample was calculated as 322 with confidence interval of 95% and maximum error of 0.5 dmft. There were 36 kindergartens in Al-Ahsa at the time of the study. The kindergartens are supervised by the Ministry of Social Work (MSW), Presidency of Girls' Education (PGE) and by private administrators. The MSW controls 19 and PGE controls 5 kindergartens, while

9 are privately supervised. Al-Ahsa area has 2 urban centers namely Hofuf and Al-Mubarraz, with surrounding rural towns. Ten kindergartens were randomly selected for the study according to the population distribution using stratified cluster sampling. All the children in the cluster were screened according to the technique of the stratified cluster sampling. Out of the 10 selected kindergartens, 5 came from Hofuf urban area, 3 from Mubarraz urban area and 2 from rural area. Six kindergartens were government controlled and 4 were privately controlled.

**Dental examination.** The children with complete primary dentition were examined for caries and any child with a permanent tooth erupted was excluded. The World Health Organization (WHO) criteria was utilized for the diagnosis of caries.<sup>20</sup> Each child was examined either sitting on a portable dental chair, on the lap of the parent or knee to knee position depending on the behavior and age of the child. Natural light and disposable mirror heads were used for the examination. The probe was used sparingly on doubtful surfaces. In case of any doubt the tooth was marked sound. No radiographs were taken.

**Examiners' calibration.** Two examiners were trained and calibrated by a senior faculty member from King Saud University College of Dentistry, KSA, who was also designated as a reference examiner.

**Inter-examiner reliability.** A very high degree of agreement (95.1% for the first examiner and 96.2% for the 2nd examiner) was demonstrated between the reference examiner and the 2 field examiners using Kappa Methods.

**Intra-examiner reliability.** Ten percent of the sample was re-examined by each examiner. The intra-examiner reliability was very high (98.9% for the first examiner and 94.8% for the 2nd examiner) using Kappa Methods.

**Data analyses.** Statistical Analyses System (SAS) was utilized to determine the descriptive and analytic statistics. The t-test and analysis of variance were used to test the mean dmft difference between groups. Chi-square test was employed to test the relationship of gender, area and age with caries prevalence.

**Results. Caries severity and prevalence.** The mean dmft in the 322 pre-school children examined was 2.92 (SD 3.51) with the decay component as the major contributor in the dmft score (**Table 1**). Out of 322 pre-school children examined, 164 (50.9%) were male and 158 (49.1%) female with a mean dmft of 3.12 (SD 3.65) and 2.72 (SD 3.35) respectively. The difference between mean dmft of the male and female children was not significant (**Table 1**). Similarly, there was no significant difference in dmft scores of children from private and government kindergartens (**Table 1**). Of the 322 pre-school

children examined 27 (8.4%) were 3-year-olds, 130 (40.4%) were 4-year-olds and 165 (51.2%) were 5-year-olds. The difference between mean dmft scores of the 4-year-old and 5-year-old children was statistically significant (**Table 2**). There were 242 (75.1%) children from urban (Hofuf and Mubarratz) areas and 80 (24.9%) from the rural area. The difference between mean dmft scores of children from urban and rural areas was not significant (**Table 3**). Out of 322 pre-school children examined 202 (62.7%) were caries positive (**Table 4**). Among the male children 106 (64.6%) were caries positive while 96 (60.8%) were caries positive in female children. The difference between the male and female children was not statistically significant. Similarly, there was no significant difference in caries prevalence between children from urban and rural areas. The prevalence of caries was higher in older children and the difference between caries prevalence of various age groups was statistically significant. No significant difference in caries prevalence was found between children of private and government kindergartens (**Table 4**).

**Caries pattern.** The mandibular first molars were the most carious teeth followed by mandibular second molars and maxillary central incisors. The least affected teeth were mandibular central incisors (**Table 5**). Among the maxillary teeth, central incisors were most carious followed by first molars. The least affected maxillary teeth were canines. Among the mandibular teeth, first molars were the most carious followed by second molars. The least affected mandibular teeth were central incisors (**Table 5**).

**Discussion.** The present study has provided important baseline data on caries prevalence and severity in pre-school children of Al-Ahsa area. The information on caries prevalence and severity will assist in determination of caries treatment needs and magnitude of preventive efforts required in the study population. The knowledge of caries pattern will help clinicians in formulation of treatment and preventive strategies. These type of studies need to be carried out regularly to monitor the effectiveness of present dental health services and, to determine any required reinforcements. The dmft score and caries prevalence in the study of pre-school children were considerably lower as compared with pre-school children of Riyadh, KSA<sup>16</sup> and other parts of the Middle East.<sup>13,14</sup> Nevertheless, the situation could not be termed as satisfactory, especially compared with results of the studies from developed countries.<sup>7,8</sup> The fact that approximately three quarters of the study children had clinical caries and that on average each child had 3 carious teeth, indicates an immediate need for enhanced preventive efforts. A major decay component indicates a high percentage of untreated caries.

There was no significant difference between dmft score and caries prevalence in relation to gender, area (urban or rural) and the type of kindergarten (government or private). This could be attributed to a short period of time, the pre-school children are exposed to socioeconomic and behavioral caries risk factors. As the children grow and remain exposed to the caries risk factors, caries prevalence and severity increases. It was evident in the form of higher dmft scores and prevalence among older children in this study. The caries risk factors related to gender, area and other social factors may become important with time. A significant difference in caries prevalence had been reported in relation to gender and area of residence among school children in Al-Ahsa area.<sup>21</sup>

Information on the caries pattern in a population assists in understanding the disease manifestation and appropriate preventive and treatment planning. The caries pattern in the study population especially the high percentage of carious maxillary incisors and lack of involvement of mandibular incisors point towards nursing caries pattern. Mandibular first molars have the highest caries prevalence. This is similar to a previous report in Saudi pre-school children of Riyadh, KSA,<sup>15</sup> and in Tanzanian pre-school children.<sup>22</sup>

It could be derived from the above results and discussion that further efforts are required in prevention and treatment of dental caries in pre-children of Al-Ahsa area. There is a high percentage of untreated caries requiring immediate attention. The authors recommend that the existing workforce be provided with training in prevention and treatment of dental disease in young children. The staff should be encouraged to participate regularly in continuing dental education programs in pediatric dentistry. Mobile dental clinics may be utilized for remote and small villages where a conventional dental set-up is not possible. There is a need for initiation of a special dental service for young children with the sole aim of improving the dental health of young children of Al-Ahsa area.

In conclusion, the dmft score and caries prevalence in the study of pre-school children were lower as compared with pre-school children of developing countries, but higher as compared with the developed countries. A major decay component indicates a high percentage of untreated caries. There was no significant difference between dmft score and caries prevalence in relation to gender, area (urban or rural) and the type of kindergarten (government or private). The high percentage of carious maxillary incisors and lack of involvement of mandibular incisors points towards nursing caries pattern. The mandibular first molars were the most carious followed by mandibular 2nd molars and maxillary central incisors. The least affected teeth were mandibular central incisors.

**Table 1** - Caries experience (decayed missing and filled teeth) in relation to childrens' gender and type of kindergarten.

Caries experience	Gender			Type of kindergarten			Total
	Male	Female	P value	Private	Government	P value	
N	164	158	-	98	223	-	<b>322</b>
Decay	2.79 ± 3.46	2.43 ± 3.25	0.333	2.77 ± 3.67	2.53 ± 3.21	0.562	<b>2.62 ± 3.36</b>
Missing	0	0.05 ± 0.08	0.319	0	0.01 ± 0.07	0.318	<b>0.01 ± 0.06</b>
Filled	0.21 ± 0.82	0.18 ± 0.67	0.718	0.19 ± 0.79	0.19 ± 0.73	0.991	<b>0.19 ± 0.75</b>
dmft	3.12 ± 3.65	2.72 ± 3.35	0.314	3.05 ± 3.72	2.85 ± 3.41	0.633	<b>2.92 ± 3.51</b>
N - number, dmft - decayed missing and filled teeth							

**Table 2** - Caries experience (decayed missing and filled teeth) in relation to age of the children.

Caries experience	3 years N=27	4 years N=130	5 years N=165
Decay	2.00 ± 2.66	2.02 ± 2.78	3.19 ± 3.77
Missing	0	0	0.01 ± 0.08
Filled	0.04 ± 0.12	0.19 ± 0.82	0.22 ± 0.75
dmft	2.15 ± 2.82	2.35 ± 3.15	3.50 ± 3.78
Analysis of variance for dmft: P value = 0.0098. The significant difference is between 4 and 5 year old, N - number, dmft - decayed, missing and filled teeth			

**Table 4** - Prevalence of caries by gender, age area and type of kindergarten.

Demographic variable	Caries free N (%)	Caries positive N (%)	Total N (%)	P value
Gender				
Male	58 (35.4)	106 (64.4)	<b>164 (50.9)</b>	0.472
Female	62 (39.2)	96 (60.8)	<b>158 (49.1)</b>	
Age				
3 years	13 (48.1)	14 (51.9)	<b>27 (8.4)</b>	0.008
4 years	59 (45.4)	71 (54.6)	<b>130 (40.4)</b>	
5 years	48 (29.1)	117 (70.9)	<b>165 (51.2)</b>	
Area				
Hofuf urban	62 (40.3)	92 (49.7)	<b>154 (48)</b>	4.437
Mubarraz urban	33 (37.5)	55 (62.5)	<b>88 (27.4)</b>	
Rural area	25 (31.7)	54 (68.4)	<b>79 (24.6)</b>	
Kindergarten				
Government	80 (35.9)	143 (64.1)	<b>223 (69.5)</b>	0.399
Private	40 (40.8)	58 (59.9)	<b>98 (30.5)</b>	
<b>Total</b>	<b>120 (37.3)</b>	<b>202 (62.7)</b>		
N - number				

**Table 3** - Caries experience (decayed missing and filled teeth) in relation to area of kindergarten.

Caries experience	Hofuf urban N=154	Mubarraz urban N=88	Rural area N=80
Decay	2.64 ± 3.46	2.52 ± 3.52	2.61 ± 2.98
Missing	0.01 ± 0.08	0	0
Filled	0.19 ± 0.77	0.27 ± 0.96	0.10 ± 0.34
dmft	2.94 ± 3.58	2.90 ± 3.62	2.87 ± 3.25
Analysis of variance for dmft: P value = 0.9856. N - number, dmft - decayed, missing and filled teeth			

**Table 5** - Tooth-specific caries prevalence.

Tooth	Maxillary		Mandibular	
	Right %	Left %	Right %	Left %
Central incisor	24.2	24.5	2.2	1.9
Lateral incisor	11.5	10.5	3.1	3.1
Canine	4	2.8	7.5	7.7
First molar	17	16.4	32.9	34.1
Second molar	18.6	17.4	30.5	32

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