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RESEARCH ARTICLE

Prevalence of dental caries and its association with Snyder test among preschool children in anganwadis of a North Indian city

Raj Sonika, Sonu Goel , Sharma Vijaylakshmi, Naveen Kishan Goel

Abstract

Background: Dental caries not only causes damage to the tooth, but is also responsible for several morbid conditions like tooth loss before time which results in malocclusion, inferiority complex and malnutrition. **Objectives:** 1. To assess the prevalence of dental caries among preschool children attending *anganwadi* centres 2. To study the association of dental caries and Snyder's test. **Methods:** A cross sectional study was conducted among the *anganwadis* of Chandigarh, India in October 2010. 495 children aged 3 to 6 from 21 *anganwadis* were selected using simple random sampling. Dental caries was recorded using the decayed, missing, filled teeth (dmft) index. The mothers were also interviewed regarding oral habits of their children. Samples of saliva (0.2 ml) of children of Anganwadi Centres (AWC) were taken in sterile tubes with Snyder test agar media to detect caries activity. **Results:** The prevalence of caries in the study population was found to be 48.3 % (n=258). The prevalence of dental caries was maximum (63.2%) in 5-6 year age group. 47.2% children reported brushing once daily. Mean dmft score in the population was 2.1 ± 3.20 . Caries activity was found in 48% (n=240) of total children examined. **Conclusion:** The study has revealed that preschool children not only have high incidence of caries but also high susceptibility of caries in future life. Snyder test is a simple and cost-effective test to determine the caries susceptibility among children. It should be introduced as a part of routine assessment of dental health examination of pre-school children.

Keywords: Prevalence; Dental Caries; Snyder test; Association.

Introduction

Dental caries is an important public health problem and is the most prevalent oral disease among children in the world (1). In India, the prevalence of caries among preschool children was found to be in range of 40-70% (2-5). The disease not only causes damage to the tooth, but is also responsible for several morbid conditions of the oral cavity and other systems of the body (6). This high prevalence of dental caries results in the absenteeism of school hours and loss of working hours and economic

loss for the parents. This has further caused an increase in tooth loss before time, resulting in malocclusion, inferiority complex and subsequently leads to malnutrition (7). If a high risk group of children with primary tooth caries can be identified and characterized, it would be useful to apply preventive measures to children with elevated risk. So the present study was conducted to assess the prevalence of dental caries among preschool children attending *anganwadi* centres and to ascertain the relationship between oral health habits and

dental caries of preschool children and to study the association of dental caries (by oral examination) and Snyder test.

Methods

The cross sectional study was conducted among *anganwadis* of Chandigarh in 2010. There are 423 *anganwadis* in Chandigarh divided into 3 projects catering to around 35000 preschool children (8). The sample size for the study has been determined by EPI-INFO WHO package. Taking alpha error to be 0.05 (likelihood of association by chance alone as less than 5%) and beta error 0.20 (i.e. statistical power of the study as 80%), and prevalence of dental caries as 40% and taking 10% as no response rate, a total of 495 children were taken for the study. Assuming that an *anganwadi* will contain around 20-25 children in the age group of 3-6 years, a total of 21 *anganwadis* were included in the study. Simple random sampling technique was used for selection of AWC (*anganwadi* centres) from 3 projects, 7 from each project (n=21). All the children aged 3-6 years attending the AWC on the date of visit, whose parents consented for the study were included. The children absent on the day of visit or those < 3 years or > 6 years or whose parents denied consent were excluded from the study. The consent of the Project Officer, Integrated Child Development Services (ICDS) and Medical Officer, ICDS, Chandigarh was obtained prior to the study. Informed verbal consent was also taken from the *anganwadi* workers (AWW).

Data was analyzed using the software SPSS-version 16. A pretested structured proforma for

estimation of dental morbidity was used. Halitosis was recorded during the oral examination. If the child had foul breath at time of examination it was considered as positive for halitosis. Only habit of thumb sucking was considered. Presence of plaque was seen on upper anterior teeth only. The explorer was passed over the labial surface of anterior teeth and if plaque present only on gingival one third then considered as stage 1, if extended to middle one third then stage 2 and if covering incisal one third area also then it was taken as stage 3. Proforma for recording of Snyder test was also used.

For collection of data, the AWC were visited and *anganwadi* workers (AWW) were explained about the nature and purpose of the study. Caries was recorded based on dmft (decayed, missing, filled teeth) index using codes and criteria as described by WHO (9). The mothers were also interviewed regarding oral habits, frequency of brushing, rinsing, medium for cleaning teeth of their children. Socioeconomic status was classified according to revised Kuppaswamy's socio-economic status criteria (10).

Collection of saliva for Snyder's test -Samples of saliva (0.2 ml) of children of AWC were taken in tubes with Snyder test agar media to detect caries activity. The media contains peptones as sources of carbon, nitrogen, vitamins and minerals. Dextrose is the carbohydrate. Bromocresol green is the pH indicator. Microorganisms that use the dextrose in the medium acidify the medium and the pH indicator, bromocresol green, changes color from

blue-green to yellow. The tubes were then transported back to laboratory and incubated at 37degree C. The readings were taken at 24, 48, 72 and 96 hrs to detect the colour change in media (11).

Results

Out of total children examined, 271(50.7%) were males and 263(49.3%) females (Table-1).The prevalence of caries in the study population was found to be 48.3 % (n=258).The prevalence of caries was maximum (63.2%) in the 5-6 year age group.

Table1:Demographic information of the study subjects.

Age Group	N	%
3-4	259	48.5
4-5	188	35.2
5-6	87	16.3
Gender		
Female	263	49.3
Male	271	50.7
Socio-economic Status		
Upper	1	0
Upper Middle	17	3
Lower Middle	87	16
Upper Lower	415	78
Lower	14	3
Residential Setup		
Urban	252	48
Peri Urban	124	23
Rural	152	29

The mean dmft score of study population was slightly higher in males (2.14) as compared to females (2.08) but the difference was not found to be statistically significant (p = 0.806).There were no cases of filled teeth in any of the

children examined. The dmft per affected child was highest (4.74) in age group of 4-5 years and difference was found to be statistically significant (p = 0.000). The dmft score was highest (2.25) in urban settings and in lower strata (3.50) but the difference was insignificant (p = 0.438) (Table-2).

Table2: The dmft and mean dmft scores of the study population (n=534).

Age Group	DMFT Mean±SD	Children with decayed teeth		P value
		N	%	
3-4	1.53±2.77	97	37.4	0.000*
4-5	2.72±3.67	106	56.3	
5-6	2.53±3.00	55	63.2	
Gender				
Female	2.08±3.23	118	44.8	0.806
Male	2.14±3.17	139	51.2	
Setup				
Urban	2.25±3.51	124	48.1	0.438
Peri urban	2.15±2.99	67	54.1	
Rural	1.84±2.77	73	48	
Socio-economic status				
Upper	-	0	0	0.642
Upper Middle	1.94	7	41.1	
Lower Middle	1.85	39	44.8	
Upper Lower	2.13	202	48.6	
Lower	3.50	10	71.4	

The primary mandibular left second molar (25.3%) was most affected followed by mandibular right second molar (24.5%). Around

47.2% children reported brushing once daily while 15% children had never brushed their teeth. Majority of them (n=455, 85.2%) used toothbrushes for cleaning. However, there was no significant association between the frequency of brushing and rinsing of mouth with prevalence of caries among children examined.

It was also found that 282 children (52.8%) claimed not to rinse their mouth post meals or post snacks. Stage-1 plaque accumulation was present in 75.5% children. Presence of oral habit (thumb sucking) was noted in 8.6% children (Table-3).97% of children had healthy gums.

Table 3: Distribution of oral diseases and habits among children examined.

Presence of Oral diseases/habit	Frequency	%
Debris	418	78.3
Halitosis	229	42.9
Fluorosis	30	5.6
Plaque		
Stage 1	403	75.5
Stage 2	113	21.2
Stage 3	4	0.7
Oral habit (thumb sucking)	46	8.6
Gingival Health Status		
Healthy	519	97.2
Bleeding	9	1.7
Calculus	6	1.1

Snyder test was performed to confirm caries activity among children, which was found positive in 48% (n=240) children. It could be conducted in 499 children only as 35 children did not spit the adequate amount of saliva. Around 15% (n=75) children were found to be

highly caries active while 20.2% (n=101) were moderate active (Table-4).The difference was found to be statistically significant (p<0.01).

Table 4: Association of Snyder test results (n=499) with socio-demographic profile of study subjects.

Domains	Snyder's Test Results*				Total
	24 hrs(+)	48 hrs(+)	72 hrs(+)	72 hrs (+)	
	N (%) High caries activity	N (%) Moderate caries activity	N (%) Low caries activity	N (%) No caries activity	
Socio economic status					
Upper	0 (0.0)	0 (0.0)	0(0.0)	1(100.0)	1
Upper Middle	3 (17.6)	5(29.4)	0(0.0)	9(52.9)	17
Lower Middle	11(12.6)	16(18.3)	14(16.0)	46(52.8)	87
Upper Lower	59(15.4)	80(20.8)	50(13.0)	195(50.7)	384
Lower	2(20.0)	0(0.0)	0(0.0)	8(80.0)	10
Location					
Urban	49(19.8)	35(14.2)	29(11.7)	134(54.2)	247
Peri urban	30(24.4)	19(15.4)	15(12.1)	59(47.9)	123
Rural	20(15.5)	30(23.3)	14(10.8)	65(50.4)	129
Age					
3-4	37(14.9)	34(13.8)	32(12.9)	144(58.2)	247
4-5	40(23.1)	36(20.8)	17(9.8)	80(46.2)	173
5-6	22(27.8)	14(17.7)	9(11.3)	34(43.0)	79
Gender					
Female	44(17.9)	42(17.1)	72(29.3)	87(35.5)	245

*p< 0.05 between various domains of variable across different timings

Discussion

Although dental caries has been declining globally in adult population, the caries prevalence in younger ones has not shown a significant decline. Most of the surveys have targeted either adult population or school going children for measurement of dental caries. The present study among preschool children showed the prevalence of dental caries as 48.3%. The findings of present study are comparable with other studies done on oral health status of preschool children in India and abroad. The National Oral Health Survey conducted in 2004 in India has shown prevalence of dental caries as 50.0% in 5 year-old children (3). A study by Mandal et al in the Eastern states of India showed the prevalence of 52.4%, 56.0%, and 61.8% in West Bengal, Orissa and Sikkim respectively (5). Prevalence of caries was 44% in children aged below 4 years in Kerala (2). A study among 1500 children by Mahejabeen et al showed the prevalence of dental caries as 54.1% in the age group of 3-5 years of Hubli -Dharwad city (12). The prevalence of dental caries in the primary dentition among 5 year old children of urban Pondicherry was 44.4% (13). However, few studies in India have shown higher prevalence of dental caries in preschool children. A study done among children aged 3-5 years of *anganwadi* in Mangalore showed higher prevalence of dental caries as 81.4 (14). Karnataka, prevalence of dental caries among preschool children was found to be higher (81.2%) (15). The prevalence of dental caries was found to be 61.4% in children aged 5-6 years of Akola city(4) The higher prevalence of dental caries among preschool children in India may be due to lack of awareness about importance of oral health and

also due to unavailability and non-affordability of dental services. Very few studies in India has shown prevalence of caries below 40%.Tewari et al in 509 primary school children of age group of 3-7 years in Haryana showed slightly low prevalence of caries of 33.8% (16).The study by Shang et al in China, in age group of 2 to 6 years showed prevalence of dental caries of 53% (17). Another study in Miranda, Venezuela indicated higher prevalence of dental caries as 64.4%, 72.8 and 72.8% in children with 4, 5 and 6 years of age respectively (18). The prevalence of caries was also found to be high (62.7%) in preschool children in Saudi Arabia (19).The high prevalence of dental caries abroad may be due to more consumption of refined food in this urbanized society.

In India, a study by Jose and King on early childhood caries lesions in children below 4 years in Kerala showed that the mean dmft was 2.87 (2). According to National Oral Health Survey 2004, mean dmft in 5 years old children was 1.9 (3). The cohort study conducted by Chawla et al showed the mean dmft of 2.69 in 5-6 year old children (20). In contrast study done among children aged 3-5 years of *anganwadi* in Mangalore showed higher mean dmft of 4.62 (14). Goel et al in a study amongst preschool children of Karnataka found mean dmft as 4.86 (15). However, fewer studies in India have shown mean dmft to be 0.73 in children of age group of 3-7 years in Haryana and prevalence of filled teeth was only 1.2% (16). The reason for higher dmft score could be due to unavailability and non-affordability of dental services in most rural parts of country. Similar results were also found in a study in Saudi Arabia which showed the mean dmft score of 2.92 with

primarily decay component (19). The study by Shang et al in China also showed higher prevalence of decayed teeth (17). The mean dmft was higher (3.2) in preschool children in Miranda (18).

The present study showed no significant difference between genders in caries prevalence although males showed a little higher prevalence. The present study showed that the mean dmft score of children was 2.1, with decay component as major contributor. A study done in Miranda showed that the mean dmft for boys (3.6) was higher as compared to girls (3.2) for same age while mean dmft was higher for age group of 5 years (18). A study by Wyne et al stated that difference between mean decayed, missing and filled teeth score was not significantly related to genders (19). The study by Shang et al in China, in age group of 2 to 6 showed that there was no statistical difference in the prevalence of caries between boys and girls though there were significant differences between different age groups (17). In a study conducted by Mandal et al in the Eastern states of India showed that the dental caries was higher in children aged 5-6 year (5). The study by Tewari et al in primary school children of Haryana found that mean prevalence of caries was highest in 6 years old children (16). Similarly, Goel et al in a study in school children of Karnataka concluded that caries was significantly higher among 5-6 year old subjects (15). Caries being higher in the boys when compared to girls was also shown in a study in Pondicherry (13). The difference could be attributed to diet, geographic location and cultural differences seen in Indian society where males are given priority.

Availability of dental services, dental health awareness and socio-economic status also influence the distribution of dmft components. The present study showed that dmft score was found to be highest (2.25) in urban settings but the difference in mean dmft between different settings was not found to be statistically significant. The reason of high caries prevalence in urban areas could be due to consumption of more of fast food, candies and refined diet. When various socioeconomic groups were compared, maximum dmft score was seen in lower strata at 3.50. The reason for this could be due to lack of awareness about oral health importance and also due to non-affordability of toothpaste and tooth brushes. Similar results were also observed by Shang et al in China (17). A study by Mandal et al on prevalence and severity of dental caries in the Eastern states of India also showed that the dental caries was higher in urban settings (5). A study by Jose and King in pre-school children in Kerala showed that the children with high risk of dental caries belonged to lower socioeconomic class (2). This could be attributed to lack of awareness and affordability of dental services. However, a study by Wyne et al found that the difference between mean decayed missing and filled teeth score was not significant in relation with area (19).

Statistical analysis of present study revealed that mandibular second molar was the most affected tooth by caries followed by maxillary central incisor. Saravanan et al in 2005 showed similar results in primary dentition among 5 year old children of urban Pondicherry where the second molars of mandibular arch were most affected by caries (13). Similar results were also seen in a

study in Miranda (18). The study carried out by Tewari et al in 509 primary school children in the age group of 3-7 years in Haryana revealed that primary molars were most affected by caries (16). In contrast to the above, a study in Saudi Arabia showed that the mandibular first molars were the most carious teeth followed by mandibular 2nd molars and maxillary central incisors (19). The reason could be morphological variation of posterior teeth and inaccessibility of toothbrush in the posterior area.

Very few studies have been conducted among preschool children with respect to practices regarding oral health. Chan et al in a study among preschool children in Hong Kong found that habit of tooth brushing as reported by 42.3% children, out of which only 19% brushed their teeth twice daily. Toothpaste was used by 49.2% of the children (21). A study in Tanzania showed that majority (92%) of preschool children brushed their teeth less than twice a day (22). The above results are comparable with the present study findings, which showed that around 47.2% children reported brushing once daily with only 4.1 % children claimed to be brushing twice daily. Almost 15% children had never brushed their teeth in their lifetime. Among the children who cleaned their teeth, majority (85.2%) used toothpaste. The awareness about tooth brush and toothpaste may be because of information from media like television which is watched by almost everybody nowadays. However in a study by Tewari et al among children of 3-7 years age group in Haryana found that only 3% of children cleaned their teeth once a day with tooth brush and tooth paste (16).

Similar results were observed in the studies conducted among school children. In North Jordan, Mahmoud et al in a study among school children revealed that the participants tooth brushing were irregular (23). The study among 12 to 15 year-old school students in Tamil Nadu also revealed that only 30.7 percent of the students brushed their teeth two or more times a day. The use of other recommended oral hygiene methods was found in only 3.9% of students (24). Harikiran et al in a study among 11 to 12-year-old school children of Bangalore, found that only 38.5% of the children brushed their teeth two or more times a day (25). In a study by Lian et al, among secondary school students showed that about 95.7% of the respondents brush their teeth at least twice per day. Almost all of the respondents (97.6%) brushed their teeth with brush and toothpaste (26).

In a study by Prasad et al in Tamil Nadu, 53.8% of children claimed that they do not rinse their mouth after eating (24). Similar results were seen in the present study wherein, 52.8% of children never rinse their mouth post meals or post snacks. National Oral Health Survey conducted in India has shown that the percentage of children among 5 years old, rinsing mouth always after meals were only 39.3% (3). It may be due to the reason that they are not aware that rinsing also protects teeth from decay.

The study conducted among children, aged between 4-6 years in Turkey by Tanboga et al used modified Snyder Test to detect caries activity and found that around 46% of the children had positive results at the end of the 48 hours. The result was in accordance with

prevalence of caries in the group (27). Similar results were found in present study where, caries activity was found in 30.2% of children (samples positive for color change after 48 hours of incubation). It implies that Snyder test should be introduced as a part of routine assessment of dental health examination of pre-school children to diagnose highly susceptible children for prioritization of the dental care and management.

The present study revealed that preschool children not only have high incidence of caries but also has high susceptibility to caries. Snyder test is a simple and cost-effective test to determine the caries susceptibility among children and should be introduced as a part of routine assessment of dental health examination of pre-school children for diagnosing highly susceptible children thus prioritizing the dental care and management.

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Conflict of Interest:

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