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ORIGINAL ARTICLE

Prevalence of Dental Caries and Gingival Health Status Amongst 5, 12 and 15 Years Old Children

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ABSTRACT
*To evaluate the prevalence of dental caries and gingival health status amongst 5-, 12- and 15-years old school going children of Meerut division, western Uttar Pradesh (INDIA). 2100 students were examined from different schools of 6 different districts. Dental caries was recorded as per World Health Organization – Basic Methods 5th Edition (2005) and SIGURD P. RAMFJORD INDEX was used to record gingival health status with the Community periodontal probe. All data was subjected to statistical analysis using SPSS 20.0.71.09% children were affected by caries. Children in 15-year age group were more affected with dental caries than 5 and 12 years old with prevalence being 73% (DMF:1.818±1.881), 72% (DMF:1.384±1.957) and 68% (DMF: 1.551±1.905) respectively. In urban population examined, 88.9% children had decayed teeth, 5.5% missing and 6.2% filled teeth. In peri-urban population, 83.6% of children had decayed teeth, 9.6% missing and 6.7% filled teeth. Where as in rural population, 80% of children had decayed teeth, 10% missing and 9.4% filled teeth. Gingival bleeding was more prevalent among 15-year-olds than 12-year-olds examined in all locations i.e., Urban, Per-urban, Rural with prevalence being 33.1%, 45.6%, 44.5% respectively. Component +D is more (75.2% in 5-year-olds, 90.6% in 12-year-olds and 81.7% in 15-year-olds) in urban areas whereas is less in peri urban (73.4% in 5-year-olds, 78.9% in 12-year-olds, 71% in 15-year-olds) and rural areas (63.6% in 5-year-olds, 80.6% in 12-year-olds, 69.4% in 15-year-olds). C*hildren in private schools had higher prevalence of healthy gingiva as compared to government schools.
Key words - Dental Caries, School Going Children, Prevalence, Gingivitis, Uttar Pradesh

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INTRODUCTION

Children are very important part of a country's demography, and children's health determines the future of the nation. School age is regarded as the phase of childhood during which a child acquires the knowledge of the norms and values of a society and emerges as a contributing member to the community [1]. Hence oral health education and promotion is considered as a priority for school-children since they are at a high risk for dental diseases predominantly dental caries and gingival diseases [2]. Both gingivitis and dental caries are caused by activity of bacterial plaque. Furthermore, some studies had also reported relationship between poor oral hygiene with dental caries and gingivitis among preschool-children as well [3]. Dental caries can be traced to be as old as civilization with its evidence seen even in skeletal remnants of prehistoric humans. Because of its uniqueness as a disease, its ubiquitous nature and stubborn resistance to resolution, it remains as one of the man's oldest and costliest ailment which poses a considerable challenge to the dental community[4]. Dental caries is defined as a 'progressive', microbial disease affecting the hard structures of the tooth exposed to the oral environment resulting in demineralization of the inorganic constituents and dissolution of the organic constituents , thereby leading to a cavity formation [4]. Caries may be considered to be a disease of the modern age. Anthropologic studies of Von Lenhossek revealed that the dolicocephalic skulls of men from pre Neolithic periods (12,000 BC) did not exhibit dental caries [5]. Historically, no evidence of dental caries was found in skull of men from pre-neolithic period while as relatively few on teeth exhibited caries in skull

fragments of Pithecanthropus (earlier known ancestors of humans) [5]. During the past 20 years, understanding of bio pathology of dental caries has undergone major refinement. It has been appreciated that dental caries is a phenomenon directly linked to continually present, highly complex molecular process active at the interface of susceptible tooth surfaces area and the microbial bio films that cover them. In the multiple sites of teeth where such micro-systems exist at various stages, a key feature is the constant oscillation between hard tissue demineralization and remineralization.

Over the last 25 years, researchers have reported that the dental caries prevalence is declining on a global basis [6]. According to the National Surveys of dental caries in United Kingdom in between 1973 to 1993 a decline in caries experience of 55% in 5-year-old-children, 75% in 12-year-old and 74% in 14-year-old children, was documented [7]. According to child Dental Health Survey 2013 in United Kingdom, the prevalence of dental caries was 46% of 15 year old, 34% of 12 year old, as compared from 2003 when the prevalence in these age groups was 56% and 43% respectively[8].

Other industrialized countries viz Scandanavia, Switzerland, Australia, Newzealand during the period of 1960-70 experienced high caries prevalence and have shown a distinct downward trend over the last 10 - 15 years and have already reached the WHO Goal of 3 DMFT at the age of 12 years by 2000 AD. It has been possible due to use of judicious fluoride in different forms and organized preventive programmes at various levels [9].

According to National Health & Nutritional examination Survey in USA in 1988-1994 and 1999- 2004, the prevalence of dental caries of 6-8 year olds children was 14.48% and 10.16% respectively, while in 9-11 year olds it decreased from 35.90% in 1988-1994 to 31.36% in 1999-2004 [10].

Similarly, in Germany, prevalence of dental caries in 12 years old children showed a decreasing trend. It was 52% in 1996, 45.7% in 2004 and further decreased to 39.3% in 2006 [11]. They associated it with the more sensible approach to sugar consumption, improved oral hygiene and several preventive programs [12, 13].

However, in developing countries dental caries prevalence showed a varied pattern. In China, 53% prevalence of dental caries was reported in 12 year old children in 1999 , in 2001 it was 80% and in 2008 was found to be 75.2% [11]. In Brazil Tralbat JL in 2001 reported prevalence of dental caries in 12 year olds children was 54.7%, Moreira PV in 2006 was 51.9%, Aavd V in 2009 was 78% and Jamellis R in 2010 was found to be 71.8%[11]. This can be related to the fact that, these countries community based prevention and oral health promotion have not been done systematically. This may also be attributed to immigration and to lack of preventive efforts and dietary changes [14].

In India dental caries prevalence in 1940 was 55.5%, while in 1960 it was reported to be 68.4% in 15 year old children [11, 13, 15-17]. According to WHO Global Oral Data Bank in 1997 the prevalence was 81.5% among 5-6 years old and 59.6% among 12-13 year old children [18]. According to National oral health survey 2004, prevalence of dental caries in India was 51.9%, 53.8% and 63.1% at ages 5, 12 and 15 years respectively [11, 13, 16, 17]. The current prevalence of dental caries in India is approximately 60-65% and shows an increasing trend [14, 19].

Another oral disease with high prevalence is gingivitis. Gingivitis or inflammation of the gingiva, is the common oral disease in children and adolescents. It is the inflammation of the soft tissues without apical migration of the junctional epithelium. It is reversible, nondestructive disease that does not involve loss of periodontal tissues [20].

It is characterized by the presence of gingival inflammation without detectable bone loss or clinical attachment loss [21-24]. The causes and risks are as varied in children as in adults and range from local to systemic causes. The most important local predisposing factor in children is poor oral hygiene which stems from children's dependence on adults for assistance with routine oral hygiene [25]. It also stems from age limitation in perception of the need for regular and efficient tooth brushing. When plaque and food debris accumulate in poor oral hygiene, micro-organisms also accumulate and the process of inflammation starts [25]. This leads to gingivitis, which, if not taken care of can progress to gradual destruction of supporting soft and hard tissues of the teeth.

Gingivitis in children is also commonly seen during eruption and exfoliation of both primary and permanent teeth and exfoliation of primary teeth[25]. This process, although physiological, if not managed carefully, may contribute to discomfort during tooth brushing, mastication and also cause restlessness in the affected children [25]. During puberty, it may be a response to hormonal changes in the developing adolescent, though more pronounced when there is plaque accumulation[25]. In children with compromised immunity, chronic malnutrition, exanthematous fevers such as malaria, measles or chicken pox, the gingivitis may be acute and necrotic[25]. The systemic effect and local destruction of soft and hard tissues may contribute to increased morbidity and poor aesthetics in affected children.

Though dental plaque is the main culprit for development of gingivitis but on experimental gingivitis models 13% of the individuals have represented to be "resistant", inspite of the presence of dental plaque[26]. This is attributed to the fact that there are factors other than the dental plaque referred to as secondary factors which include metabolic factors such as puberty and pregnancy, genetic factors such as Down syndrome, nutritional factors such as vitamin C deficiency, the intake of drugs, which also greatly influences the inflammatory response of the gingival to the dental plaque [26].

According to data from NHANES III, gingival bleeding was most prevalent in the 13 to 17 year old age group (63%) and declined gradually through the 35 to 44 year old group [27]. The prevalence increased again at the 45 to 54 year old. Mehta and Sanjana [18] and Sanjana *et al* [29] found the prevalence of gingivitis was 93.7%. Shick H.S. [30] evaluated the prevalence of gingivitis in age group 5-19 years was 74.59%. National Oral Health Survey and fluoride mapping 2002-2003, Dental Council of India, New Delhi, 2004 showed the prevalence of Gingivitis increased with age [31]. The prevalence was 57%, 67.6% in the age groups 12 and 15 years respectively. Dhar *et al.,* [32] found prevalence of gingivitis was 84.34% in children of Udaipur district. According to Singh [33] the current prevalence of gingivitis in India is approximately 77.52%.

To develop and apply dental health programs of prevention of dental caries and gingivitis successfully, it is necessary to know the intensiveness and spread of the diseases and their risk factors. To best of our knowledge, till date no study has been conducted regarding prevalence of dental caries and gingival health status among 5, 12 and 15 years old school going children of six districts of Meerut Division of Western Uttar Pradesh namely Ghaziabad, Meerut, Gautam budh nagar, bagpat, Hapur and Bulandshahr. The goal of this study is to provide data for designing the preventive measures against dental caries and gingivitis on the basis of factors associated with it.

MATERIAL AND METHODS

The present study is a school based cross sectional survey undertaken on children in the age group of 5, 12 and 15 years of Meerut division of Western U.P. (India) namely Meerut, Ghaziabad, Gautam Buddha Nagar, Hapur, Bagpat, and Bulandshahr, by single examiner from the department of Pedodontics, ITS center for dental studies and research, Muradnagar.

Before starting the study, ethical clearance was obtained from the Institutional Ethical Committee of ITS – CDSR Muradnagar, Ghaziabad. A sample of 2100 students were examined from different schools of 6 districts comprising of urban, peri-urban as well as rural populations Meerut division of Western U.P. Informed written consent was taken from the parents / caregiver / guardians of the children through school authorities to participate in the study. The clinical examination was carried out by single trained and calibrated examiner to ensure consisted clinical judgments for reliable and valid data collection. An initial training and calibration exercise was conducted prior to the study under guidance of principal investigator by the Department of Pedodontics and Preventive Dentistry, I.T.S-CDSR to check for the feasibility of the study methodology and coding system and also to ensure that a consistent standard of diagnosis was maintained. A group of 10 participants were examined both, by the examiner and the principal investigator daily, over a period of 1 week. The examination was repeated until both examiners had substantial co-relation as measured by Cohen's Kappa ($k>0.006$). The examiner then re-examined the same participant so as to avoid chances of bias in the methodology during the coding/scoring. Once the examiner was trained, the study was initiated.

Children in age group of 5, 12 and 15 years present at the day of examination in the school, who had informed written consent from their parents/guardian were included in the study while, medically compromised children or children who were undergoing orthodontic treatment were excluded.

The students were examined at their respective schools, using sterile mouth mirror and flash light. The data was recorded on a self-designed modified WHO oral health assessment form 5th edition (2005) which included information about certain variables like demographic data, dental caries and gingival health status. Dental caries was recorded as per World *Health Organization – Basic Methods 5th Edition* (2005) and SIGURD P. RAMFJORD INDEX was used to record gingival health status with the Community periodontal probe. The form were arranged in serial number & stacked in group of number of 100. The bundles were labelled with student code numbers and date of recording to make them readily available for the data entry. The data was entered into MS office excel sheet and then subject to analysis using SPSS software version 20.0.

RESULTS

A total of 2100 children were examined in the study. Table 1 represents distribution of participants according to different location, geographic location, age and gender. Out of total children examined, 700

belong to each population (urban, per-urban and rural).

Out of 2100 children examined, 1493(71.09%) were affected dental caries. Also children in 15 year age group were more affected with dental caries than 5 and 12 years old with prevalence being 73%, 72% and 68% respectively. Mean scores of DMF in primary and permanent teeth in different age group. Reveal that DMF is more amongst 15 year olds (1.818±1.881) than 5 year olds (1.384±1.957) and 12 year olds (1.551±1.905). (Table2)

Mean scores of def+DMF teeth in 5, 12 and 15 year old of urban, peri urban and rural areas of Meerut Division of Western U.P. Reveal highest values that (1.30±2.02) among 5 year olds in urban population while in peri-urban and rural population it is highest amongst 15 year olds being 1.98±1.971 and 2.06±1.841 respectively. (Table 3)

Of the total urban population examined, 88.9% children had decayed teeth, 5.5% missing and 6.2% filled teeth. Out of which decayed, missing and filled component for 5-year-olds 84.6%, 7.69% and 7.69% respectively. For 12 years, decayed, missing and filled component is 94.4%, 1.57% and 3.93% respectively and for 15 years, itwas 90.9%, 4.1% and 4.95% respectively. In peri-urban population, 83.6% of children had decayed teeth, 9.6% missing and 6.7% filled teeth, out of which decayed, missing and filled component for 5-year-olds is 79.3%, 9.5% and 11.1% respectively, for 12 years 87.4%, 7.3% and 4.6%respectively and for 15 years 82.8%, 11.1% and 6% respectively. Where as in rural population, 80% of children had decayed teeth, 10% missing and 9.4% filled teeth. Of which, decayed, missing and filled component for 5-year-olds is 65.2%, 14% and 20.66% respectively, for 12 years 89%, 6.5% and 4.32% respectively and for 15 years 81%, 11% and 8% respectively. (Table 4, 5, 6)

Table 7 depicts mean and standard deviation of def(decayed, extracted, filled)±DMF(decayed, missing, filled) surfaces in 5, 12 and 15 yearolds among different population. In urban location mean and standard deviation of def±DMF surfaces for 5, 12 and 15 year olds is 1.94±3.30. Out of which 5-year-olds has mean and standard deviation of 2.14±3.99. while, 12-year-olds has mean and standard deviation of 1.81±2.63 and for 15-year-olds, it is 1.7±2.46. In Peri urban location mean and standard deviation of def±DMF surfaces in 5, 12 and 15year-olds for subjects is 3.01±3.93. Out of which 5-year-olds has mean and standard deviation of 3.69±5.02, 12-year-olds has 2.42±3.32 and for 15-year-olds, it is 3.13±3.69. In Rural location mean and standard deviation of def±DMF surfaces in 5, 12 and 15 is 2.98±3.80. Out of which 5-year-olds has mean and standard deviation of 2.76±4.32, 12-year-olds has 2.82±3.43- and 15-year-oldhas 3.37±3.55.

Of the total Urban population examined, 80.9% children had decayed, 14% missing and 5.1% filled surfaces. Out of which decayed, missing and filled component for 5-year-olds 75.2%, 17.7% and 7.1% respectively. For12-year-olds, decayed, missing and filled component is 90.6%, 6.4% and 3% respectively. While in 15-year-olds it was 81.7%, 15% and 3.5% respectively. In peri-urban population, 74% of children had decayed teeth, 21.4% missing and 4.5% filled teeth, out of which decayed, missing and filled component for 5-year-olds is 73.4%, 20.3% and 6.1% respectively. For 12 years old, decayed, missing and filled component is 87.4%, 7.3% and 4.6% respectively, and for 15 years it was 82.8%, 11.1% and 6% respectively. Where as in rural population, 70.1% of children had decayed teeth, 22.2% missing and 6.5% filled teeth. Out of which decayed, missing and filled component for 5-year-old63.6%, 24.8% and 11.5% respectively. For 12-year-olds, decayed, missing and filled component is 80.6%, 16% and 3% respectively and for 15-year-olds it was 81%, 11% and 8% respectively. (Table 7)

In intra analysis of defs+DMFS decayed component of children of urban population, among 5 year olds, the mean and standard deviation for decayed occlusal surface is 0.71±1.436, for mesial surface 0.33±1.04, for distal surface 0.22±0.819, for buccal surface 0.18±0.651 and for lingual surface 0.18±0.670. For 12 year olds, mean and standard deviation for decayed occlusal surface is 1.05±1.672, for mesial surface it is 0.14±0.48, for distal surface 0.12±0.467, for buccal surface 0.20±0.494 and for lingual surface 0.15±0.487, and for 15 year olds, mean and standard deviation for decayed occlusal surface is 1.08±1.605, for mesial surface it is 0.12±0.435, for distal surface 0.02±0.133, for buccal surface 0.02±0.133 and for lingual surface 0.17±0.606. (Table 8)

In intra analysis of defs+DMFS decayed component of children of periurban population, among 5 year olds, the mean and standard deviation for decayed occlusal surface is 0.84±1.428, for mesial surface it is 0.64±1.255, for distal surface 0.42±1.029, for buccal surface 0.38±1.031 and for lingual surface 0.45±1.1. For 12-year-olds, mean and standard deviation for decayed occlusal surface is 1.20±1.74, for mesial surface it is 0.21±0.501, for distal surface 0.14±0.469, for buccal surface 0.12±0.475 and for lingual surface 0.23±0.626, and for 15-year-olds, mean and standard deviation for decayed occlusal surface is 1.55±1.78, for mesial surface it is 0.17±0.484, for distal surface 0.08±0.285, for buccal surface 0.18±0.552 and for lingual surface 0.24±0.576. (Table 9)

In intra analysis of defs+DMFS decayed component of children of rural population, among 5 year olds, the mean and standard deviation for decayed occlusal surface is 0.51±1.188, for mesial surface it is 0.36±0.942, for distal surface 0.29±0.892, for buccal surface 0.26±0.84 and for lingual surface 0.33±0.873. For 12-year-olds, mean and standard deviation for decayed occlusal surface is 1.54±1.89, for mesial surface it is 0.26±0.521, for distal surface 0.11±0.443, for buccal surface 0.10±0.406 and for lingual surface 0.28±0.673. For 15-year-olds, mean and standard deviation for decayed occlusal surface is 1.51±1.63, for mesial surface it is 0.17±0.484, for distal surface 0.10±0.309, for buccal surface 0.29±0.677 and for lingual surface 0.26±0.591.
Gingival bleeding was more prevalent among 15-year-oldsthan 12-year-olds examined in all locations i.e., Urban, Per-urban, Rural with prevalence being 33.1%, 45.6%, 44.5% respectively. (Table 10).

Table 1: Gender wise distribution of subjects of Meerut division of Western, U.P according to different locations

Location	Geographic Location	Total	Age in years	Gender			
				Male		Female	
		n		n	%	n	%
Urban (700)	Meerut (350)	120 111 119	5 12 15	85 85 72	70.8 76.6 60.5	35 26 47	29.2 23.4 39.5
	Gautam buddha nagar (350)	205 95 50	5 12 15	127 63 41	62 66.3 82	78 32 9	38 33.7 18
Peri-urban (700)	Ghaziabad (350)	52 131 167	5 12 15	20 76 96	38.5 58 57.5	32 55 71	61.5 42 42.5
	Hapur (350)	116 116 118	5 12 15	73 80 87	62.9 69 73.7	43 36 31	37.1 31 26.3
Rural (700)	Baghpat (350)	119 111 120	5 12 15	77 72 80	64.7 64.9 66.7	42 39 40	35.3 35.1 33.3
	Bulandshahr (350)	119 122 109	5 12 15	72 74 61	60.5 60.7 56	47 48 48	39.5 39.3 44
Total		2100		1314	62.5	786	37.4

Table 2- Prevalence and severity of dental caries in 5 ,12 and 15 year olds of Meerut Division of Western U.P.

Age in years	Total no. of children	Prevalence of dental caries No.	%	def+DMF Teeth Mean±SD	def+DMF Surfaces Mean±SD
5	731	527	72	1.384±1.957	2.703±4.395
12	686	467	68	1.551±1.905	2.376±3.194
15	683	499	73	1.818±1.881	2.865±3.418
All ages combined	2100	1493	71.09	1.580±1.924	2.649±3.726

Table 3 - Means of (def+DMF) teeth in 5, 12 and 15 year old of Urban, Periurban and Rural areas of Meerut Division of Western U.P

Location	Age in years	def+DMF Mean±S.D
Urban	5	1.30±2.02
	12	1.27±1.79
	15	1.21±1.65
	Total	1.27±1.87
Peri-Urban	5	1.79±2.068
	12	1.51±1.876
	15	1.98±1.971
	Total	1.77±1.97
Rural	5	1.21±1.756
	12	1.85±2.00
	15	2.06±1.841
	Total	1.70±1.899

Table 4 – Intra analysis of deft and DMFT components in 5, 12 and 15 year olds of Urban areas (Meerut, Gautam Budh nagar)of Meerut Division of U.P.

Location	Age in years	Total no. of children	deft+DMFT Mean±SD	d+D Teeth % Mean±SD		e+M Teeth %Mean±SD		f+F Teeth %Mean±SD	
Urban	5	325	1.30±2.02	84.6	1.10±1.93	7.69	0.10±0.43	7.69	0.10±0.486
	12	206	1.27±1.79	94.4	1.20±1.78	1.57	0.02±0.154	3.93	0.05±0.291
	15	169	1.21±1.65	90.9	1.10±1.64	4.1	0.05±0.251	4.95	0.06±0.358
	All ages combined	700	1.27±1.87	88.9	1.13±1.81	5.5	0.07±0.332	6.2	0.08±0.407
Peri-urban	5	168	1.79±2.068	79.3	1.02±1.94	9.5	0.17±0.606	11.1	0.20±0.659
	12	247	1.51±1.876	87.4	1.32±1.78	7.3	0.11±0.417	4.6	0.07±0.36
	15	285	1.98±1.971	82.8	1.64±1.81	11.1	0.22±0.534	6	0.12±0.496
	All ages combined	700	1.77±1.97	83.6	1.48±1.84	9.6	0.17±0.517	6.7	0.12±0.502
Rular	5	238	1.21±1.756	65.2	0.79±1.419	14	0.17±0.557	20.66	0.25±0.651
	12	233	1.85±2.00	89	1.65±1.907	6.5	0.12±0.446	4.32	0.08±0.393
	15	229	2.06±1.841	81	1.67±1.691	11	0.23±0.556	7.3	0.15±0.552
	All ages combined	700	1.70±1.899	80	1.36±1.729	10	0.17±0.524	9.4	0.16±0.547

*d = decayed w.r.t primary teeth, *D = decayed w.r.t permanent teeth
*e = extraction, M = missing
*f = filled w.r.t primary teeth, *F = filled w.r.t permanent teeth
*deft = decayed, extracted, filled teeth, *DEFT = decayed, missing, filled teeth

Table 5- Means of def+DMF surfaces in 5, 12 and 15 year old of Urban, Periurban and Rural areas of Meerut Division of Western U.P.

Location	Age in years	Def+DMF Mean±S.D
Urban	5	2.14±3.99
	12	1.81±2.63
	15	1.7±2.46
	Total	1.94±3.30
Peri-Urban	5	3.69±5.02
	12	2.42±3.32
	15	3.13±3.63
	Total	3.01±3.93
Rural	5	2.76±4.32
	12	2.82±3.43
	15	3.37±3.55
	Total	2.98±3.80

Table – 6 Intra analysis of defs+DMFS components in 5, 12 and 15 year olds of Urban areas (Meerut, Gautam Budh Nagar) of Meerut Division of Western U.P.

Location	Age in years	Total no. of children	defs+DMFS Mean±SD	d+D Surface %Mean±SD		e+M Surface % Mean±SD		f+F Teeth % Mean±SD	
Urban	5	325	2.14±3.99	75.2	1.61±3.48	17.7	0.379±1.69	7.1	0.154±1.18
	12	206	1.81±2.63	90.6	1.64±2.51	6.4	0.115±0.739	3	0.053±0.329
	15	169	1.7±2.46	81.7	1.39±2.15	15	0.25±1.14	3.5	0.061±0.358
	All ages combined	700	1.94±3.30	80.9	1.57±2.93	14	0.27±1.35	5.1	0.1±0.847
Peri-Urban	5	168	3.69±5.02	73.4	2.71±4.48	20.3	0.750±2.63	6.1	0.226±0.794
	12	247	2.42±3.32	78.9	1.91±2.74	18.2	0.441±1.57	3.1	0.076±0.410
	15	285	3.13±3.63	71.2	2.23±2.58	24.4	0.764±2.03	4.3	0.136±0.549
	All ages combined	700	3.01±3.93	74	2.23±3.20	21.4	0.647±2.05	4.5	0.137±0.579
Rular	5	238	2.76±4.32	63.6	1.76±3.53	24.8	0.686±2.15	11.5	0.32±0.888
	12	233	2.82±3.43	80.6	2.28±2.85	16	0.45±1.65	3	0.086±0.428
	15	229	3.37±3.55	69.4	2.34±2.50	25.2	0.853±2.20	5.2	0.178±0.625
	All ages combined	700	2.98±3.80	71.1	2.12±3.01	22.2	0.664±2.02	6.5	0.195±0.683

Table 7 - Intra analysis of defs+DMFS according to surfaces involved in 5, 12 and 15 year olds of Meerut division of western U.P. (Urban)

Urban		5 Years (n=325)	12 Years (n=206)	15 Years (n=169)	Total (n=700)
		Mean±SD	Mean±SD	Mean±SD	Mean±SD
Decayed	Occlusal	0.71±1.436 0.33±1.04	1.05±1.672	1.08±1.605	0.90±1.558
	Mesial	0.22±0.819	0.14±0.48	0.12±0.435	0.22±0.790
	Distal	0.18±0.651	0.12±0.467	0.02±0.133	0.14±0.621
	Buccal	0.18±0.670	0.20±0.494	0.02±0.133	0.14±0.526
	Lingual	1.61±3.48	0.15±0.487	0.17±0.606	0.2±0.605
	Total		1.64±2.51	1.39±2.15	1.57±2.93
Missing	Occlusal	0.379±1.69	0.115±0.739	0.25±1.14	0.27±1.35
	Mesial	0.379±1.69	0.115±0.739	0.25±1.14	0.27±1.35
	Distal	0.379±1.69	0.115±0.739	0.25±1.14	0.27±1.35
	Buccal	0.379±1.69	0.115±0.739	0.25±1.14	0.27±1.35
	Lingual	0.379±1.69	0.115±0.739	0.25±1.14	0.27±1.35
	Total	0.379±1.69	0.115±0.739	0.25±1.14	0.27±1.35
Filled	Occlusal	0.10±0.475	0.05±0.291	0.06±0.358	0.07±0.401
	Mesial	0.02±0.248	0.00±0.069	0.00±0.000	0.01±0.173
	Distal	0.01±0.222	0.00±0.000	0.00±0.000	0.01±0.151
	Buccal	0.01±0.222	0.00±0.000	0.00±0.000	0.01±0.20
	Lingual	0.01±0.222	0.00±0.000	0.00±0.000	0.01±0.151
	Total	0.154±1.18	0.053±0.329	0.061±0.358	0.1±0.847
Total	Total	2.14±3.99	1.81±2.63	1.7±2.46	1.94±3.30

Table 8 - Intra analysis of defs+DMFS according to surfaces involved in 5, 12 and 15 year olds of Meerut division of western U.P. (Peri-Urban)

Periurban		5 Years (n=168)	12 Years (n=247)	15 Years (n=285)	Total (n=700)
		Mean±SD	Mean±SD	Mean±SD	Mean±SD
Decayed	Occlusal	0.84±1.428	1.20±1.74	1.55±1.78	1.26±1.71
	Mesial	0.64±1.255	0.21±0.501	0.17±0.484	0.77±0.029
	Distal	0.42±1.029	0.14±0.469	0.08±0.285	0.18±0.618
	Buccal	0.38±1.031	0.12±0.475	0.18±0.552	0.21±0.683
	Lingual	0.45±1.1	0.23±0.626	0.24±0.576	0.3±0.750
	Total	2.71±4.48	1.91±2.74	2.23±2.58	2.23±3.20
Missing	Occlusal	0.750±2.63	0.441±1.57	0.764±2.03	0.647±2.05
	Mesial	0.750±2.63	0.441±1.57	0.764±2.03	0.647±2.05
	Distal	0.750±2.63	0.441±1.57	0.764±2.03	0.647±2.05
	Buccal	0.750±2.63	0.441±1.57	0.764±2.03	0.647±2.05
	Lingual	0.750±2.63	0.441±1.57	0.764±2.03	0.647±2.05
	Total	0.750±2.63	0.441±1.57	0.764±2.03	0.647±2.05
Filled	Occlusal	0.18±0.561	0.06±0.338	0.11±0.470	0.11±0.455
	Mesial	0.02±0.244	0.01±0.090	0.01±0.084	0.01±0.141
	Distal	0.01±0.10	0.00±0.000	0.00±0.059	0.01±0.053
	Buccal	0.01±0.077	0.01±0.127	0.02±0.132	0.01±0.20
	Lingual	0.01±0.109	0.00±0.000	0.00±0.059	0.01±0.065
	Total	0.226±0.794	0.076±0.410	0.136±0.549	0.137±0.579
Total	Total	3.69±5.02	2.42±3.32	3.13±3.63	3.01±3.93

Table 9 - Intra analysis of defs+DMFS according to surfaces involved in 5, 12 and 15 year olds of Meerut division of western U.P. (Rural)

Rural		5 Years (n=238)	12 Years (n=233)	15 Years (n=229)	Total (n=700)
		Mean±SD	Mean±SD	Mean±SD	Mean±SD
Decayed	Occlusal	0.51±1.188	1.54±1.89	1.51±1.63	1.18±1.66
	Mesial	0.36±0.942	0.26±0.521	0.17±0.484	0.20±0.504
	Distal	0.29±0.892	0.11±0.443	0.10±0.309	0.17±0.612
	Buccal	0.26±0.84	0.10±0.406	0.29±0.677	0.21±0.672
	Lingual	0.33±0.873	0.28±0.673	0.26±0.591	0.29±0.724
	Total	1.76±3.53	2.28±2.85	2.34±2.50	2.12±3.01
Missing	Occlusal	0.686±2.15	0.45±1.65	0.853±2.20	0.664±2.02
	Mesial	0.686±2.15	0.45±1.65	0.853±2.20	0.664±2.02
	Distal	0.686±2.15	0.45±1.65	0.853±2.20	0.664±2.02
	Buccal	0.686±2.15	0.45±1.65	0.853±2.20	0.664±2.02
	Lingual	0.686±2.15	0.45±1.65	0.853±2.20	0.664±2.02
	Total	0.686±2.15	0.45±1.65	0.853±2.20	0.664±2.02
Filled	Occlusal	0.25±0.651	0.08±0.393	0.14±0.535	0.16±0.542
	Mesial	0.02±0.129	0.0±0.066	0.01±0.093	0.01±0.100
	Distal	0.02±0.129	0.00±0.000	0.01±0.093	0.01±0.092
	Buccal	0.02±0.130	0.00±0.000	0.02±0.146	0.01±0.113
	Lingual	0.02±0.129	0.00±0.000	0.00±0.000	0.01±0.075
	Total	0.32±0.888	0.086±0.428	0.178±0.625	0.195±0.683
Total	Total	1.02±2.18	1.04±1.64	1.12±1.77	1.03±1.90

Table 10 - Prevalence of gingival bleeding in 12 and 15 year olds of Urban, Periurban and Rural areas of western U.P.

Age	12 Years (n=686)		15 Years (n=683)		Total (n=1369)	
Gingival Status	No. of individuals	%	No. of individuals	%	No. of individuals	%
Urban Absence of condition Presence of condition Total	 160 46 206	 77.6% 22.3% 100%	 113 56 169	 66.9% 33.1% 100%	 273 102 375	 72.8% 27.2% 100%
Periurban Absence of condition Presence of condition Total	 152 95 247	 61.5% 38.5% 100%	 155 130 285	 54.4% 45.6% 100%	 307 225 532	 57.7% 42.3% 100%
Rural Absence of condition Presence of condition Total	 132 101 233	 56.7% 43.3% 100%	 127 102 229	 55.5% 44.5% 100%	 259 203 462	 56% 44% 100%

DISCUSSION

It is important to control the disease process by assessing and rendering the treatment required along with spreading awareness regarding their prevention. But for developing appropriate prevention approaches, anticipating utilization patterns, and planning effectively for organization and financing of dental resources, the knowledge of oral health status and treatment needs of populations with different characteristics is important.

In present study, prevalence of dental caries was found to be highest in 15 year olds followed by 5 and 12 years (73%, 72% and 68% respectively). This was rather similar to the results found in National Oral Health Survey conducted in 2004 in India where prevalence of 51.9% in 5 year-old children, 53.8% in 12

year-old children and 63.1% in 15 year-old teenagers was documented[11,13,16,17]. Almost similar prevalence of dental caries has been reported by Kundu H *et al* [17] in northern India, where they found the prevalence to be highest in 15 year olds followed by 5 and 12 years (62.02%, 48.11% and 43.34% respectively).. Another study done by George B and Mulamoottil VM [13] in Kerala, India, showed prevalence of dental caries in 5, 12 and 15 years old to be 41.5%, 36.9% and 43.4% respectively. The reason for the higher prevalence of dental caries at 15 years compared to 12 years can be related to the fact that caries being a continuous and cumulative process, increases over a span of 3 years; moreover, the number of teeth are more at the age of 15 years.

High caries experience among 5-year-old could be attributed to the factors such as a diet high in sugars and/or the inability of a young child to properly brush teeth on their own. Besides this, lack of preventive measures in India could be another reason which increases the pril. Also, the thickness of enamel in the deciduous teeth which is less than that of permanent teeth being 1 mm and 2.5 mm respectively. Lower calcium content of deciduous teeth and structural differences may increase caries susceptibility in deciduous teeth along with lack of preventive measures. The low caries experience was witnessed in 12-year age group when compared to 5 year age group. This can be ascribed to the fact that WHO index does not record incipient caries, but puts down only when the caries involves dentin, resulting in slight underestimation of caries in 12 year groups.

In present study the mean deft+DMFT is 1.384±1.957 among 5-year-old children which is low when compared to studies conducted in Brazil (1.7±2.6), Chennai (3.53±3.07 in boys and 3.49±2.83 in girls) [46], Udaipur (1.79±2.8) and Gurgaon (1.93±0.43)[34] and greater compared to studies conducted in Kerala (0.67±1.44) [13]. The mean deft+DMFT is highest in 5 years children who belonged to the peri urban location (1.79±2.068), this could be due to their dietary habits and oral hygiene measures. Whereas, the mean deft+DMFT is lowest in 5 year olds who belonged to the rural population (1.21±1.756). This may be attributed to the fact that most of the subjects in rural population use tree-stick for cleaning their teeth, consume lesser sticky and carbohydrate rich food (e.g. pastries, pasta and white bread) as compared to the urban and peri urban population.

While it was highest (1.85±2.00 in 12-year-old and 2.06±1.841 in 15-year-old) followed by peri-urban population (1.51±1.876 in 12-year-old and 1.98±1.971 in 15-year-old) and urban population (1.27±1.79 in 12-year-old and 1.21±1.87 in 15-year-old). This may be due to lack of awareness, affordability, or underutilization of dental care facilities by the children belonging to the rural area [34].

Further, analyzing in our study deft+DMFT, d+D component showed higher percentage (84.6% in 5-year-olds, 94.4% in 12-year-old and 90.9% in 15-year-olds) in urban areas while lesser in peri urban (79.3% in 5-year-olds, 87.4% in 12-year-olds, 82.8% in 15-year-olds) and rural areas and (65.2% in 5-year-olds, 89% in 12-year-olds, 81% in 15-year-olds) compared to the urban areas. This may be attributed to the more refined diet consumed in urban area in contrast to peri urban and rural areas.

Another study done by Sohi RK et al (2012) in Chandigarh showed that percentage of d+D component is 85.3% in 5-year-old and 77% in 12-year-olds[1]. Similarly, Mittal *et al* in their prevalence study, showed that the percentage of d+D component is 89.03% in 5-year-olds and 83.33% in 12-year-olds children in rural Gurgaon [34], Dhar *et al* [32] in Udaipur reported 91.05% prevalence in 5-7-year-old, 97.26% prevalence in 11-14year-olds.

In present study higher decayed component has been observed as compared to filled. Very few subjects from rural and peri urban areas are found to have filled teeth which might be attributed to various factors like financial constraints and negligence among parents of rural and peri urban population and lack of appropriate use of health care facilities.

The mean counts of defs+DMFS in the present study in 5-year-olds (2.703±4.395), in 12-year-olds (2.37±3.194) and in 15-year-olds (2.865±3.418) were lower than reported Goyal *et al* [6] where they found that DMFS, among 12 and 15 year olds to be 4.06±3.91 and 5.12±5.12 respectively. Another study done by P.K.Sahoo *et al* (1990) in the city of Cuttack, Orissa reported the mean dmfs+DMFS among 5, 8, 11 and 15-year-olds was 4.94±7.04, 5.82±6.01, 2.86±3.04 and 3.11±3.78 respectively in rural area whereas it was 3.96±4.91, 4.43±5.48, 3.31±5.14 and 2.93±3.55 respectively in urban area. Damle *et al* [16] in Dharavi, Bombay, reported the mean DMFS in 12, 13, 14 and 15-year-olds as 5.08±5.76, 5.84±0.73, 5.93±3.15 and 5.86±5.51 respectively.

Thus in our study the mean defs+DMFS is highest in 5 years children who belonged to the peri urban area 3.69±5.02, whereas the mean defs+DMFS is highest in 12 and 15-year-olds children who belonged to rural population (2.82±3.43 and 3.37±3.55 respectively). This may be due to lack of awareness, affordability, or underutilization of dental care facilities by the children belonging to the rural area.

The findings of the present study shows that, d+D component is more (75.2% in 5-year-olds, 90.6% in 12-year-olds and 81.7% in 15-year-olds) in urban areas whereas is less in peri urban (73.4% in 5-year-olds,

78.9% in 12-year-olds, 71% in 15-year-olds) and rural areas (63.6% in 5-year-olds, 80.6% in 12-year-olds, 69.4% in 15-year-olds). In the city of Cuttack, Orissa showed the d+D component percentage among 5, 8, 11 and 15-year-olds was 88.73%, 74.84%, 94.27% and 90.47% respectively in rural area whereas in urban areas dmfs+DMFS, d+D component percentage among 5, 8, 11 and 15-year-olds was 88.73%, 74.84%, 94.27% and 90.47% respectively [30]. The higher percentage in urban areas may be attributed to the more refined diet consumption in urban area in contrast to peri urban and rural areas.

Decayed teeth formed the major component of total dmfs scores, followed by missing and the least contribution is of filled teeth. Comparable proportions are evident in majority of studies. The attributed explanation might be that majority of children do not undergo dental restorations primarily because of high treatment cost, lack of affordable dental services and false perceptions of parents regarding significance of retaining primary teeth, while those who undergo treatment prefer extraction rather than restorations.

The intra analysis of defs+DMFS/deft+DMFT findings reveal d+D surfaces scores dominated the total scores while e+M teeth/surface scores and f+F teeth/surface score contribution is very less comparatively in urban, peri urban and rural area. These findings suggest that there is a dire need of dental professional care and also need for awareness of general population in these areas.

Intra analysis of defs+DMFS decayed component according to surfaces involved

In our study, it was frequent to find decay on occlusal surfaces, the mean score (0.71±1.436) followed by mesial (0.33±1.04), distal (0.22±0.819), buccal (0.18±0.651) and rare in lingual /palatal surfaces(0.18±0.670). Occlusal surfaces of teeth were most frequently affected with decay compared to other surfaces. Similar results were found by Basha *et al* [18] among 6-and 13-year-olds where they found that in primary dentition the most affected surface was occlusal (38.28%) followed by mesial (15.5%), distal (18.73%), buccal (16.88%) and palatal (5.17%), whereas in permanent dentition the pattern was occlusal 79.15%, mesial 1.97%, distal 0.85%, buccal 12.39% and palatal 4.79%. Another a study done by Goyal *et al* [6] in (2007) in Chandigarh, observed that in 9-year-old-children, occlusal surfaces were found to be the most affected followed by buccal and lingual surfaces and the proximal surfaces were found to be the least affected. This is may due to the development of caries is the presence of deep, narrow occlusal fissures quite early. Such fissures tend to trap food, bacteria and debris and it difficult to clean them at the base of fissure leading rapid development of caries in these areas. Also, presence of fluoride in drinking water prevented smooth surface decay.

Prevalence of gingival health status

Ramford index has been considered for assessment of gingival health status which considers the permanent molars and premolar teeth. Also, it is difficult to assess gingival bleeding status in 5 years age group because children become un-cooperative. Hence, in the present study, only 12 and 15 year olds were scored for gingival health status.

In the present study the prevalence of gingivitis among 12 and 15 years old children is 35.3% and 42.1% respectively. The prevalence of gingivitis was low compared to the study conducted by Sukhabogi JR *et al* [36], among 12 and 15 year olds (51% and 53% respectively in private school whereas 49% and 52% respectively in government school) in Hyderabad. Another study done by Goel *et al* [34] in Haryana found the prevalence of gingivitis among 12 and 15 year olds to be 70% and 63% respectively.

The prevalence of gingivitis was higher compared to the study done by Patel DR *et al* [35] in the city of Ahmadabad, where the percentage was 12.23% and 42.73% among 12 and 15 year olds children respectively. The higher percentage of gingival bleeding may be attributed to the oral habits like mouth breathing which is usually associated with inflamed adenoids or upper respiratory tract infections, dental conditions like malocclusion, poor oral hygiene and pubertal changes (in girls). In the present study, mean gingival score is higher in the 15-year-old children as compared to 12-year-olds, which may be attributed to the fact that the hormonal changes near puberty that increases permeability of vessels is significantly associated with gingivitis in growing age and unhealthy eating and improper brushing habits.

In our study the prevalence of gingivitis among 12 and 15 years old children is highest in rural areas (43.3% in 12-year-olds and 44.5% in 15-year-olds respectively) followed by peri urban (38.5% in 12-year-olds and 45.6% in 15-year-olds respectively) and urban (22.3% in 12-year-olds and 33.1% in 15-year-olds respectively). This results is in accordance with study reported by Kumar et al[34.] Where they found that the children in private schools had higher prevalence of healthy gingiva as compared to government schools. Which may be attributed to lack of awareness, poor peer influence and lack of parental and professional education. Whereas children who belonged to urban areas had higher percentage of individual with better gingival health, which could be due to their good oral hygiene practices e.g. daily brushing and flossing.

CONCLUSION

Since, the school children do not know much about dental diseases and methods of their prevention, therefore education and motivation of children to maintain proper oral hygiene is of paramount importance. Teachers and parents should be taught and encouraged to inculcate healthy lifestyle habits in children. One more aspect which should be covered in school dental health programs is the management of dental fear which is a world-wide problem and universal barrier to oral health care services. Fears acquired in childhood through direct experience with painful treatment or vicariously through parents, friends, or siblings may persist into adulthood. Symptomatic treatment and lack of trust and control exacerbate fears. The prevention of fear development through the use of effective behavioral child management techniques combined with preventive dentistry should be a fundamental part of school dental health programs.

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