

Dental Caries Experience and Oral Hygiene Status among Institutionalized Orphans of Bhubaneswar City, Odisha: A Comprehensive Dental Healthcare Program Outcome

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ABSTRACT

Aim and objective: To assess the dental caries experience and oral hygiene status among the institutionalized orphans of Bhubaneswar city, Odisha.

Materials and methods: A descriptive cross-sectional study was conducted in 14 orphanages consisting of 729 inmates aged 3–18 years. An assessment form was recoded for Decayed Missing Filled Tooth Index (DMFT/dmft), oral hygiene index-simplified [OHI(S)] along with a questionnaire to record the participants' sugar consumption and oral hygiene practices. The Student's *t*-test was used to analyze discrete data and analysis of variance for continuous data. A binary grading system categorizing participants as "DMFT/dmft = 0" or "DMFT/dmft ≥ 1" for comparison between dental caries experience oral hygiene practices and the sugar consumption was done. The mean OHI(S) score was compared with the oral hygiene practices. A $p \leq 0.05$ was considered to be statistically significant.

Results: The caries prevalence of this study population was 41.4%. Mean DMFT/dmft was 1.07 ± 1.56 for permanent teeth and 0.96 ± 2.11 for primary dentition. The method of toothbrushing and the frequency of sugar intake were statistically associated with the presence of dental caries ($p = 0.002$). The OHI(S) score was 2.09 ± 1.21 for the entire sample which inferred a fair oral hygiene status. Circular method of cleaning and changing the toothbrush within 3 months reported least mean OHI(S) scores.

Conclusion: The oral health status revealed a huge occurrence of oral diseases and unmet oral health needs in the form of untreated dental caries and fair oral hygiene status. This was largely due to their poor oral health knowledge and limited availability of materials for the maintenance of proper oral hygiene.

Clinical significance: Even though the results of this study are fairly modest, it is enough to speculate that there is an apparent need for dental health programs to target the institutionalized orphans to improve their oral health status and prevent oral diseases.

Keywords: Dental caries, Decayed Missing Filled Tooth Index, Institutionalized, Oral hygiene index, Orphanages, Prevalence.

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INTRODUCTION

According to UNICEF, nearly 10,000 children become orphans every day.¹ It is internationally accepted that there are at least 140 million orphans worldwide and nearly 61 million in Asia alone.² The Indian National Family Health Survey (NFHS-4) reports that 5% of India's population under the age of 18 years are orphans. The same survey reports that the north-eastern region of the country has the highest percentage of orphans.³ Odisha is a state in eastern India with a population roughly of 42 million where 40% belong to scheduled tribes and scheduled castes including 13 particularly vulnerable tribal groups.⁴ Children's vulnerability in such populations deepens with high levels of poverty, displacement of families, frequent natural calamities, the presence of left-wing extremism, and the existence of rigid social norms and cultural practices.⁵

UNICEF and global partners define an orphan as a child <18 years of age who has lost one or both parents to any cause of death.² Following the death of a parent, many children enter orphanages. The pattern of orphanage living is quite poor when compared to family living.⁶ Poor living conditions in orphanages may be related to many complex health problems like developmental disturbances and psychiatric disorders.⁷ This is due to numerous influences that affect these children like economic hardship, neglect, malnutrition, and abuse.⁸

UNICEF, UNAIDS, and USAID reported that orphanages can be unfavorable for the growth and development of children to

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their full potential because for children to survive and thrive, they need to grow up in a community and family environment

that caters to their changing needs.⁹ Orphans, therefore, are considered a disadvantaged and socially marginalized population in whom disease burden is high.¹⁰ More disturbing is the evidence that the health care of orphans is often neglected. It has been well documented that the absence of family support adversely influences the knowledge on general and oral health behaviors.¹¹ Being an orphan is one of the most important predictors for poor oral health¹² as oral health care is one of the most common unmet health care needs of this group.¹³

Children from orphanages are expected to experience untreated dental caries and periodontal diseases as a consequence of their poor oral hygiene and dental neglect.⁸ Prevalence of dental caries among the children residing in orphanages of India has been reported to be as high as 88.5%.¹⁴ Similarly, studies conducted overseas have also reported comparable statistics; a study conducted in Yemen¹⁵ reports a prevalence of 84.7%, a study from Saudi Arabia¹⁶ reports 96% prevalence in 4- to 12-year-old orphans, and a study from China¹⁷ reports 50% prevalence in 4–17-year-old orphans. Such a high prevalence of untreated dental caries embraces the risk of dental sepsis¹⁸ along with a negative impact on child's quality of life-impacting their appearance, ability to eat, communicate, and perform daily tasks at home or school.¹⁹

Good oral hygiene is recognized as the key to oral disease prevention. Regular toothbrushing with fluoride toothpaste and adequate mechanical dental plaque removal helps to control most oral diseases.²⁰ Children's knowledge and skills of oral hygiene are mostly derived from their parents.^{21,22} In orphanages, it is now the responsibility of caregivers to fill-in this gap. Often these caregivers fail in their duties to cater to the needs of their inmates. This lacuna has been attributed to low care-taker to child ratio, poor funding, and inadequacies in the public health care system.²³

Oral hygiene promotion is most effective among younger populations; as peer groups can be targeted as agents of behavioral change within their communities. It is the primary concern of public health dentists to impart positive oral health knowledge and behaviors in society. The first step in achieving this is to provide relevant information and raise their awareness of oral health.²⁴ Past research in similar populations confirms the limited knowledge and access to services.^{12,25,26} Hence, implementation of comprehensive dental health care programs (CDHP) through outreach programs could serve dual purposes of creating oral health awareness and reducing the disease burden among this population.

No prior data exist regarding the oral health status and oral hygiene practices of orphans in Bhubaneswar, Odisha. Hence, this study was undertaken to assess the dental caries experience and oral hygiene status among the institutionalized Orphans of Bhubaneswar city, Odisha. The first objective of this study was to compare the dental caries experience with the study participants' oral hygiene and dietary sugar consumption practices. The second objective was to compare oral hygiene status with study participants' oral hygiene practices and finally, to provide CDHP services rendering both preventive and curative oral health care to this population.

MATERIALS AND METHODS

Study Design

A descriptive cross-sectional study was conducted from March 2019 to September 2019 to assess the prevalence of dental caries, dental caries experience, and oral hygiene status among the

institutionalized orphans of Bhubaneswar city, Odisha. This study is reported in accordance with the "Strengthening the Reporting of Observational Studies in Epidemiology" (STROBE) Statement: guidelines for reporting observational studies.²⁷

Setting and Participants

A list of the orphanages in Bhubaneswar city was acquired from the District collector, Khouarda, Odisha. This list consisted of a total of 14 orphanages both governmental and aided registered with the Department of Disabilities and Social Empowerment, Government of Odisha. The total study population consisted of 729 children aged 3–18 years, institutionalized in these 14 orphanages of Bhubaneswar city. All the orphans who consented to participate in the study and were present on the day of examination were included in the study. Orphans who refused to participate and those with systemic illness/developmental disorders/mental health issues/medically compromising conditions were excluded from the study. A universal sampling technique was employed in this study to allow all the participants to reap the benefits of this program.

Variables

The data were collected using an assessment form designed to record Decayed Missing Filled Tooth Index (DMFT)²⁸ for permanent dentition similarly, dmft index according to Gruebel²⁹ for the deciduous dentition and oral hygiene index-simplified³⁰ for oral hygiene assessment.

Data Measurement

A 15-item questionnaire was used to record the demographic data, participants' dietary sugar consumption practices (frequency of intake, time of intake, form, and consistency), and the oral hygiene practices (the type of cleaning, materials used, method of cleaning, frequency of brushing per day, and frequency of changing the toothbrush). The investigator (VS) himself interviewed the participants in their local vernacular language using the questionnaire before the clinical examination was carried out. Each participant had an undergone an ADA specification type III oral examination to determine their oral health status. A trained recording assistant was made to sit close enough to the examiner so that the instructions and codes could be easily heard and the findings recorded correctly. The questionnaire took about 25 minutes to complete.

Control of Bias

Before data collection, a pilot study was carried out on 50 participants to calibrate the examiner in recording the indices and to assess the ease and uniformity in interpretation of the questionnaire. The intra-examiner reliability kappa value was 0.89 indicating high reliability. No major corrections in the questionnaire were necessary. These data gathered during the pilot survey were not included in the main study.

Ethical Considerations

The institutional review committee approved the study bearing reference no.: KIIT/KIMS/IEC/090/2019. Permission to conduct the program in the orphanages of Bhubaneswar city, Odisha was obtained from the Department of Disabilities and Social Empowerment, Government of Odisha. Written permissions were also obtained from the concerned orphanage directors/administrators/wardens after explaining the purpose and nature of the study. The caretakers/wardens of orphanages offered written

proxy consent for the children in the orphanages. All participants' identity was kept confidential.

Statistical Methods

Data were imported to SPSS Version 18.0. Continuous measurements were presented as mean ± standard deviation and categorical measurements were presented in numbers (%). Discrete data were analyzed using Student's *t*-test and continuous data were analyzed using analysis of variance. *Post hoc* test was applied for situations in which already a significant omnibus *F*-test. Comparison between proportions was done using the Chi-square test. The outcome measures were assessed among the following age groups: ≤6, >6 to ≤13, >13 years, and gender. A binary grading system categorizing participants as "DMFT/dmft = 0" or "DMFT/dmft ≥ 1" for comparison between dental caries experience oral hygiene practices and the sugar consumption was done. The mean OHI(S) score was compared with the oral hygiene practices. A *p* ≤ 0.05 was considered to be statistically significant.

RESULTS

Demographics

A coverage rate of 94.5% was recorded for this study. The common reason to evade participation was absenteeism during the time of examination followed by nonconsenting. The age range of the participants was 3–18 years with a mean age of 10.7 ± 3.19 years. Among the 729 participants, 389 (53.4%) were males and 340 (46.6%) were females. The study population was grouped into three age groups based on their type of dentition (<6 years: deciduous dentition, ≥6 to ≤13 years: mixed dentition, and >13 years: permanent dentition). Most of the participants fell in the age group of 6–13 years 516 (70.8%). There was no statistical difference between the demographic characteristics of the study population (Table 1).

Dental Caries

The caries prevalence of this study population was 41.4%. This study also reports a caries prevalence of 57% in the deciduous dentition (participants aged <6 years). This suggests a higher rate of occurrence of dental caries in the primary dentition than the permanent dentition in this study population. The mean DMFT/dmft was 1.07 ± 1.56 for permanent dentition and 0.96 ± 2.11 for primary dentition. The decayed (D,d) component was the chief

contributor to the DMFT/dmft score. A highly significant difference was found while comparing DMFT/dmft between the age groups (*p* = 0.000) (Table 2). No statistically significant difference existed while comparing DMFT/dmft between genders (Table 3).

After dichotomizing dental caries as present or absent, comparisons were made between the presence of caries and the oral hygiene practices/dietary sugar consumption practices. Every participant (*n* = 729, 100%) used toothbrush and nearly every participant (*n* = 680, 93.3%) used toothpaste for brushing their teeth. The majority of the study population (*n* = 589, 80.8%) brushed their teeth once daily. More than half of the study sample (*n* = 487, 66.8%) used the horizontal scrub technique to brush their teeth in comparison to the vertical and circular brushing techniques. Among the various oral hygiene practices assessed, only the method of toothbrushing was statistically associated with the presence of dental caries (*p* = 0.002). The dietary sugar consumption when compared to the presence of dental caries; 520 (71.3%) participants consumed sugary foods at least once daily, 496 (68%) participants consumed sugary foods in-between meals, and 553 (75.9%) participants consumed sugary foods in solid form and sticky consistency. The frequency of sugar intake was the only variable to be significantly associated with the presence of dental caries among the study participants (Table 4).

Oral Hygiene Status

The OHI(S) was assessed for participants above the age of six considering the fully erupted of the permanent incisors and first molars (index teeth). The mean OHI(S) score was 2.09 ± 1.21 for the entire sample which inferred a fair oral hygiene status. Among the study population; the OHI(S) scores recorded across the age groups and between genders were statistically insignificant (Table 5).

On comparing oral hygiene practices with the mean OHI(S) scores of the participants, the type of cleaning, materials used for cleaning, and the frequency of brushing were statistically insignificant. However, the method of cleaning and frequency of changing the toothbrush was statistically significant. *Post hoc* multiple comparisons when applied to the different methods of cleaning the teeth were ranked as; circular < vertical < horizontal in the order of the least mean OHI(S) scores. Likewise, multiple comparisons when applied on the frequency of changing the toothbrush, 0 to ≤3 months was ranked higher than all the other permutations (*p* = 0.027) (Table 6).

Table 1: Distribution of the study population according to gender and age

Gender	Age (years)			Total	χ ²	p value
	<6	≥6 to ≤13	>13			
Male	34 (41.5)	286 (55.4)	69 (52.7)	389 (53.4)	5.573	0.062
Female	48 (58.5)	230 (44.6)	62 (47.3)	340 (46.6)		
Total	82 (11.2)	516 (70.8)	131 (18.0)	729 (100.0)		

Table 2: Comparison of dmft/DMFT index scores with age

	Age	d/D	m/M	f/F	dmft/DMFT	F test	p value
dmft	<6	2.65 ± 3.46	0	0	2.65 ± 3.46	44.227	0.000*
	≥6 to ≤13	1.21 ± 2.21	0	0.01 ± 0.22	1.23 ± 2.23		
	>13	0.07 ± 0.56	0	0	0.07 ± 0.56		
DMFT	<6	0.08 ± 0.57	0	0	0.08 ± 0.57	31.744	0.000*
	≥6 to ≤13	0.78 ± 1.26	0	0	0.78 ± 1.26		
	>13	1.55 ± 1.91	0.04 ± 0.22	0.00 ± 0.09	1.60 ± 1.95		

Comprehensive Dental Healthcare Programs

During the study period, 154 work hours were spent, 36 dental outreach visits were carried out over a duration of 4 months. A total of 1,458 basic care oral health procedures were performed, of which 364 (33.27%) were preventive and promotional, while 733 (67.01%) were curative. Referrals to the specialized care in the hospital, consisted of X-ray requests ($n = 587$), pulp therapy ($n = 376$), and various prosthesis ($n = 81$).

DISCUSSION

Epidemiological surveys assessing the oral health status of typical populations like school children, urban adult populations, and industrial workers are quite common. Whereas studies on such

neglected segments of our society like the inmates of orphanages are scanty. This study provides us a unique opportunity to describe the dental caries experience and oral hygiene status in this marginalized population of society. Residents of these orphanages are considered to be marginalized as these homes can barely meet the needs of their inmates. Owing to this, orphans usually portray a poor oral hygiene status which is the root cause for the various oral hard and soft tissue diseases. There are very few specific studies on orphans living under institutionalized care in India and none conducted in Bhubaneswar city. Thus, the present cross-sectional study was undertaken to determine the dental caries experience and oral hygiene status of institutionalized orphans in Bhubaneswar city of Odisha, India.

The caries prevalence in the present study was 41.4%. Studies conducted on similar populations abroad reported a caries prevalence of; 96% in Saudi Arabia,¹⁶ 84.7% in Yemen,¹⁵ and 34.8% in Pakistan.³¹ Whereas, studies conducted in various states/cities of India reported a caries prevalence of; 66.2% in Jammu and Kashmir,³² 62.12% in Vadodara city,³³ 58.3% in Nellore,¹² and 50.2% in Mysore City.³⁴ Such high prevalence of dental caries in this population may be due to the low-cut nature of government funding which is insufficient to cater to the needs of its inmates. On the same grounds, the present study reported a caries prevalence

Table 3: Comparison of dmft/DMFT index scores with gender

Variables	Gender	Caries experience		
		dmft/DMFT	t	p value
dmft	Male	2.26 ± 3.314	-1.233	0.221
	Female	3.20 ± 3.54		
DMFT	Male	1.86 ± 2.05	0.456	0.649
	Female	1.70 ± 1.96		

Table 4: Comparison of oral hygiene practices and dietary sugar consumption with the presence of dental caries

Variables		n (%)	Binary grading		χ^2	p value
			DMFT = 0	DMFT ≥ 1		
Type of cleaning	Toothbrush	729 (100)	427 (58.6)	302 (41.4)	No statistics are computed	
	Finger	0	-	-		
Materials used	Tooth paste	680 (93.3)	403 (59.3)	277 (40.7)	3.088	0.214
	Tooth powder	48 (93.3)	23 (47.9)	25 (52.1)		
	Charcoal	1 (0.1)	1 (100)	0		
Method of cleaning	Horizontal	487 (66.8)	307 (63.0)	180 (37.0)	12.111	0.002*
	Vertical	58 (8)	28 (48.3)	30 (51.7)		
	Circular	184 (25.2)	92 (50)	92 (50)		
Frequency of brushing	Once	589 (80.8)	348 (59.1)	241 (40.9)	0.898	0.638
	Twice	131 (18)	75 (57.3)	56 (42.7)		
	Thrice	9 (1.2)	4 (44.4)	5 (55.6)		
Frequency of sugar intake	Once	520 (71.3)	325 (62.5)	195 (37.5)	19.024	0.000*
	Twice	166 (22.8)	83 (50)	83 (50)		
	Thrice	22 (3)	14 (63.6)	8 (36.4)		
	>Thrice	21 (2.9)	5 (23.8)	16 (76.2)		
Time of intake	With meal	233 (32)	145 (62.7)	87 (37.3)	2.358	0.125
	In between	496 (68)	281 (56.7)	215 (43.3)		
Form	Solid	553 (75.9)	323 (58.4)	230 (41.6)	0.026	0.873
	Liquid	176 (24.1)	104 (59.1)	72 (40.9)		
Consistency	Sticky	534 (73.3)	312 (58.4)	222 (41.6)	0.018	0.894
	Nonsticky	195 (26.7)	115 (59)	80 (41)		

*Statistically significant ($p \leq 0.05$)

Table 5: Comparisons of age and gender with oral hygiene index scores

Age	Oral hygiene status			t	p value
	DI(S)	CI(S)	OHI(S)		
≥6 to ≤13	1.52 ± 0.88	0.61 ± 0.49	2.11 ± 1.22	-0.613	0.540
>13	1.44 ± 0.84	0.80 ± 0.55	2.17 ± 1.09		
Male	1.46 ± 0.88	0.66 ± 0.54	2.13 ± 1.27	0.803	0.422
Female	1.47 ± 0.86	0.59 ± 0.49	2.06 ± 1.14		
Total	1.47 ± 0.87	0.63 ± 0.52	2.09 ± 1.21		

Table 6: Comparison of oral hygiene practices with oral hygiene index scores

Variables		n (%)	OHI(S) scores	p value
Type of cleaning	Toothbrush	729 (100)	-	No statistics are computed
	Finger	0		
	Stick	0		
	Others	0		
Materials used	Toothpowder	48 (6.58)	1.81 ± 0.82	F = 1.594, p = 0.204
	Toothpaste	680 (93.2)	2.11 ± 1.23	
	Charcoal	1 (0.13)	12.8	
Method of cleaning	Horizontal	487 (66.8)	2.50 ± 1.33	F = 17.510, p = 0.000*
	Vertical	58 (7.95)	2.33 ± 1.04	
	Circular	184 (25.2)	1.91 ± 1.14	
Frequency of brushing	Once	589 (80.7)	2.06 ± 1.22	F = 2.232, p = 0.108
	Twice	131 (17.9)	2.28 ± 1.18	
	Thrice	9 (1.23)	1.71 ± 1.16	
Frequency of changing toothbrush	0 to ≤3	360 (49)	1.02 ± 0.64	F = 3.081, p = 0.027*
	>3 to ≤6	298 (38)	2.01 ± 1.18	
	>6 to ≤12	64 (9)	2.15 ± 1.24	
	>12 to ≤24	7 (0.03)	2.28 ± 1.14	

*Statistically significant ($p \leq 0.05$)

of 57% in deciduous dentition. Identical studies have reported similar prevalence where; National Oral Health Survey and Fluoride Mapping³⁵ reported 50%. The caries prevalence was higher in younger ages owing to the lack of adult supervision leading to improper cleaning of teeth and frequent intake of sweet and sticky food. Yet, another reason behind this neglect is, primary dentition is not given the same importance as its permanent counterparts as they are considered temporary and ignored even when there is a definitive need for attention. Caries prevalence decreased with an increase in age as the deciduous teeth exfoliated naturally and permanent teeth which are more resistant to caries replaced them.

The dental caries experience was 1.07 ± 1.56 for permanent teeth and 0.96 ± 2.11 for primary dentition in the present study. Studies abroad have also reported comparable results; Pakistan (DMFT = 1.18 ± 0.39 , dmft = 1.04 ± 0.23)³¹ and Yemen (DMFT = 2.06 ± 1.94 , dmft = 2.28 ± 2.37).¹⁵ Various studies conducted in India have reported similar caries experiences; Jodhpur City, Rajasthan (DMFT = 1.40 ± 1.78),³⁶ Jammu and Kashmir (DMFT = 1.74 ± 1.92 , dmft = 1.35 ± 1.79),³² Udaipur City, Rajasthan (DMFT 1.16 ± 1.14),²⁶ and Nellore, Andhra Pradesh (DMFT = 1.01 ± 1.52 , dmft = 2.21 ± 2.82).¹² Orphanages have their own faculty to cater to the educational needs of their children. However, no health education was imparted to these children which was a matter of concern.

Furthermore, it was observed that the caries experience was largely contributed by the decayed (d/D) component in both primary and permanent dentition. These findings are in line with the studies reported earlier.^{32,37,38} This suggests a lack of access to dental care in these groups and also indicates that the reason for dental visiting/examination was problem-based. Many factors are contributing to such a high percentage of untreated carious lesions among the underprivileged orphan population; lack of knowledge about good oral hygiene practices among caretakers and concerned authorities, lack of motivation, low priority given to dental care in society, lack of the facility for early/regular oral health check-up and cost of treatment.

The mean DMFT was higher among males (1.86 ± 2.05) compared to females (1.70 ± 1.96) in the present study; though statistically insignificant. Correspondingly, Sudha et al.³⁹ and Laganà

et al.⁴⁰ also found no statistically significant difference between genders. Whereas, Sharma et al.,⁴¹ Shailee et al.,⁴² and Saravanan et al.³⁸ found females had significantly higher caries experience than males. The authors of these studies attributed higher caries experience among females to an early eruption of teeth and their prolonged exposure to the deleterious oral environment. On the contrary, Thetakala et al.,³⁴ Khare et al.,²⁶ and Gaur et al.³³ reported significantly higher caries experience among males which, is in agreement with the observations of the present study. The higher caries experience among males could probably be because females were more particular about maintaining esthetics, appearance, cleanliness, and hygiene while males are negligent about their health particularly oral health.

In the present study, all participants (100%) used a toothbrush to brush their teeth and 80.8% of the participants brushed their teeth only once, while a very small percentage (8%) brushed twice daily. On the same lines, Gaur et al.³³ reported 99.4% of orphans brushed their teeth only once, and an insignificant 0.6% brushed twice whereas. While comparing this with children of the same age with parents disclosed that 72.7% brushed once and 27.3% brushed twice a day.³³ This lower percentage of children brushing their teeth twice may be due to limited availability of brushing aids (toothbrush and toothpaste), lack of motivation, and guidance from caregivers in the orphanages. It was also seen that the participants used a horizontal scrubbing method of brushing (66.8%). Though all the participants brushed their teeth, they seemed ignorant of its importance and the proper technique of brushing the teeth. Further, many were not even aware of the ill effects of frequent snacking in-between meals and adequate oral hygiene performance, which reflects poor oral health awareness.

Further, dietary sugar consumption history revealed tendencies toward having dental caries (DMFT > 1) increased as the; intake of sugars having a sticky consistency in-between meal increased. As far as the restriction of refined sugar intake was concerned in these orphanages, the people who visited them on a timely basis felt sympathetic toward the plight of these children and pampered them with sweets and snacks at the orphanages on social occasions leading to this practice of frequent in-between meal snacking.

Poor oral hygiene has been implicated in the etiology and progression of oral hard and soft tissue diseases. This is more so for those at risk due to their inability/failure to maintain adequate and proper oral health care resulting from lack of awareness and/or nonavailability of resources. Forty-nine percent of the study participants presented with fair oral hygiene. This is similar to the study by Shanbhog et al.¹⁴ where 47.5% of participants revealed fair oral hygiene status. However, higher percentages have been reported by Ojahanon et al.²⁵ (73.7%) in orphans of Benin city, Nigeria. Both the motivation of the individual and his/her manual dexterity in the use of oral hygiene aids influences the success of plaque removal.

The findings of our study showed that younger age groups had better oral hygiene when compared to participants above 13 years of age though, not statistically significant. On the contrary, a study by Mahesh Kumar et al.⁴³ reported older children having lower scores. It has been proven that brushing skills get better with age and that the duration and dexterity of brushing improved significantly as age advanced.⁴⁴ Our study indicated an insignificant difference in oral hygiene between genders ($p = 0.422$). Females (2.06 ± 1.14) had marginally less OHI(S) scores as compared to males (2.13 ± 1.27). On the contrary, Markeviciute and Narbutaite⁴⁵ reported a significant difference in oral hygiene between genders ($p = 0.007$) where females (0.86 ± 0.36) were significantly better than boys (1.28 ± 0.45). The better oral hygiene in females is suggestive of a possible growing awareness about esthetics and understanding the contribution of a healthy clean tooth for the same.

Toothbrush (100%) and toothpaste (93.2%) were the most common materials used for teeth. A mere 18% of the participants reported brushing their teeth at least twice a day whereas, in a study by Markeviciute and Narbutaite,⁴⁵ 32.8% of kids brush their teeth at least twice a day. Studies have reported that the frequency of toothbrushing does not always mean better oral hygiene rather the quality of toothbrushing is more imperative.⁴⁵ Nearly half of the study population ($n = 487, 66.8\%$) brushed their teeth in a horizontal scrubbing motion. It is well known that the circular method is the best way to remove dental plaque from hardly reachable surfaces of children's teeth. This irregularity in the method of toothbrushing may be due to the varying children's ability to brush based on their experience, physical and neurological development.

Improvements in the oral health status of vulnerable groups can be achieved by initiating CDHPs catering to these populations' dental needs and contributing to the improvement of their oral health condition. Such programs provide a platform to dispense oral health curative and preventive programs utilizing the oral health care infrastructure and manpower of an academic dental institution.

Limitations

Such marginalized populations are influenced by several background factors such as attitudes, beliefs about health, past diseases, and past dental experience. The significance of these factors influencing oral health behavior was not assessed in the present studies. Due to economic and practical limitations, this study could not be carried out on a longitudinal design which could have given us a better understanding of the cultural, socioeconomic backgrounds, and environmental conditions present in these vulnerable populations.

Recommendations

This study reports the urgent need for planning preventive services and provision of treatment to such marginalized populations.

Few unforeseen limitations encountered in the present study can be overcome through the following suggestion for future research:

- Initiation of oral health promotion programs to train the faculty, staff, and children residing in the orphanages, in oral hygiene maintenance.
- Assessment of deleterious oral habits like nail/lip/pencil biting, thumb sucking and more adverse habits which affect their oral health as these populations are more prone to emotional/psychological problems due to the lack of parental attention, affection, and care.
- Periodic preventive visits of these children to the nearest dental facilities instead of visits only during emergencies. If not, implementation of comprehensive dental care program at regular intervals catering to the needs of this population as and when they arise.

CONCLUSION

Children in orphanages are a neglected segment of our society. They face certain emotional, social, and psychological distress which affects their general as well as oral health. An effort has been made to throw some light on unattended oral health problems in orphanages. The oral health status revealed a huge occurrence of oral diseases and unmet oral health needs in the form of untreated dental caries and fair oral hygiene status. This was largely due to their poor oral health knowledge and limited availability of materials for the maintenance of proper oral hygiene. Even though the results of this study are fairly modest, it is enough to speculate that there is an apparent need for dental health programs to target the institutionalized orphans to improve their oral health status and prevent oral diseases.

It is obvious; however, that information about dental health and dental health behavior must be repeated and practiced over a longer period. Their caregivers need to update their knowledge of oral health care to ensure appropriate supervision. Creating opportunities for the orphans to visit dental health facilities for regular checks will assist them in achieving the same.

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