

Original Article

Assessment of oral health parameters among students attending special schools of Mangalore city

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ABSTRACT

Background: The aim of the study was to assess the oral health status and treatment needs and correlation between dental caries susceptibility and salivary pH, buffering capacity and total antioxidant capacity among students attending special schools of Mangalore city.

Materials and Methods: In this study 361 subjects in the age range of 12–18 years were divided into normal ($n = 84$), physically challenged ($n = 68$), and mentally challenged ($n = 209$) groups. Their oral health status and treatment needs were recorded using the modified WHO oral health assessment proforma. Saliva was collected to estimate the salivary parameters. Statistical analysis was done using Statistical Package for Social Sciences version 17. Chicago.

Results: On examining, the dentition status of the study subjects, the mean number of decayed teeth was 1.57 for the normal, 2.54 for the physically challenged and 4.41 for the mentally challenged study subjects. These results were highly statistically significant ($P < 0.001$). The treatment needs of the study subjects revealed that the mean number of teeth requiring pulp care and restoration were 1 for the normal, 0.12 for the physically challenged, and 1.21 for the mentally challenged study subjects. These results were highly statistically significant ($P < 0.001$). The mean salivary pH and buffering capacity were found to be lowest among the mentally challenged subjects. Physically challenged group had the lowest mean total antioxidant capacity among the study subjects. Among the study subjects, normal students had the highest mean salivary pH, buffering capacity, and total antioxidant capacity. These results were highly statistically significant ($P < 0.001$).

Conclusion: This better dentition status of the normal compared to the physically and mentally challenged study subjects could be due to their improved quality of oral health practices. The difference in the treatment needs could be due to the higher prevalence of untreated dental caries and also due to the neglected oral health care among the mentally challenged study subjects. The salivary pH and buffering capacity were comparatively lower among the physically and mentally challenged study subjects which could contribute to their increased caries experience compared to the normal study subjects. However, further studies are needed to establish a more conclusive result on the total anti-oxidant capacity of the saliva and dental caries.

Key Words: Dental caries, education, oral health, saliva, statistics susceptibility

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INTRODUCTION

The birth of a child is always eagerly awaited by family and friends alike, as it is an event of joy and happiness. But, when it becomes apparent that something is amiss with their newborn, their world is shattered. Anger, denial, and depression set in and the parents of such children suffer great agony.

Amidst many other problems faced the maintenance of good general and oral health of such children is difficult. Hence, the management of these “God’s forgotten children” is a task which needs special effort on the part of the dental surgeon.^[1]

Most physically challenged individuals start their life with teeth and gums that are as strong and healthy as those of the normal people.^[2] Eventually, poor oral hygiene leads to various dental diseases like dental caries, periodontal diseases, which eventually affects the overall health.

According to the National Sample Survey Organization, there are 18.49 million persons with disabilities in India which constitutes around 1.8% of the total population.^[3] It is very important to assess their oral hygiene status.

Earlier studies^[4] on physically challenged children have shown that the standard of dental cleanliness deteriorated steadily with increasing age. This behavior is explained by factors like negligence and lack of awareness. A study that assessed the oral health status of physically challenged certified that among school children in the age group of 5–9 years 46% were affected with caries. In 13–16 years age group, 55% of caries lesions were untreated. In another study^[5] conducted on physically challenged individuals revealed that caries prevalence in physically challenged subjects was 54.1%. A follow-up examination showed a considerable improvement in the treatment of caries. It can be concluded from this study that it is feasible to set up an effective dental service for these special groups and improvements in the treatment of dental caries can be achieved in a relatively short period.

To date, only a very few studies have been conducted to determine the oral health status and dental caries prevalence of physically challenged children in India.^[6,7]

Recently, it has been claimed that the imbalances in levels of free radicals, reactive oxygen species, and

antioxidants in saliva may play an important role in the onset and development of dental caries.^[8] Hence, evaluation of those factors in saliva that may increase the risk of individuals to dental caries can pave the way to make recommendations that will cater specifically to needs of an individual.^[9]

Hence, an attempt is made here to assess the oral health status, treatment needs, and correlation of dental caries susceptibility with salivary pH, buffering capacity, and total antioxidant capacity among students attending special schools of Mangalore city.

MATERIALS AND METHODS

Patient selection

Students aged 12–18 years attending the special schools of Mangalore and who were present on the day of examination were included in the study after obtaining consent from their parent/guardian. It was carried for 20 months from February 2012 to September 2013. Students were selected from the five special schools of Mangalore city. They are,

1. Saanidhya Special School, Shakthinagar
2. Roman and Catherine Blind School, Urwa
3. Chetana Special School, Carstreet
4. Integrated Special School, Vamanjoor
5. St Agnes Special School, Bendoor.

The students excluded in the study were students who were uncooperative with the procedures and not willing to participate in the study, students on medication for any other systemic disorders, students taking any drugs influencing salivary constituents, students who were participating in any kind of interventional studies at present or during the past 3 months and students who were both physically and mentally challenged. The study was reviewed and approved by the Institutional Ethical Committee of A.J. Institute of Dental Sciences, Mangalore.

A pilot study was conducted to assess the sample size and feasibility of the study.

Sample size determination

$$n = \frac{Z_{\alpha}^2 p \cdot q}{E^2}$$

Where, $Z_{\alpha} = 1.96$; $p = 81$ (prevalence of dental caries); $q = 19$ ($100 - p$); Confidence interval = 95%; Power = 95%; Level of significance = 5%; E (allowable error) = 5% of $P = 4.05$.

Substituting the values in the formulae:

$$n = \frac{1.96^2 \times 81 \times 19}{4.05^2}$$

$$= 360.45$$

$$= 361$$

Thus, the sample size was estimated to be 361.

Examination procedure

The study subjects were selected based on convenience sampling. The examination was done by a single examiner. The data were recorded by a trained postgraduate student from the department. Intra-examiner calibration was carried out. The data obtained was analyzed using Kappa statistics. The coefficient was found to be 0.86, reflecting a high degree of agreement in the observations.

They were examined using the study proforma. The study pro forma consisted of two parts. The first part was a structured questionnaire to record the demographic profile. The demographic profile includes age, gender, and medical condition of the study subjects. Medical history and relevant information were obtained from individual files of these children that are maintained in the school. The second part was to record the clinical data which were collected using type III examination (ADA). Oral health status and treatment needs were recorded using the WHO Oral Health Assessment Pro forma (1997).^[10]

The study subjects were asked to rinse the mouth with water, and 5 ml of unstimulated saliva were collected from every subject in a 30 ml sterile plastic container. It was stored in an ice box with temperature maintained at 4°C and was taken to Department of Biochemistry, for estimation of pH, buffering capacity and total antioxidant capacity of each sample. The biochemical analysis was started within 45 min of a collection of salivary samples.

Salivary buffering capacity was measured by "Ericsson method, 1959."^[11] An aliquot of 0.5 ml of saliva was added to 1.5 ml of 5 mmol/l HCl. The mixture was vigorously shaken and then centrifuged for 1 min and allowed to stand for 10 min when the final pH of supernatant was measured using manual pH meter.

Salivary total antioxidant capacity was measured using a spectrophotometer.^[12] An aliquot of 0.1 ml of a sample solution containing a reducing species

was combined in an Eppendorf tube with 1 ml of reagent solution (0.6 M sulfuric acid, 28 mM sodium phosphate, and 4 mM ammonium molybdate). The tubes were then capped and incubated in a thermal block at 95°C for 90 min. After the samples had cooled to room temperature, the absorbance of the aqueous solution of each was measured at 695 nm against a blank. The blank solution contained 1 ml of reagent solution and an appropriate amount of the same solvent used for the sample, and it was incubated under the same conditions as the rest of the samples. For each sample of saliva, the total antioxidant capacities were measured as equivalents of ascorbic acid using spectrophotometer. The results obtained in nanometers were converted to µg/L for each sample.

Statistical analysis

The data obtained was analyzed using Kappa statistics. The coefficient was found to be 0.86, reflecting a high degree of agreement in the observations. Oral health status of the normal, physically challenged, and mentally challenged students were compared with their clinical findings and was analyzed using Chi-square test. The comparison of dentition status and treatment needs among the normal, physically challenged and mentally challenged was done by Kruskal–Wallis test. Karl Pearson's correlation coefficient was used to assess the correlation of dental caries susceptibility with salivary pH, buffering capacity and total antioxidant capacity of the study subjects.

RESULTS

The study population consisted of 361 study subjects aged 12–18 years with their mean age being 15.45 years with a standard deviation of 1.60.

47.4% of them were males and 52.6% of the study subjects were females. Among the male study subjects, 19% were normal, 79.4% were physically challenged, and 48.3% were mentally challenged study subjects. Among the female study subjects, 81% were normal, 20.6% were physically challenged, and 51.7% were mentally challenged study subjects [Table 1].

Bleeding on probing was present among 24.4% of the normal, 17.7% of the physically challenged, and 39.3% of the mentally challenged study subjects. Calculus was present among 8.6% of the normal, 10.3% of the physically challenged, and 20.2% of the mentally challenged study subjects. These results were not statistically significant ($P > 0.05$).

The distribution of the dental caries susceptibility among the study subjects showed that the mean dental caries susceptibility was 1.92 for the normal, 2.74 for the physically challenged and 4.38 for the mentally challenged study subjects. These results were highly statistically significant ($P < 0.001$) [Table 2].

The distribution of dentition status among the study subjects showed that the mean number of missed

Table 1: Distribution of study subjects based on medical condition and gender

Medical Condition of the study subjects	Sex of the study subject		Total subjects
	Male	Female	
Normal	16 (19.0%)	68 (81.0%)	84
Physically Challenged	54 (79.4%)	14 (20.6%)	68
Mentally Challenged	101 (48.3%)	108 (51.7%)	209
Total	171 (47.4%)	190 (52.6%)	361

Table 2: Distribution of dental caries experience among the study subjects

Medical Condition of the study subjects	N	Mean	Standard Deviation	P
Normal	84	1.92	1.36	< 0.001
Physically Challenged	68	2.74	1.63	HS
Mentally Challenged	209	4.38	2.74	

HS: Highly significant; NS: Non significant; SIG: Significant

teeth due to caries was 0.1 for the normal, 0.13 for the physically challenged and 0.04 for the mentally challenged study subjects. The mean number of teeth with trauma was 0 for the normal, 0.46 for the physically challenged and 0.78 for the mentally challenged study subjects [Table 3].

The mean number of permanent teeth not requiring treatment was 26.81 for the normal, 25.53 for the physically challenged, and 20.88 for the mentally challenged study subjects. These results were highly statistically significant ($P < 0.001$).

The distribution of treatment needs among the study subjects showed the mean number of two or more surface fillings needed was 0.77 for the normal, 0.86 for the physically challenged and 1.39 for the mentally challenged study subject. The mean number of teeth requiring pulp care and restoration was 1 for the normal, 0.12 for the physically challenged, and 1.21 for the mentally challenged study subjects. These results were highly statistically significant ($P < 0.001$) [Table 4].

The distribution of salivary pH, buffering capacity and total antioxidant capacity among the study subjects showed that the mean salivary pH was 6.27 for the normal, 6.32 for the physically challenged, and 5.48

Table 3: Distribution of dentition status among the study subjects

	Medical condition	N	Mean	P
Total number of decayed permanent teeth in the study subject	Normal	84	1.57	<0.001 HS
	Physically handicapped	68	2.54	
	Mentally Challenged	209	4.41	
Total number of filled teeth with decay in permanent dentition	Normal	84	0	<0.001 HS
	Physically handicapped	68	0.09	
	Mentally Challenged	209	0.02	
Total number of filled teeth in permanent dentition	Normal	84	0.11	>0.05 NS
	Physically handicapped	68	0.09	
	Mentally Challenged	209	0.04	
Total number of missed teeth due to caries in study subject	Normal	84	0.10	<0.05 SIG
	Physically handicapped	68	0.13	
	Mentally Challenged	209	0.04	
Total number of missed teeth due to other reasons in study subject	Normal	84	0	>0.05 NS
	Physically handicapped	68	0.17	
	Mentally Challenged	209	0.01	
Total number of unerupted teeth in study subject	Normal	84	4.00	<0.001 HS
	Physically handicapped	68	4.41	
	Mentally Challenged	209	5.03	
Total number of teeth with trauma in study subject	Normal	84	0	<0.001 HS
	Physically handicapped	68	0.46	
	Mentally Challenged	209	0.78	
Total number of permanent teeth not requiring treatment in study subject	Normal	84	26.81	<0.001 HS
	Physically handicapped	68	25.53	
	Mentally Challenged	209	20.88	

for the mentally challenged study subjects. The mean salivary buffering capacity was 5.27 for the normal, 5.15 for the physically challenged, and 4.68 for the mentally challenged study subjects. The mean salivary total antioxidant capacity was 0.99 for the normal, 0.30 for the physically challenged, and 0.51 for the mentally challenged study subjects. These results were highly statistically significant ($P < 0.001$) [Table 5].

The distributions of correlations of the dental caries susceptibility with salivary parameters among the study subjects were evaluated. Among the normal study subjects, salivary pH showed a moderate negative correlation, buffering capacity, and total antioxidant capacity showed a low negative correlation and these results were highly statistically significant ($P < 0.001$). Among the physically challenged students, salivary pH, buffering capacity, and total antioxidant capacity showed no correlation with dental caries susceptibility and the results were not statistically significant ($P > 0.05$). Among the mentally challenged subjects, salivary pH and total

antioxidant capacity showed no correlation and salivary buffering capacity showed a low negative correlation. These results were highly statistically significant ($P < 0.001$) [Table 6].

DISCUSSION

The disabled form a substantial section of the community, and it is estimated that there are about 500 million people with disabilities worldwide. The primary target of a nation should be to improve the health and social functioning of the deprived people. This group is often neglected because of ignorance, fear, stigma, misconception, and negative attitudes.^[2]

The present study was conducted over a period of 20 months from February 2012 to September 2013, and the sample consisted of 361 study subjects. The students of the age group of 12–18 years were included in the study. Their oral health status and treatment needs were recorded as given in the modified WHO Oral Health Assessment Proforma (1997).

Table 4: Distribution of treatment needs among the study subjects

Medical Condition of the study subjects	Total mean number of one surface filling needed	Total mean number of two or more surface fillings needed	Total mean number of teeth requiring pulp care and restoration	Total mean number of teeth requiring extraction	Total mean number of teeth requiring other care
Normal	1.06	0.77	1.00	0	0
Physically challenged	1.70	0.86	0.12	0.19	0.12
Mentally challenged	1.58	1.39	1.21	0.19	0.07
<i>P</i>	>0.05 NS	<0.001 HS	<0.001 HS	>0.05 NS	<0.001 HS

Table 5: Distribution of salivary parameters among the study subjects

Medical condition of the study subjects	Mean Salivary pH	Mean Salivary Buffering capacity	Mean Salivary Total Anti Oxidant capacity	<i>P</i>
Normal	6.27	5.27	0.99	<0.001 HS
Physically challenged	6.32	5.15	0.30	
Mentally challenged	5.48	4.68	0.51	

Table 6: Distribution of correlations of dental caries experience with salivary parameters among the study subjects

Medical Condition of the study subjects	Salivary Parameters	Pearson Correlation <i>r</i> value	<i>P</i>
Normal	Salivary pH	-0.52	<0.001 HS
	Salivary Buffering Capacity	-0.42	<0.001 HS
	Salivary Total Antioxidant capacity	-0.47	<0.001 HS
Physically Challenged	Salivary pH in study subject	-0.13	>0.05 NS
	Salivary Buffering Capacity	-0.22	>0.05 NS
	Salivary Total Antioxidant capacity	-0.08	>0.05 NS
Mentally Challenged	Salivary pH	-0.24	<0.001 HS
	Salivary Buffering Capacity	-0.45	<0.001 HS
	Salivary Total Antioxidant capacity	0.23	<0.001 HS

The study subjects in the present study were sorted into the following categories: normal, physically challenged, and mentally challenged students. Among the physically challenged study subjects in the present study, the mean number of decayed teeth was 2.54, missing due to caries were 0.13, and a total number of permanent teeth not requiring any treatment was 25.53, respectively.

The higher incidence of dental caries among the physically challenged when compared to normal study subjects might be attributed to the low level of awareness and negligence of oral hygiene practices. Among the mentally challenged study subjects in the present study, the mean number of decayed teeth were 4.38, missing due to caries were 0.04 and a total number of permanent teeth not requiring any treatment were 20.88. This finding is in concurrence with the study conducted by Solanki *et al.*^[13] The high caries activity among the mentally challenged study subjects could also be attributed to their difficulty in maintaining oral hygiene, poor muscular coordination, muscle weakness interfering with their routine oral hygiene procedures, low powers of concentration and lack of motor skills. According to a study conducted by Dinesh *et al.*, the lack of manual coordination in the disabled children is a factor which affects the maintenance of their oral hygiene.^[14]

The most important variable in determining oral health status is the type of disability and how that disability impacts the maintenance of adequate or sound oral hygiene. Furthermore, a lack of knowledge about good oral hygiene practices among the concerned authorities, lack of motivation, the low priority given to oral health care in the society and the generally poor socio-economic status of parents or guardians may be other explanations of the poor level of oral hygiene among the disabled children.^[14]

In the present study on assessing the treatment needs, pulp care and restoration needs were the highest among the mentally challenged study subjects. This could be due to the higher prevalence of untreated dental caries and also due to the neglected oral health care among the mentally challenged study subjects. According to a study conducted by Dinesh *et al.*,^[14] the main barriers to equal access to dental treatment for individuals with disabilities seems to be inadequate facilities and insufficient time. According to a study conducted by Purohit and Singh^[3] majority of the children with disabilities had never visited

a dentist due to their socioeconomic backgrounds, including family income, parental education and area of residence along with cost of dental care, which might have influenced dental service utilization.

In the present study, among the normal study subjects, salivary pH showed a moderate negative correlation with dental caries susceptibility. According to the study conducted by Preethi *et al.*, as the salivary pH decreases, dental caries susceptibility of the student's increases.^[15]

In the present study, salivary buffering capacity and dental caries susceptibility showed a low negative correlation among the normal, no correlation among the physically challenged and a low negative correlation among the mentally challenged study subjects. This might be due to the fact that as the buffering capacity of the saliva decreases, the saliva tends to remain at an acidic pH and thereby it would lead to the demineralization of the tooth structure and initiation of dental caries.^[16]

In the present study, salivary total antioxidant capacity showed a low negative correlation with dental caries susceptibility among the normal study subjects and no correlation among the physically challenged study subjects. The presence of an infectious challenge in the form of caries or poor oral hygiene could be one of the factors for the comparatively decreased levels of total antioxidant capacity among the study subjects and in the initiation of dental caries. However, further studies are needed to establish a more conclusive result on the role of salivary total antioxidant capacity in the initiation of dental caries.

Lack of important data is a serious limitation for providing adequate treatment to the underprivileged.^[17] The strength of the study lies in the fact that children were selected from five special schools in the same locality.

The possible mechanism to improve the condition is to conduct oral health programs and periodic monitoring of unmet treatment needs. Use of electrical toothbrush can be advised. pH supplements and antioxidants could be given on a regular and periodic basis under proper guidance to reduce the dental caries susceptibility of the students attending special schools of Mangalore city.

CONCLUSION

The true measure of a society lays on the way it treats its older, physically challenged, and disadvantaged

citizens. If good oral health is to become a reality in the future for people with special needs, it is essential that people in daily contact with the individuals become involved in oral care. From the present study, we can conclude that mentally challenged students have poor levels of oral hygiene, even more so in comparison with physically challenged and normal students attending special schools of Mangalore city. The limitation of the study was the small sample size, and only the assessment of treatment need was done. No treatment was provided. Further studies are required in the form of systematic reviews and meta-analysis to increase the strength of evidence and preventive initiatives have to be taken by the government and other social bodies to improve the condition. This emphasizes the critical need of a frequently applied oral hygiene measure by dental professionals. Prevention should be the main objective, as these patients are often apprehensive and uncooperative.

The constant motivation of the parent and caretakers to comply for the demands of the treatment and necessary training of the dental team in the matters of behavior management and treatment strategies is needed to improve the oral health status of students attending special schools of Mangalore city.

“Disabled doesn’t mean worthless... It is never about productivity; it is about humanity.”

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Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or non-financial in this article.

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