Assessment of caries activity by using ORATEST among 4-12 years old children": An observational study

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Research Article

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Abstract

Objective: To evaluate caries activity using simple chairside oral rinse test (Oratest) among school going children.

Methodology: A total of 50 children aged between 4-12yrs meeting the inclusion criteria were selected and allocated into control group (25 children) and test group (25 children). The test group consisted of 25 children, which were further divided on the basis of no of carious teeth into three subgroups I (1-2 carious teeth), II (3-5 carious teeth) and III (7-9 carious teeth). Oratest was performed to check the existing caries status. The time taken to change Colour depicts the caries activity was recorded in structured proforma. Independent sample T-test and One-way ANOVA was used for statistical analysis.

Result: Out of total 50 children, 26 were female and 24 were male with a mean age of 6.74 ±2.20 yrs. The result reported significant difference in mean time for Colour change between control and test group. The Oratest time was highest in patients with less carious activity depicting an inverse relation exist between Oratest and caries activity

Conclusion: Oratest can be used to assess caries activity as a simple, inexpensive, chairside and less time consuming method. It can be of great help in paediatric dental setups for caries activity assessment as it is readily accepted by children.

Introduction

The Oral cavity is colonized with different microorganisms causing some common diseases of the oral cavity, out of which periodontal diseases and caries are of particular importance. There is a rise in the prevalence of caries among developing countries mainly due to inaccessible and poor quality of health services [1]. A survey was conducted by WHO in 2003 in many constituencies of Pakistan which concluded that dental caries was five times more common than asthma seven times more prevalent than Hay fever in children [2, 3].According to Sturdevant's: “Dental caries is an infectious microbiologic disease of the teeth that results in localized dissolution and destruction of calcified tissues” [4].Different factors that contribute towards caries include the number of bacteria, the composition of saliva, and dietary habits of patient. Caries is mainly caused by streptococcus mutants, lactobacillus and actinomyces [5]. Information about the bacterial load can help to determine the risk of individuals towards caries [6].This will help the dentists to bring balance between caries preventive and predisposing factors. However, determination of bacterial load alongside with other factors is a difficult task [7].

Various methods available to check caries activity are focused on identifying the count of causative microorganisms however, such methods are expensive, invasive, time consuming, need laboratory support and are technique sensitive with varying levels of reliability and sensitivity [8]. Rosenberg *et al.* [9] developed Oratest in 1989, a noninvasive, inexpensive and time efficient method to evaluate existing caries status. Oratest is based on the principle of oxygen depletion by organisms in expectorated milk. Aerobic dehydrogenase enzyme transfers protons or electrons to oxygen. Anaerobic environment is

created after consumption of oxygen by aerobic organisms. The indicator used is methylene blue which accepts the electron and gets reduced to leukomethylene blue hence the Colour change is observed. Milk is used as a medium that helps to dislodge microorganisms. Similar studies have been done using this method for gingivitis, halitosis, and hygiene evaluation [1, 10, 11].In 2020, a study was conducted using oratest for caries risk assessment [12]. To my knowledge limited studies have been done on this topic. Therefore, the present study was aimed to evaluate caries activity using simple chairside oral rinse test (Oratest) among school going children.

Materials And Methods

The present observational study was conducted at dental clinics, private Dental College, Karachi Pakistan. Simple randomization method was used for selection of participants. Ethical approval was taken from the ethics committee of the college with ref no.04/2019. Informed consent was taken from each participant parent before included in the study.

Sample size was calculated using WHO sample size calculator using the study by chandak *et al* [10] who reported mean time for color change in the test group as 74 ± 37mins, using this value and keeping the confidence level at 95% and absolute precision at 15%. The required sample size was 24 as we have two groups test and control a total 48 sample was required. We included total 50 children with age range between 4–12 years, systemically healthy, and whom parents gave consent, while children's who were non-co-operative, allergic to lactose, whose teeth were periodontally compromised or near to exfoliation were excluded from the study.

Sample of 50 children were divided into two groups (Test and Control) with sample of 25 each. The children included in control group were free from gingivitis, caries and other oral diseases. The test group consisted of patient with carious teeth and was further divided on the basis of no of carious teeth into three subgroups I (1–2 carious teeth), II (3–5 carious teeth) and III (7–9 carious teeth). The division was done for the ease of sampling. (Fig. 1)

Participants were asked to rinse with 10ml (collected in disposable syringe) of sterile milk (cow milk, 3% fat, pH 6.5), (Nestle Nesvita), which was collected in the test tube (Pyrex). 3 ml of the sample was collected in a sterile test tube, to which 0.12 ml of 0.1% methylene blue dye was added with the help of pipette and observed for the colour change from blue to white, and time duration was noted using stop watch. The time taken to change Colour depicts the caries activity. All the data was recorded in self structured proforma.

Statistical analysis

Statistical analysis was performed using SPSS version 22. Frequency was calculated for qualitative variables like gender, and means and standard deviations were determined for quantitative variables like mean time to Colour change. T-Test was used to evaluate the difference in mean time for Colour change

between control and test group. One- way ANOVA and Post hoc Tukey test was applied to compare the mean time taken for Colour change among the test subgroups keeping the level of significance at ≤ 0.05.

Results

Out of total 50 children, 24 were male and 26 were female with a mean age of 6.74 ± 2.20 yrs. The distribution of patient in various groups are mentioned in Fig. 2.

The present study reported higher Oratest time in male gender (64.71 ± 38.52minutes) as compared to female gender (56.46 ± 29.32 minutes), and the results were statistically significant (*p*-value > 0.007).

The maximum time noted for the Colour change was 110 minutes and the minimum time noted for colour change was 18 minutes. The mean time taken for the change of Colour from blue to white was 28.8 ± 9.16 minutes in the Test Group and 91.96 ± 14.01minutes in the Control group and the difference was statistically significant (*p*-value of 0.000). (Table – 1).

Our results showed a significant different in mean time for colour change among the test subgroups (*p*-value = 0.000). (Table 2 & Table 3).

Table 1
Comparison of mean time for colour change depicting caries activity between Test and Control group.

S.No:	**Experimental Groups** **n = 50**	**Mean time to change colour (minutes)** **Mean ± SD**	***p*-value** ***(T-test)*** ***Level of significance (p value ≤ 0.05)***
1.	Test group (n = 25)	28.88 ± 9.16	0.009
2.	Control group (n = 25)	91.96 ± 14.01	
*Independent sample T-test			
*p value **≤ 0.05**			

Table 2
Comparison of mean time for colour change depicting caries activity among subgroups.

S.no	Test Group n = 25	Mean ± SD	*p*-value
1.	Sub group I (n = 8)	37.50 ± 6.21	0.000
2.	Sub group II (n = 10)	29.30 ± 6.48	
3.	Sub group III (n = 7)	18.43 ± 1.13	
***One way ANOVA**			
*****p-value **≤ 0.05**			

Table 3
Comparison of mean time for colour change depicting caries activity between subgroups.

S.no	Test-groups n = 25	Mean ± SD	*p*-value
1.	Sub group-I (n = 8)	37.50 ± 6.21	0.38
	Sub group-II (n = 10)	29.30 ± 6.48	
2.	Sub group-II (n = 10)	29.30 ± 6.48	0.18
	Sub group-III (n = 7)	18.43 ± 1.13	
3.	Sub group-I (n = 8)	37.50 ± 6.21	0.00
	Sub group –III (n = 7)	18.43 ± 1.13	
*Post-hoc tukey test			
*p value **≤ 0.05**			

Discussion

The activity of dental caries has been tested by various methods which helps in assessing and motivating patients [13]. Caries activity can be assessed by counting the microorganisms involved or qualitative and quantitative analysis of bacterial metabolism [14, 15]. Most of these methods are difficult to execute due to the armamentarium required, duration, and technique sensitivity. Out of all the

qualitative methods, Oratest is one of the most simple, non–invasive and chair side procedure [10, 16, 18]. Therefore, the objective of the study was to assess the caries activity by using Oratest.

Ambati *et al.* [19] reported higher Oratest time in male as compared to female gender, but the results were not significant, however our study showed a significantly higher oratest time in males. This can be due to greater number of carious teeth and poor oral hygiene in females. Our study demonstrated a significant difference in caries activity between the control and test group. The color change occur earlier in test group *i.e.*, caries group because of the presence of greater microbial load. These results are consistent with the findings of previously conducted studies [1, 9, 19].

The results of our study showed that among the carious teeth groups, the highest time taken for Colour change was in the subgroup I and the lowest time taken was by subgroup III and the difference was statistically significant. Similar results were reported by studies done by Sundaram *et al.*[10] and Patalay *et al.*[20] Studies have also evaluated the correlation between caries activity and Oratest time and have reported an inverse relationship between Oratest time and caries activity [19, 21]. Oratest also has linear relationship with streptococcus mutans [22].

Based on these findings, Oratest is reliable and only gives Colour change when the level of microorganisms is high. The higher the infection, the lesser will be the time required for Colour change indicating the high microbial levels [23, 24].

The limitations of this test is that it lacks specificity and also give positive results in cases of gingivitis, periodontitis and poor oral hygiene and also doesn’t give number of microorganisms until the sample is cultured.

The strengths of the study were that it was a simple and cost effective chair-side test to evaluate caries activity. Limitations include small sample size, single center study and qualitative method of assessment. We recommend multiple center trial with large sample size and comparison of efficacy of this test with other methods to evaluate caries activity.

Conclusion

Oratest can be used to assess caries activity as a simple, inexpensive, chairside and less time consuming method. It can be of great help in paediatric dental setups for caries activity assessment as it is readily accepted by children.

Declarations

Ethics approval and consent to participate

The ethical conduct of this study was approved by the Bahria University Medical and Dental College, Ethics Committee (ERC 04/2019). All procedures performed in studies involving human participants were

in accordance with the ethics standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethics standards. Informed consent was obtained from their parents/legal guardian(s).

Consent for Publication

Not applicable

Availability of data and materials

All data generated or analysed during this study are included in this published article. Spss file of data collection has been attached.

Competing interests

The authors declare that they have no competing interests.

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Authors Contribution:

Dr Umeed Jawaid-literature search, data collection, data interpretation, drafting.

Dr Shama Asghar-study design and concept, questionnaire design, Critical revision of the article.

Dr Meisha Gul-literature search, data analysis, data interpretation, Critical revision of the article.

Dr Ayesha Zafar-drafting, Critical revision of the article.

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Figures

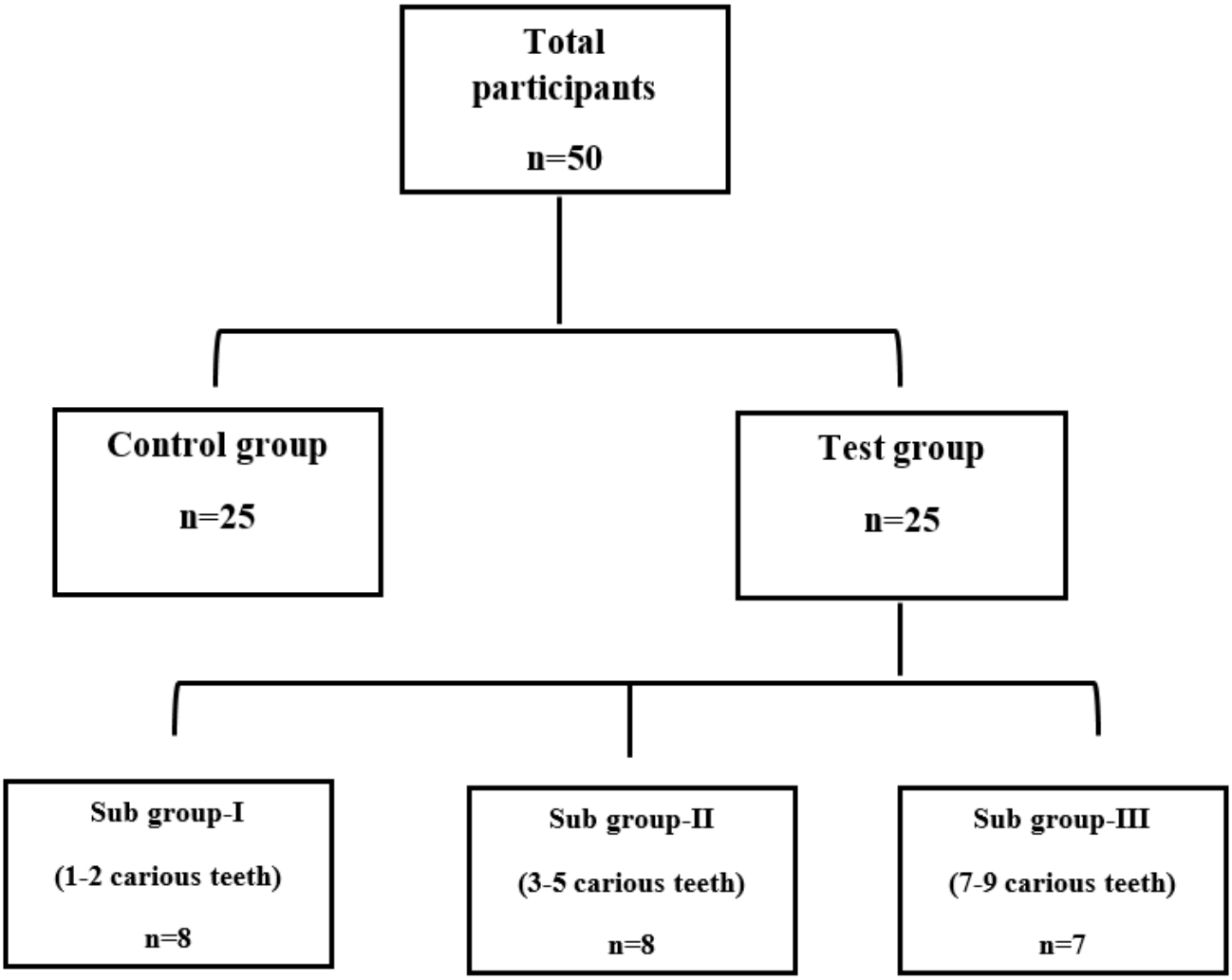

Figure 1

Flowchart showing distribution of groups

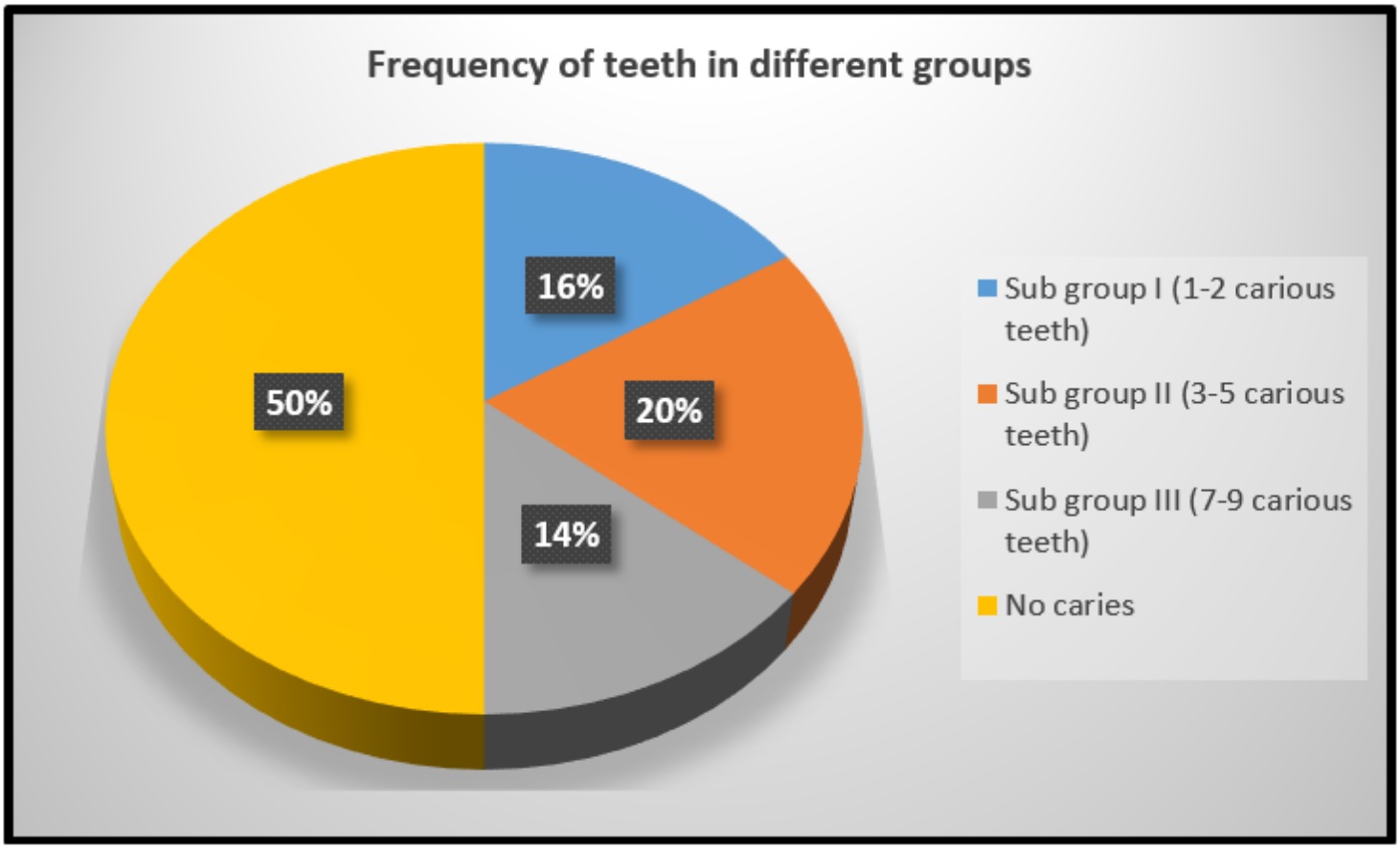

Figure 2

Frequency distribution of patients in control and test groups

Supplementary Files

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