EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 5
Issue: 7
745-749
Year: 2018

RELATIONSHIP OF SALIVARY pH AND BUFFER CAPACITY WITH DENTAL CARIES STATUS IN CHILDREN RESIDING IN ORPHANAGES OF UDAIPUR CITY

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Article Received on 17/05/2018 **Article Revised on 07/06/2018** **Article Accepted on 28/06/2018**

ABSTRACT
Caries affects persons of both sexes in all races, all socio-economic strata, and every age group. As children reach school age, they will have an increasing incidence of carious lesions because of change in dietary habits, which includes refined carbohydrates and sweeteners. It is also profoundly affected by other factors like oral hygiene and saliva. The various components of saliva play individual roles in the total properties of saliva. Salivary flow, pH and buffering capacity play an important role in the initiation and progression of dental caries. The sudy was undertaken to evaluate the relationship of dental caries status with salivary pH and buffer capacity in the children residing in the orphanages of Udaipur district, India. A cross-sectional study was conducted among 600 children aged 5, 12 and 15 years living in different orphanage houses of Udaipur city. The WHO oral health assessment form status form was used to evaluate the dental caries status. The salivary pH and buffer capacity were measured using G C Saliva Check. The data obtained was statistically analysed and the result showed that the salivary pH and buffer capacity did not show a significant relation with the dental caries status.

KEYWORDS: Dental caries, salivary pH, buffer capacity, orphanages, saliva.

INTRODUCTION
Good oral health is a vital component of general health, which contributes to each individual's mental well being, quality of life, physical appearance and interpersonal relationship. Good oral health includes more than just having healthy teeth; many children have inadequate oral and general health because of active and uncontrolled dental caries.[1] Among the oral diseases, dental caries is the most common chronic disease of mankind. Caries affects persons of both sexes in all races, all socio-economic strata, and every age group. As children reach school age, they will have an increasing incidence of carious lesions because of change in dietary habits, which includes refined carbohydrates and sweeteners. It is also profoundly affected by other factors like oral hygiene and saliva.[2]

The saliva circulating in the mouth at any given time is termed as whole saliva and comprises a mixture of secretions from the major, minor salivary glands and traces from the gingival crevicular fluid. To a large extent, it promotes oral health, whereas lack of its secretion contributes to the disease process.[2,3] The various components of saliva play individual roles in the total properties of saliva. Salivary flow, pH and buffering capacity play an important role in the initiation and progression of dental caries.[2]

According to WHO's global healthcare review of oral health, despite great improvements in the oral health of populations in several countries, oral problem still persists. This is particularly among underprivileged groups, in both developed and developing countries.[4] One of the high risk groups is orphans.[5] The World Health Organization (WHO) recommends that for the planning of dental services, surveys of oral health is used to collect information about oral diseases, oral health and treatment needs of a population, which helps in monitoring changes in levels and patterns of these variables overtime. It is suggested that these surveys be conducted in children aged 5years , 12years, 15 years.[6] Hence, this study was undertaken to evaluate the relationship of salivary pH and buffer capacity with

dental caries status in the children residing in the orphanages of Udaipur district, India.

Study population and methodology

Study population

A cross-sectional study was conducted among 639 children aged 5, 12 and 15 years living in different orphanage houses of Udaipur city out of which 600 were selected for the study. Participants were randomly selected from different orphanage houses, which were run by government and private authorities. Ethical approval for the study was obtained from the Ethical Committee. A letter was sent to the orphanages explaining the aims of the study and asking them for their consent for concerned children to participate in the study. Also, children who participated in the study were informed regarding the aim of the study and their consent was obtained.

METHODOLOGY

Children were clinically examined seated on a chair with back rest under natural light conditions. Visual examination was conducted with a plane dental mirror and explorer only. Radiographs were not taken. The oral findings were recorded in accordance with the WHO Oral Health Assessment Forms for Children, 2013 for the assessment of dental caries status.

On the day of collection of saliva, participating children were instructed not to eat or drink anything for at least one hour before the collection of saliva sample. To control the circadian variations, samples were collected between 10 am-11.30 am. Children were asked to rinse their mouth with water thoroughly 10 minutes before collection of saliva to avoid the contamination of food debris. Each sample was estimated for pH and buffer capacity using Saliva Check (GC Asia Dental Pte Ltd-India).[7]

For evaluation of pH the patient was asked to expectorate any pooled saliva into the collection cup. The pH strip was placed into the sample of unstimulated saliva for 10 seconds and then the colour of the strip was checked for the colour change. This was then compared with the testing chart available in the package for the pH of the saliva.

For evaluation of the buffer capacity the buffer strip was removed from the foil package and placed onto an absorbant tissue with test side up. Using pipette, sufficient saliva was drawn from the collection cup, and one drop was dispensed on each of 3 test pads. Immediately the test strip was turned around at 90 degrees to soak up the excess saliva on absorbant tissue. The test pads begin to change colour immediately and after 2 minutes the final result can be calculated by adding the points according to the final colour of each pad.

The salivary parameters like pH and buffer were calculated from saliva samples and its relation to dental caries status was statistically evaluated.

RESULTS

Table 1 shows the age and gender profile of the study population. There were significantly more number of subjects (390) among 12 year age group than 5 and 15 year old age group. study sample was comprised of less number of female subjects (105) then male subjects (495).

Table 1: Age and Gender profile of the study population.

			Gender		Total
			Males	Females	
AGE	5 years	N	87	33	120
		%	72.5%	27.5%	100.0%
	12 years	N	324	66	390
		%	83.1%	16.9%	100.0%
	15 years	N	84	6	90
		%	93.3%	6.7%	100.0%
Total		N	495	105	600
		%	82.5%	17.5%	100.0%
P[a] value			<0.0001*		

* Significant

P[a] Chi-square test

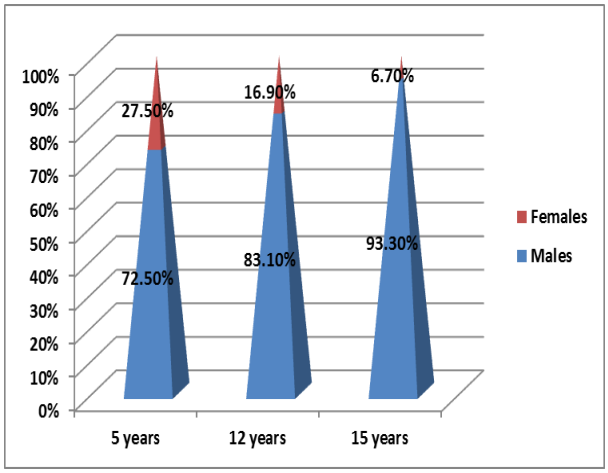


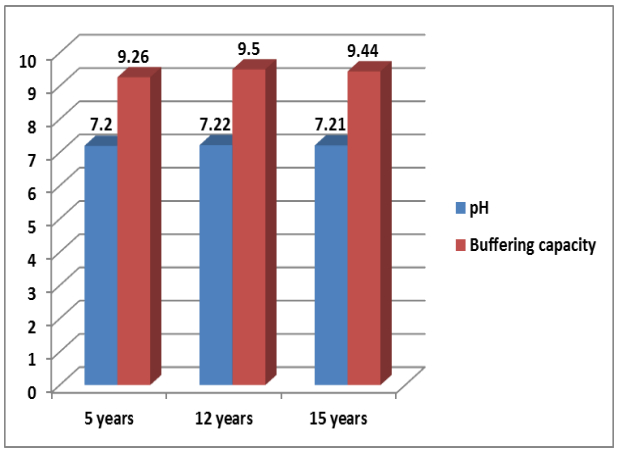
Figure 1: Age and Gender profile of the study population.

Maximum mean salivary pH and buffering capacity was found to be among 12 year old subjects. When difference in mean salivary pH values and buffering was compared using one way ANOVA capacity it failed to reach the level of statistical significance (p>0.05) (table2).

Table 2: Age wise distribution according to mean salivary pH and buffering capacity.

Age	pH		Buffering capacity	
	Mean	Std. Deviation	Mean	Std. Deviation
5 years	7.200	.3176	9.26	.778
12 years	7.225	.3166	9.50	.834
15 years	7.219	.3520	9.44	.689
P[b] value	0.064 NS		0.107 NS	

[b]ANOVA
NS-not significant

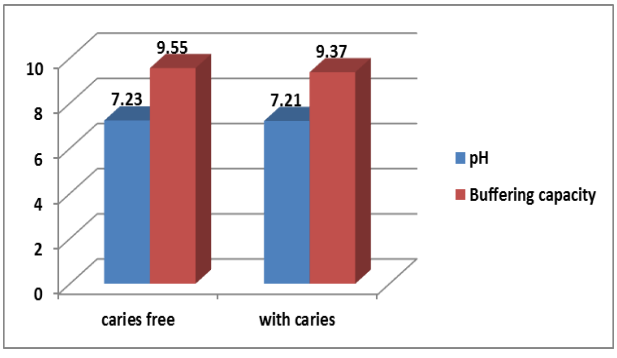


Mean pH was found to be low (7.21) among subjects with dental caries though it did not differ significantly from caries free subjects. When mean buffering capacity was compared among caries free and among subjects with dental caries, it could not reach the level of statistical significance as p>0.05 (table 3).

Table 3: comparison of Mean salivary pH and buffering capacity among caries free and subjects with caries.

		Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	P[c] value
					Lower Bound	Upper Bound			
pH	Caries free	7.232	.3075	.0173	7.198	7.266	6.2	7.8	0.480 NS
	With caries	7.211	.3319	.0258	7.160	7.262	6.2	7.8	
Buffering Capacity	Caries free	9.55	.812	.046	9.28	9.46	8	11	0.026 NS
	With caries	9.37	.828	.064	9.42	9.68	8	11	

p[c]Independent sample t test
Figure 3: comparison of Mean salivary pH and buffering capacity among caries free and subjects with caries



DISCUSSION

The aim of selecting this study was to evaluate the relationship between salivary pH and buffer capacity with dental caries status. The study population were children of 5, 12 and 15 years age group residing in various orphanages of Udaipur city. Respondants of this study were made up of 82.5% males and 17.5% females. This is a clear indication that there are more orphan boys than girls. This can be attributed to the fact that given the hardships of living alone, girls prefer to live with relatives or work as house helpers for safety and security.[8] A study done by FK kahabuka and HS Mbawalla on institutionalized former street children also showed a significantly higher number of males than females residing in the institutions.[8] In contrast Mohit Bansal et al,[9] and Mazhari F et al,[10] who reported high female to male ratio in their study.

Our study included collection of unstimulated whole saliva by spitting method that appeared to be the most reproducible. Studies have shown that patient with low or no caries activity had a resting salivary pH of around 7.0 and those with extreme caries activity had a resting pH below critical pH 5.5.[2] Oral cavity is quite

frequently exposed to components whose pH differs from normal pH (6.5 – 7.5) of saliva and these components may cause damage to teeth or mucosal surface.

The maximum mean salivary pH and buffering capacity was found to be among 12 year old subjects. Though, when difference in mean salivary pH values and buffering was compared it failed to reach the level of statistical significance. This can be attributed to the fact that in today's world eating habits of children have noticed a drastic change. Habits such as tobacco chewing, smoking etc have also become more prevalent these days. The effects range from changes in the salivary composition to oral diseases.[11]

The mean pH was found to be low (7.21) among subjects with dental caries though it did not differ significantly from caries free subjects. When mean buffering capacity was compared among caries free and among subjects with dental caries, it could not reach the level of statistical significance. This study showed that pH and buffering capacity had a weak correlation with caries activity. The other factors like microflora, diet, and retention of food might have dominated the buffering capacity to initiate caries which is multifactorial.[12] Similar results were seen in study conducted by Tuhunoglu O.S. (2006),[13] which showed no correlation between pH values and caries activity, age and gender. They were dependent upon individual and environmental variations. A study done by Dogra S et al also concluded that flow rate, pH and buffer capacity of saliva in caries active children were decreased but not significantly.[7]

Our study was in contrast to the study conducted by Ericsson (1959),[14] which showed that salivary buffering capacity has a negative relationship with caries incidence. This maybe due to the fact that there is considerable individual variation and it is not surprising that it has not been possible to demonstrate a significant association between saliva, pH and caries.[15]

Studies conducted by Rovelstad et al showed an inverse relationship between salivary parameters like pH, flow rate and buffer with dental caries.[16] Also, Larsen (1999).[17] have emphasized that the buffering capacity of unstimulated saliva varies so much that single measurements are not reliable for caries prediction.

CONCLUSION

The salivary pH and buffer capacity did not show a significant relation with the dental caries status. Dental caries is a complex and dynamic process where a multitude of factors influence and initiate the progression of disease. Hence, more clinical and laboratory studies involving wider parameters are needed to determine the exact relationship between physiochemical properties of saliva with dental caries.

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