Original Study

EVALUATION OF DENTAL CARIES AND ORAL HYGIENE STATUS IN RELATION TO VARIATION IN SALIVARY FLOW RATE AMONG SCHOOL CHILDREN OF PANCHKULA

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ABSTRACT

Aims & Objective: The aim of this study was to verify stimulated salivary flow rate [SFR] variations in 11to15-year-old children, and correlate these data to gender, age, type of dentition and health Status, BMI, DMFT,OHI-S.

Materials & Method: A cross-sectional study was carried out among school children of Panchkula regarding the salivary flow rate measurement. From three different school, 332 children's of 11 to 15 years of age group are evaluated in the study by simple random method. Oral examination and sialometry were performed in every child. Caries and oral hygiene status was assessed by using DMFT and OHI-S Index respectively.

Additionally, age, gender, brushing habits, mode of cleaning the teeth, height, weight, health status, material use to clean the teeth and dental visiting habits of each subject was recorded.

Results: Mean SFR was 1.255ml/min., but SFR was significantly influenced by gender as it is less in females than males of the same age. As far as age is concerned SFR increases with age from 11 to 14 years but was significantly less in 15 years old children. This study shows that maximum percentage of subjects have mean SFR less than 1 ml/min and maximum percentage of subjects have fair OHIS. It is found that 63% of subjects were having DMFT score in between 0-3, while 8% were having DMFT score in between 7-9.

Conclusion: The result of present study shows that clinical variables like gender, age, BMI, DMFT, OHI-S, health status and brushing habits were not correlated to salivary flow rate.

Keywords: SFR, Age, BMI, DMFT, OHI-S, Sialometry

Introduction

Saliva is the essential component of oral cavity as well as the digestive system. The principle glands of salivation are parotid, sub mandibular, sub lingual and many buccal glands (minor salivary gland).

The daily secretion of saliva normally ranges between about 800 to1500 ml/day.

The secretion plays an exceedingly important role in maintaining oral tissue healthy.

The mouth is loaded with pathogenic bacteria that can easily destroy tissue and cause dental caries. The flow of saliva itself washes away pathogenic bacteria. Saliva also contains thiocynate ions, proteolytic enzymes and lysozyme which play important role in destroying bacterial colonization.

The salivary flow rate (SFR)

The salivary flow rate (SFR) in healthy individuals may vary according to different factors. The knowledge of influence of different variables on SFR may be important for understanding oral health status and the importance of saliva protection at different ages.

Saliva has been shown by many studies to exert an important control on the incidence of dental caries.[1,2,3] There are many ways by which saliva exerts this control. These include its physical means of cleaning the oral cavity of food debris and more importantly of removing plaque acid formed as a result of bacterial metabolism.[4] Apart from its role in modifying plaque pH and acid production many studies have also shown that saliva also favors a plaque microbial flora population which is capable of more base formation than acid formation.[3]

It is well known that saliva has a cleansing effect which is important in decreasing the level of dietary sugar in the mouth and therefore lowers caries formation levels. Therefore the rate of production of saliva could be used as a diagnostic index in assessing dental disease.[5]

There are many ways by which saliva exerts this control. It can be assumed that where the preventive oral health care is well organized, normal variations in salivary flow rate do not have a direct bearing effect on the development of caries in healthy children and adolescents. On the other hand, when there is a radical change in the flow rate such as takes place as a result of certain diseases, medication, radiation treatment or congenital absence of salivary glands, caries may develop rapidly.[6]

Moreover, variations regarding gender,[6] age,[6-8] weight,[7] height,[7] nutrition,[9] health status[7,10-15] and the type of dentition[7] have been pointed out. There is a scarcity of studies from different geographical areas that analyze SFR variation in children. The aim of this study was to verify stimulated salivary flow rate [SFR] variations in 11 to 15-year-old children, and correlate these data to gender, age, type of dentition and health status.

Materials and Methods

A cross-sectional study was carried out among school children of Panchkula regarding the salivary flow rate measurement. Before starting the study ethical clearance was obtained from the Institutional ethical committee. Informed consent was taken from the subjects before starting the study. Questionnaire was checked by a pre test prior to starting of study.From three different school,332 children's of 11 to 15 years of age group are evaluated in the study by simple random method. These children's were approached by one of the interviewers who explained the objectives of the research to them and sought their Consent.

Out of 332 children's, 20 children's were excluded because they are taking medication, and rest 12 were excluded because of having oral mucous abnormality. Now final subjects were 213(71%) males and 87(29%) female out of 300 students.

In each school, we measured the SFR of all 11 to15-year-old healthy children along with oral examination. Examinations were performed using Type III examination procedure, by two examiners .Inter examiner variables are checked by kappa statistics which was 90.2%.

Caries and oral hygiene status was assessed by using DMFT and OHI-S (Oral Hygiene Index –Simplified) Index respectively. A plane mouth mirror and CPI probe was used for caries examination under adequate illumination, according to WHO caries diagnostic criteria (World Health Organization, 1993). Instruments were sterilized.

SFR was obtained by chewing-stimulated whole saliva under standard condition .The saliva samples are collected in morning hours. Participants are asked to chew pre weighted unflavored gum (1gm) for 5 minute to chew rubber piece for 1 minute in 1st minute saliva should be swallowed, then they were instructed to spit the accumulated saliva periodically into calibrated cylinder for next 5minute, salivary flow was then measured with a discard syringe. Only liquid component of saliva was measured (not foam) and the result was determined in millimeter/minute.

Additionally, age, gender, brushing habits, mode of cleaning the teeth, height, weight, health status, material use to clean the teeth and dental visiting habits of each subject was recorded .

Results

Table 1 state that maximum subjects (84%) brushes their teeth's once a day, and only 10% brushes twice a day or more, which shows a lack of knowledge and awareness in the population.

Table 2 reveals that Mean SFR was 1.255ml/min.,but SFR was significantly influenced by gender as it is less in females than males of the same age .As far as age is concerned SFR increases with age from 11 to 14 years but was significantly less in 15 years old children. In 14 years old male mean SFR was 1.682 ml/min. while in female it was 0.69 ml/min.

	N	N%
Never	3	1.0
Once a Day	252	84.0
Occasionally	15	5.0
Twice a day or more	30	10.0
Total	300	100.0

Table 1- Frequency of cleaning the teeth in 300 school children

AGE	N	Mean	SD	SEX	N/gender	MEAN	SD	p VALUE for Gender
11	48	0.941	0.988	MALE	24	1.253	1.328	0.027
				FEMALE	24	0.63	0.165	
12	72	1.06	0.984	MALE	51	1.165	1.104	0.161
				FEMALE	21	0.806	0.544	
13	69	1.441	1.419	MALE	51	1.788	1.501	0.000
				FEMALE	18	0.457	0.208	
14	96	1.558	1.152	MALE	84	1.682	1.179	0.005
				FEMALE	12	0.69	0.217	
15	15	0.4	0.065	MALE	3	0.500	0	0.000
				FEMALE	12	0.375	0.045	
TOTAL	300	1.255	1.167	MALE	213	1,519	1.279	
				FEMALE	87	0.610	0.337	

Table 2- Mean value, Standard deviation, Age and gender differences of salivary flow rate in 300 school children

TABLE 3 reveals that 17% overweight subjects were having DMFT score in between 0-3 while 4% having DMFT score in between 7-9.

			DMFT			Total
			(0-3)	(4-6)	(7-9)	
BMI	Underweight (less than 18.5 kg/m²)	Count	33	12	0	45
		% of Total	11.0 %	4.0%	0%	15.0%
	Normal (18.5 - 25 kg/m²)	Count	93	39	12	144
		% of Total	31.0%	13.0%	4.0%	48.0%
	Overweight (25 - 30 kg/m²)	Count	51	27	12	90
		% of Total	17.0%	9.0%	4.0%	30.0%
	Obese (more than 30 kg/m²)	Count	12	9	0	21
		% of Total	4.0%	3.0%	0%	7.0%
Total		Count	189	87	24	300
		% of Total	63.0%	29.0%	8.0%	100.0%

p =0.069 ,chi square =11.696(a)

Table 3- BMI, DMFT in school children

Table 4 reveals that 7% overweight children's were having poor oral hygiene while only 4% of normal subjects were having the same. And 19% of overweight subjects shows fair oral hygiene as compared to 40% of normal subjects.

			OHIS			Total
			GOOD	FAIR	POOR	
BMI	Underweight (less than 18.5 kg/m²)	Count	9	30	6	45
		% of Total	3.0%	10.0%	2.0%	15.0%
	Normal (18.5 - 25 kg/m²)	Count	12	120	12	144
		% of Total	4.0%	40.0%	4.0%	48.0%
	Overweight (25 - 30 kg/m²)	Count	12	57	21	90
		% of Total	4.0%	19.0%	7.0%	30.0%
	Obese (more than 30 kg/m²)	Count	0	15	6	21
		% of Total	0%	5.0%	2.0%	7.0%
Total		Count	33	222	45	300
		% of Total	11.0%	74.0%	15.0%	100.0%

p =0.001, chi square =21.520(a)

Table 4 – BMI and OHIS in school children

Table 5 reveals that DMFT score was in between 0-3 in 46% of subjects who all were having SFR less than 1 ml/min.,while 5% subjects were having DMFT score in between 7-9.

			DMFT			Total
			(0-3)	(4-6)	(7-9)	
SFR	Less than 1ml/min	Count	138	69	15	222
		% of Total	46.0%	23.0%	5.0%	74.0%
	Between 1to 3ml/min	Count	12	9	0	21
		% of Total	4.0%	3.0%	0%	7.0%
	More than 3 ml/min	Count	39	9	9	57
		% of Total	13.0%	3.0%	3.0%	19.0%
Total		Count	189	87	24	300
		% of Total	63.0%	29.0%	8.0%	100.0%

p =0.017, chi square =11.989(a)

Table 5 – SFR and DMFT in school children's

Table 6 reveals that 53% subjects who all were having fair OHI-S, and 13% were having poor OHI-S, also have SFR less than 1 ml/min.

			OHIS			Total
			GOOD	FAIR	POOR	
SFR	Less than 1 ml/min	Count	24	159	39	222
		% of Total	8.0%	53.0%	13.0%	74.0%
	b/w 1 to 3 ml/min	Count	3	18	0	21
		% of Total	1.0%	6.0%	0%	7.0%
	More than 3 ml/min	Count	6	45	6	57
		% of Total	2.0%	15.0%	2.0%	19.0%
Total		Count	33	222	45	300
		% of Total	11.0%	74.0%	15.0%	100.0%

P =0.210, Chi-square =5.859(a)

Table 6 – SFR and OHIS in school children

Discussion

The present study was directed towards the influence of gender, age, dentition, BMI, DMFT, OHIS, Health status and nutrition on SFR among school children.

Oral health status seriously impairs quality of life in a large number of individuals and they may affect various aspects of life, including function, appearance, interpersonal relationships and even career opportunities.

In turn, oral disease pattern is dependent on various socioeconomic characteristics of the children and parents. Out of 300 children's there were 12 children having mucosal alteration and 20 were taking medication, therefore they were excluded from study.

Some publications states that SFR increase with age in children and adolescent population[6-8,16] whereas other studies have some controversies.[17-21]

As far as age is concern, in our study SFR increases with age from 11 to14 years but lowest mean SFR was found in 15 year old children.

And it should be emphasized that children's in these schools are from lower socioeconomic status. Nutrition has been strongly associated with the size of salivary gland and subsequently the SFR, so that might be a reason of low SFR. Ingestion of fibrous foods has for example been found to be associated with increased salivary gland size and a subsequent increase in salivary flow rate.[14] This is likely due to the fact that chewing of fibrous foods entails a lot of masticatory action causing increased stimulus for the activity of the gland subsequently leading to increased salivary gland size and salivary flow rate.[22]

Previous studies has shown that males have higher salivary flow rate than females[23-25] even in children population [3,6 ,15 ,21] which also has been pointed out in this study ,might be due to hormonal changes during the age of puberty, or this may be attributed to the increase in total body surface area in males which is directly proportional to salivary gland size and hence more salivary flow rate.[26]

Moreover some authors have found that climatic conditions may influence SFR,[7,19] however these data were not considered in this study because the climate was almost same during the study.

Similar to previously published results from a study of individuals in a subtropical climate, salivary flow-rate variation was inversely associated with ambient temperature in both the total and the subsection of regular attendees.[19]

In the tropical climate for example, there is a tendency to consume more water than in the temperate climate due to high temperatures in the tropics. The water so taken is stored in the body tissue and whenever a condition which simulates that of thirst sets in, this water is readily made available through increased salivary flow.[27]

A study conducted by Sandra Regina Torres et al. has shown that Mean SFR was 1.23 ± .59ml/min.[21] The values are approximately same as that was obtained in present study which was 1.255ml/min.

Recent longitudinal studies of Swedish school children have failed to demonstrate any association between salivary flow rate and caries frequency [28,29]

The present study also reveals some more facts about the correlation between SFR and DMFT or OHIS of an individual. This study shows that maximum percentage of subjects have mean SFR less than 1 ml/min and maximum percentage of subjects have fair OHIS. It is found that 63% of subjects were having DMFT score in between 0-3, while 8% were having DMFT score in between 7-9. And 74% subjects were having fair OHI-S while 15% were having poor OHI-S.

Children who are overweight are, more likely to have or develop high blood pressure, heart disease, diabetes etc.Children at risk of overweight had higher caries rates then 'normal' or 'overweight' children. Caries and obesity coexist in children of low socioeconomic status.[30]

In present study 4% normal subjects have poor OHI-S, while 7% of overweight subjects were having poor OHI-S.

In clinical practice, SFR should be routinely measured as diagnostic and preventive measures for oral health.

Conclusion

The result of present study shows that clinical variables like gender, age, BMI, DMFT, OHI-S, health status and brushing habits were not correlated to salivary flow rate variations in the analyzed school children's from Panchkula. It is suggested that further studies should be carried out to investigate wider age groups and to confirm the reasons which have been advanced for the observations in this study.

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