

ORIGINAL RESEARCH

Evaluation of health status, oral surgical and dental treatment history in patients and their correlation with DMFT status, salivary pH and flow rate -A cross-sectional study

ABSTRACT:

INTRODUCTION: It is a practitioner/ student responsibility to screen Medical and Dental health, social, personal, family history of patients. AIMS and objectives: In this study we aimed to evaluate the association of medical/dental history with the values of saliva parameters (pH, flow rate), tooth calculus and stains score and also DMFT status of our patients. **MATERIAL AND METHODS:** A total of 50 participants were asked to fill in their past medical and dental history in a questionnaire based form. Participants were screened for a full mouth DMFT, calculus and stains score. Salivary pH and flow rate tests were also conducted. **RESULTS:** In the present study, sample size of male and female patients was same. However, 20% of participants were ≤ 30 years age, 44% were between 30-50 years age group and 36% were ≥ 60 years of age group. Past medical and dental history was not significantly associated with their DMFT Status, salivary pH and flow rate levels. Salivary pH(p value $\leq .01$), flow rate(p value $\leq .001$) and DMFT(p value $\leq .003$) was highly significantly correlated with history of addiction. Tooth stains score was significantly associated with salivary pH(p value $=.002$) and calculus score was significantly associated with salivary flow rates(p value $=.05$). Tooth brushing frequency was significantly associated with DMFT status of the patients(pvalue $\leq .005$). **CONCLUSION:** Medical and dental health screening showed significant associations with DMFT, salivary pH and flow rate.

Key words: Dental caries, DMFT status, salivary pH, salivary flow rate.

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INTRODUCTION:

With global incidence of newer medical diseases, emergence of resistant and silent infections and their significant association with medical and dental health, oral health and medical health should be evaluated from time to time. There is high need for timely evaluation of influence of medical health, addiction history, tooth brushing frequency, beverage, water and also consumption of diet type on patients who underwent oral surgical and various other dental treatments. Several studies have reported the association of decayed, missing, filled teeth status, tooth calculus and stains score, salivary pH and flow rate with patient's medical history, dental history and also their personal history and social background [1-14].

We aimed to evaluate the association of medical, dental and personal history and their social background with the values of saliva parameters (pH, flow rate), tooth calculus and stains score and also DMFT status of our patients with this motivational survey.

MATERIAL AND METHODS

A total of 50 participants from a cross sectional area of sector 40 Chandigarh road Ludhiana were evaluated for their medical, dental and personal history.

1) Study design Participants in this survey were asked to fill in their past medical and dental history, tooth brushing frequency per day, frequency of glasses water, tea/coffee and other beverage consumption per day, addiction history and also type of diet, in a questionnaire based form.

One final year bachelor of dental surgery student under supervision performed intraoral examination that included full mouth DMFT, sign grading calculus and stains score and also conducted salivary pH and flow rate tests in all the participants. Salivary tests were made for salivary pH and flow rate at rest. Before performing the tests, the subjects were asked not to smoke, eat or drink anything, not to brush their teeth, nor to use mouthwash for at least one hour before the test. For measuring the pH we asked the subject to collect saliva into a designated cup. We dipped in the pH indicator paper for 10 seconds. Reading the result was made before the drying of the strip in order to avoid false results. We cleaned and dried the cup for the next step of the test.

Study was validated by repeating the patients to fill the same questionnaire after a week. All subjects voluntarily agreed to take part in this non interventional study. Ethical clearance was followed.

2) Armamentarium

Dental probe, mirror and twizzer for intraoral examination salivary pH testing strips 5.0-8.0, calibrated test tubes for collecting saliva Statistical analysis of the data was performed using Statistical Package for the Social Sciences (SPSS) version 22.0

RESULTS

In the present study, mean $\pm$ SD of age group(I) below 30 years was 24 $\pm$ 4 years, between 30-50 years (age group II) was 42 $\pm$ 5 and above 50 years of age (age GROUP III) was 60 $\pm$ 7 years. In this study 20% of participants were $\leq$ 30 years age, 44% were between 30-50 years age group and 36% were $\geq$ 60 years of age group. This study revealed that diabetes was most common medical history and was present in age group III, tooth extractions was most common dental history and was present mostly in group III and periodontal surgery was mostly observed in group II. Females from urban social background were mostly present in group I and II and males from rural background in group III. In this study average salivary pH and flow rate decreased with age. However, DMFT and tooth stains score increased with age. Average Tooth brushing frequency was twice a day in age group I and II and once a day in age group III. Most common beverage in age group I was juice, group II was salad and group III was sweets. Average tea/coffee intake was 2 times in group I, 2.5 times in group II and 1 time in group III. Average diet intake was vegetarian in group I and mixed diet in group II and III. History of water intake was 13 times in group I, 5.5 times in

group II and 10 times in group III. In the present study Analysis of variance (ANOVA) between salivary flow rate, pH and DMFT status shows that the mean difference between the age groups was highly significant with p value of 0.000 as shown in table 1, but the correlation between salivary flow rate and overall DMFT score ($r=-0.5, p<0.001$ S) is also highly significant as shown in table 2. However correlation between salivary pH and DMFT was not significant ($r=-0.2, p<0.164$ NS)

Out of n=50 (n=number of participants) male female ratio was 1:1, 45 urban and 5 were rural.

Personal history revealed 33 vegetarian and 17 on mixed diets. All the rural participants were on a mixed diet.

History of tea coffee consumption was present in 37 out of 45 urban and in all of the rural participants. Beverage preference was cold drink in 7, juice in 17, salad in 2, and sweets in 5 participants. Only 1 rural participant gave history of consuming cold drink, while 30 urban participants had a history of beverage consumption. Distribution of beverages in male/female and in urban/rural participants is shown in table 4 and 5 and figures 4 and 5.

In this study 15 male participants were addicted to alcohol (n=2), smoking (n=2), smoking and alcohol (n=3), smoking and tobacco (n=1), tobacco (n=1) and tobacco and alcohol (n=6). Tea/coffee intake reported by 40/50 participants was once a day (n=6), twice a day (n=17), more than twice a day (n=17). 4 out of 5 rural participants had history of addiction and 11 out of 45 urban participants gave history of addiction.

Past medical history was revealed in 23 participants that consisted of diabetes (9), hypertension (n=6), diabetes along with hypertension (n=1), hypertension along with uncontrolled thyroid hormones (n=1), hypertension along with uncontrolled uric acid levels (n=1), COPD (1), depression (n=2), migraine (n=1), previous history of oral cancer (n=1). In the present study only urban participants (n=23) had a past medical history while none of the rural participants were having a past medical history.

Past dental history was present in 37 participants that consisted of a previous history of tooth extractions (n=18), root canal treatment (n=9), restorations (n=4), periodontal surgery (n=1) and scaling (n=5). Past dental history was observed in 34

urban and 3 rural participants. Tooth extractions were observed in all the rural participants and also most commonly were also mostly commonly observed in the past dental history urban participants as well. Frequency of tooth brushing was once a day($n=32$), twice a day($n=15$) and more than twice a day($n=3$).

On clinical examination, full mouth DMFT score was 0($n=5$), 1($n=2$), 2($n=4$), 3($n=6$), 4($n=3$), 5($n=2$), 6($n=3$), 7($n=5$), 8($n=4$), 9($n=1$), 10($n=3$), 12($n=2$), 15($n=3$), 16($n=3$), 17($n=3$), 19($n=1$). Oral prophylaxis was indicated in all the 50 study participants with sign grading calculus score of + ($n=8$), ++($n=36$) and +++($n=6$) and in 48 participants with stains score of + ($n=15$), ++($n=27$) and +++($n=6$).

Association of medical and dental history was not significant with salivary flow rate, pH saliva and DMFT scores. However, mean difference of diabetics and nondiabetic participants was significantly associated with salivary flow rate (p value = **.018(S), with not assumed equal variance and .07 NS with equal variances assumed**). History of beverage intake was significantly associated with salivary Ph (p value = .02 S). History of addiction was significantly associated with salivary flow rate (p value = **<0.001; HS**), pH saliva (p value = **<0.010; S**) and DMFT scores (p value = **<0.003; HS**). Oral water intake was significantly associated with salivary flow rate (p value = **<0.03; S**) and pH (p value = **<0.03; S**). Tea/coffee intake of less than 5 cups

per day was significantly associated with salivary flow rate (p value = **<0.04; S**) and salivary pH (p value = **<0.008; HS**) and more than 5 cups per day was significantly associated with DMFT score (p value = **<0.005; HS**). Turkey HSD Post Hoc statistics for multiple comparisons revealed that mean difference of 0.14264 for calculus score (calculus score+ minus calculus score++) was significantly (p value = .039) associated with salivary flow rate and between the calculus score groups of +, ++ and +++ with a p value = .03 S, $df=2$, $f=3.2$ with a standard error of .05 obtained with one way Anova. Mean difference of -3.7 with turkey HSD post hoc statistics for stain score (score 0 minus score++) was significantly associated with salivary pH with a p value = .002 S, $df=3$, and $f=5.5$ between the stains score groups of 0, +, ++ and +++.

Results have been summarized in table 1-5 and figure 1-8.

Discussion

Medical History forms are for screening purposes only, and serve to highlight possible significant medical problems that require further investigation. The information on the form should be entered into the computer at the first appointment before the patient departs. It is a practitioner/student responsibility to obtain this information and in the case of a student it must be checked by a supervisor. Medical histories should be updated every 6 months and a note made in the record that this has occurred. It is important to appreciate that detail of the social, dental and family histories are accurate only the time they are recorded; they can change considerably within a short period of time [1].

Keeping patients' records and information enables us to review the information in leisure or in the process of a clinical research and study. As taking, recording, and keeping information makes a basis for reviewing and re-assessing patient's medical history, it is a valuable resource for discovering the main causes and origins of the disease, regarding patients' symptoms, complications, or other information that has helped better diagnosis for the dentist [2].

In the present study patients of different age groups were assessed for their medical, dental, diet type, beverage consumption, and water consumption and addiction history. They were clinically examined for stains/calculus, decayed/missing/filled/treated dental status and investigated noninvasively for the flow rate and pH of saliva.

In this study patients personal history of > 5 cups of tea/coffee intake (mean $\pm$ SD = 10.6 ± 7.5) had highest DMFT score obtained in this study followed by patients with history of addiction (10.6 ± 5.7), diabetes (mean $\pm$ SD = 10.6 ± 5.4), 3+ stains score (mean $\pm$ SD = 10.6 ± 4.8) and 3+ calculus score (9 ± 5) respectively. However, their past medical and dental history was not significantly associated with their DMFT Status, salivary pH and flow rate levels. Talwar M et al in their study reported that it is difficult to obtain a cause and effect between dental infections and systemic diseases because of several confounding factors and oral infections are one of the many factors. Sample size of 50 subjects also restricts the scope and ability to generalize the survey and further work in this direction is required [3].

However, mean difference of diabetics and nondiabetic participants was significantly associated with salivary flow rate (p value=.018(S), with not assumed equal variance and .07 NS with equal variances assumed). Salivary secretion rates are not dependent on age, and flow rates remain constant despite the degeneration of acinar cells during the aging process. Medication side effects or systemic disease are more likely to be responsible for hypofunction of salivary glands in elderly patients[4]. In this cross sectional study sample size of male and female patients was same. However, 20% of participants were ≤ 30 years age, 44% were between 30-50 years age group and 36% were ≥ 60 years of age group. Thus the chronological age of participants was ≥ 18 years of age. This study reflected the fact that only 44% participants from urban background had a past medical history and 37(74%) participants in this study were with past dental history predominantly of tooth extractions. The differences in urban-rural health[5] showed that none of the rural participants had a past medical history and 3 participants of rural background had a past dental history of only tooth extractions. Tooth extractions were observed in all the rural participants and also were also mostly commonly observed in the past dental history of urban participants as well. This gives a reflection of either poor health care facilities or lack of attitude and awareness of rural folks primarily and even in the urban inhabitants in this study[5,6,7].

Our study shows that consumption of distinct types of commercial acidic beverages (i.e., a fruit juice and a soft drink) beverages is significantly associated with salivary pH but it was not able to predict their erosive effects[8]. Tenuta LM et al[8] mentioned that future research on the pH of the tooth surface should be done with different salivary flow rates and buffering capacities, and sequential sipping of acidic beverages should be evaluated to simulate clinical conditions. This is in concordance to our study as tooth stains score was significantly associated with salivary pH (p value=.002) and calculus score was significantly associated with salivary flow rates (p value=.05).

This study showed a noticeable increase in DMFT score of patients who were taking mixed diet in comparison to participants who were taking vegetarian food predominantly[9]. However, patient's diet was not significantly associated with DMFT, Salivary pH and flow rate.

Srinvasulu G et al[10] reported a negative correlation between caries experience and nutritional status among institutionalized elderly subjects. They also reported that low salivary flow rate combined with low buffering capacity and pH in malnourished subjects may have been responsible for high caries experience. Without significant salivary flow rate, food debris remains in the mouth, where it is fermented by dental plaque bacteria to organic acids that initiate the dental caries process[10]. This was in accordance to the finding in our study that DMFT status of the patients was highly significant with salivary flow rate as shown in table 2 (r value: -0.542 value:<0.001**).

Generally the oral and dental health problems accompanied by hallucinogenic drug abuse also include xerostomia, improper hygiene, bad taste in mouth and extensive caries, leading to dental erosions [8]. Similarly in our study salivary pH (p value=.01), flow rate (p value=.001) and DMFT (p value=.003) was highly significantly correlated with history of addiction.

Patients water consumption was significantly associated with salivary flow rate with p value=.03. This is supported by the evidence that human saliva is 99.5% water, while the other 0.5% consists of electrolytes, mucus, glycoproteins, enzymes, and antimicrobial agents such as secretory immunoglobulin A and lysozyme [10, 11]. Tea coffee intake was significantly associated with salivary flow rate and salivary pH as shown in table 3. Tea is the second most widely consumed beverage in the world after water[12,13]. In this study 40% of urban and 31% of the rural participants were taking tea or coffee. Caffeine is naturally present in coffee, tea, cocoa, and chocolate, and is an additive to some medications, many popular carbonated beverages and, more recently, bottled water. Caffeine is believed to be the world's most widely consumed psychoactive agent. Low to moderate doses of caffeine tend to produce a certain level of positive subjective effects, such as, increased alertness, feelings of well being, energy, concentration and confidence levels, while decreasing fatigue, boredom, and drowsiness with a low level of side effects, at least in the view of the public, soft drink manufacturers, and some clinicians[14]. These findings were in line with the fact that alcoholic or non alcoholic drinks and juices,

for instance, were consumed more in the urban areas as compared to the rural areas during the measured time period. However, tea/coffee consumption was more common in rural participants of this survey[15] as displayed in figure 7 and table 4.

More frequent tooth brushing is associated with less decayed teeth, less chance of having "missing teeth" and a higher chance of having "filled teeth", supporting our finding that tooth brushing frequency was significantly associated with DMFT status of the patients (pvalue=.005)[16]. Nikola D et al reported that these indicators should be considered in prevention program planning if reduction of tooth extractions and restoration of remaining teeth is to be achieved.

CONCLUSION

The self-report nature of the information in this area level survey may have led to under-estimation [15] of their dental and medical health status. However, with significant associations of their history of diabetes, addiction of cigarette, tobacco and alcohol, tooth brushing frequency and consumption of water, caffeine based tea, coffee and other beverages such as juice, cold drink, sweets with DMFT, salivary pH and flow rate, meaning our findings are likely to be authentic.

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TABLE I: DESCRIPTIVES STATISTICS FOR AGE

TABLE 1.1 Descriptives statistics for age								
age	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Group I (<=30Years)	10	24.10	4.149	1.312	21.13	27.07	18	30
Group II (31-50 Years)	22	42.68	5.515	1.176	40.24	45.13	32	50
Group III (>50 Years)	18	60.94	7.264	1.712	57.33	64.56	51	75
Total number of participants	50	45.54	14.804	2.094	41.33	49.75	18	75

TABLE 1.2 : DESCRIPTIVES STATISTICS FOR AGE

age groups	Flow rate	pH	DMFT	Calculus	stains	brushing frequency	addiction	beverage	tea/ coffee	dental h/o	medical h/o	social background	gender	diet	water intake freq.
Group I (<=30Years)	0.46	7.5	0	2	1	2	absent	juice	2	absent	absent	urban	female	veg	13
Group II (31-50 Years)	0.26	6.5	8	2	2	1	smoking and alcohol	salad	2.5	pdl surgery	absent	urban	female	mixed	5.5
Group III (>50 Years)	0.25	6.5	9	2	3	1	alcohol	sweets	1	tooth extractions	diabetes	rural	male	mixed	10

One way anova between the groups: df=2, f=125.7, significance=.000

TABLE 2: Correlation between Flow Rate Saliva and pH Saliva with DMFT

Salivary parameter		DMFT
Flow rate Saliva	r	-0.542
	p	<0.001**
pH Saliva	r	-0.200
	p	0.164^{NS}

NS: p > 0.05; Not significant; **p<0.001; Highly significant

TABLE 3: N%, mean±SD, T Value and P value (assuming equal variances) of salivary flow rate, pH saliva and DMFT with frequency of water and beverage intake, tooth brushing, medical and dental history and also dental

variable	N%	mean±SD			T value			P Value (with equal variance assumed)		
		Flow rate	pH	DMFT	Flow rate	pH	DMFT	Flow rate	pH	DMFT
Veg diet	33	0.34 ± 0.16	6.5 ± 1.3	6.6 ± 5.5	.8	.8	1.0	0.411; NS	0.41; NS	0.306; NS
mixed diet	17	0.3 ± 0.13	6.2 ± 1.7	8.35 ± 5.49						
Beverage consumption (not harmful)	21	0.33 ± 0.18	5.90 ± 1.86	6.76 ± 5.48	.1	2.3	.49	0.9 NS	0.02 S	0.6 NS
Beverage (Harmful)	29	0.33 ± 0.13	6.84 ± 0.97	7.55 ± 5.69						
Addiction present	15	0.2 ± 0.07	5.64 ± 1.72	10.6 ± 5.7	3.7	2.6	3.1	<0.001; HS	<0.010; S	<0.003; HS
Addiction absent	35	0.38 ± 0.15	6.7 ± 1.2	5.7 ± 4.8						
No Medical condition	28	0.349 ± 0.112	6.4 ± 1.5	6 ± 5	0.9	0.0	1.7	0.344; NS	0.9; NS	0.08; NS
Medical condition present	22	0.3 ± 0.1	6.4 ± 1.4	8.7 ± 5.8						
No dental history	13	0.38 ± 0.15	6.7 ± 1.6	6.4 ± 6.7	1.3	0.8	0.5	0.192; NS	0.4; NS	0.5; NS
With past dental history	37	0.31 ± 0.15	6.34 ± 1.42	7.49 ± 5.17						
<7 glass oral water intake per day	20	0.27 ± 0.08	5.9 ± 1.5	8.8 ± 5.5	-2.1	-2	.913	0.03 S	0.03 S	0.366 NS
>7 glass oral water intake per day	30	.36 ± .17	6.7 ± 1.5	6.6 ± 5.5						
Tea/coffee <5 cups per day	46	0.3 ± 0.15	6.6 ± 1.4	6.9 ± 5.3	2	2.7	-1.2	.04 S	.008 S	.222
>5 cups per day	4	.18 ± .05	4.6 ± .5	10.5 ± 7.5						
Brushing 1 time a day	32	.3 ± .1	6.2 ± 1.6	8.8 ± 4.9	-1	-1	2.9	.2 NS	.3 NS	.005 S
Brushing more than 1 time a day	18	.3 ± .1	6.7 ± 1.1	4.3 ± 5.5						
Non-diabetics	41	.34 ± .15	6.4 ± 1.5	6 ± 5.4		.2	1.8	.018(S) , with not assumed equal variance) (0.07(NS), with equal variance assumed)	.8	.07
diabetics	9	.25 ± .08	6.3 ± 1	10 ± 5.4						
Non-hypertensives	41	.3 ± .12	6.4 ± 1.4	7 ± 5		-.19	1.1	.07	0.8	0.2
hypertensives	9	.4 ± .23	6.5 ± 1.7	5 ± 7						
Calculus score 1	8	0.4 ± 0.2	6.6 ± 1.7	5 ± 4	-2.8	1.8	-0.6	.05 S	.9	.3
calculus score 2	36	.3 ± .1	6.4 ± 1.3	7 ± 5						
calculus score 3	6	.6 ± .3	6.3 ± 2	9 ± 5						
Stains score 0	2	.2 ± .04	3.5 ± 1.5	4 ± 0.0	-0.5	-8.3	-0.979	.18	.002 S	0.2
stains score 1	15	.3 ± .1	7.2 ± .5	5.5 ± 6.0						
Stains score 2	27	.3 ± .1	6.2 ± 1.5	7.7 ± 5.4						
stains score 3	6	.2 ± .1	6.1 ± 1.2	10 ± 4.8						
Total participants	50	.3 ± .1	6.17 ± 0.2	7.2 ± 5.5	Infinity (between the groups)			0.000 S (between the groups)		

calculus and stain scores of the study population

NS: p > 0.05; Not significant; S: p < 0.05; Significant; HS: p < 0.001; Highly significant

FIGURE 4: DISTRIBUTION OF BEVERAGES IN THE URBAN AND RURAL PARTICIPANTS IN THE STUDY

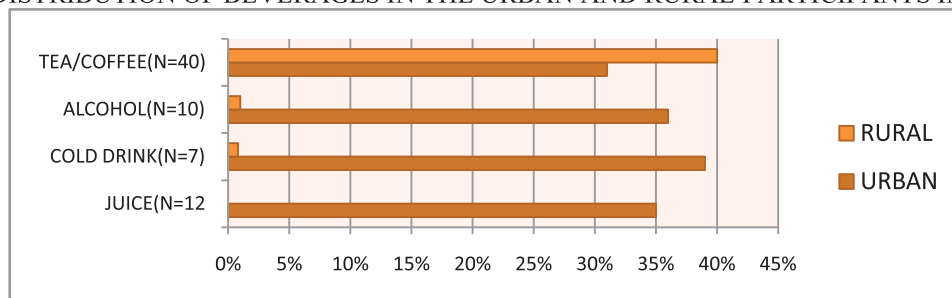


FIGURE 5: DISTRIBUTION OF BEVERAGES IN MALE AND FEMALE PARTICIPANTS IN THE STUDY

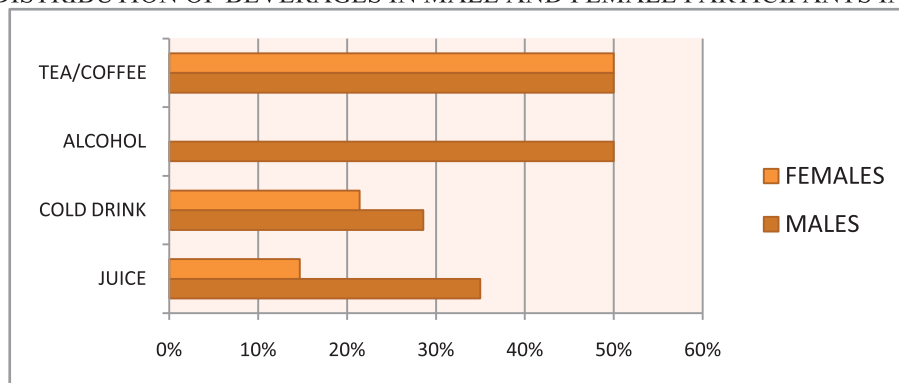


FIGURE 6: SALIVARY FLOW RATE

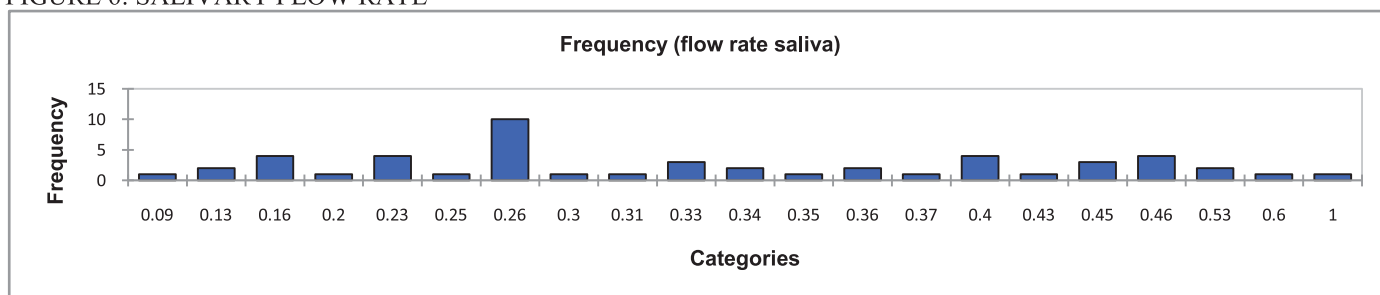


FIGURE 7: SALIVARY pH

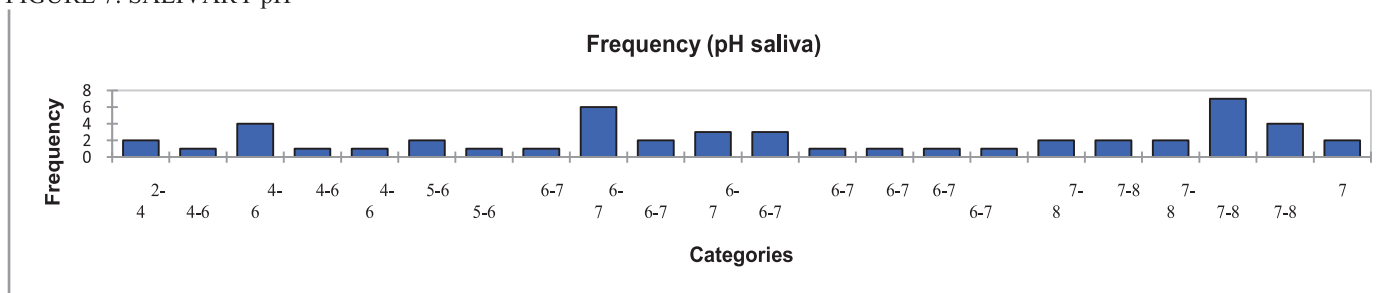


FIGURE 8: DMFT SCORE

