International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 9; Issue 03 (B); March 2020; Page No.21534-21539
DOI: http://dx.doi.org/10.24327/ijcar.2020.21539.4235

Research Article

A CLINICAL STUDY TO COMPARE BETWEEN UNSTIMULATED AND STIMULATED WHOLE SALIVARY FLOW RATE BEFORE AND AFTER COMPLETE DENTURE PLACEMENT IN DIABETIC AND NON DIABETIC PATIENTS

[1]Dr.Khot Kalyani Jalindar, [2]Dr. Basavaraj S. Salagundi, [3]Dr. Rupesh P. L, [4]Dr. Mallikarjuna D. M, [5]Dr. Unni Pympallil and [6]Dr. Namitha AP

[1]Postgraduate Student, Department of Prosthodontics, Coorg Institute of Dental Sciences, Karnataka, India
[2]Professor & H. O. D, Department of Prosthodontics, Coorg Institute of Dental Sciences, Karnataka, India
[3]Professor & Chair, Department of Prosthodontics, Coorg Institute of Dental Sciences, Karnataka, India
[4]Reader, Department of Prosthodontics, Coorg Institute of Dental Sciences, Karnataka, India
[5]Senior Lecturer, Department of Prosthodontics, Coorg Institute of Dental Sciences, Karnataka, India
[6]Postgraduate Student, Department of Prosthodontics, Coorg Institute of Dental Sciences, Karnataka, India

A R T I C L E I N F O

Article History:
Received 14th December, 2019
Received in revised form 29th January, 2020
Accepted 05th February, 2020
Published online 28th March, 2020

Key words:

Unstimulated Saliva, Stimulated Saliva, Salivary Flow Rate, Diabetes Mellitus.

A B S T R A C T

Aim – The aim of this study was to compare between unstimulated and stimulated whole salivary flow rate before, immediately after and 2 months after complete denture placement in diabetic and non- diabetic patients.

Materials and Methods – In this study, total 40 edentulous individuals requiringcomplete denture prosthesis were selected from the Department of Prosthodontics, Coorg Institute of Dental Sciences, Virajpet, Karnataka, India. 20 patients were healthy and 20 patients were having type II diabetes mellitus. The unstimulated and stimulated whole salivary flow rates were measured at three stages i.e. i) Before complete denture placement;ii) Immediately after complete denture placement; and iii) After 2 months of complete denture placement. Saliva production was stimulated by chewing paraffin wax.Flow rate was calculated as collected volume/collection time. Statistical analysis was done by Independent t test and One Way ANOVA test for comparison.

Results - Statistically significant differences were seen in unstimulated and stimulated salivary flow rate before, immediately after, and after 2 months of complete denture placement. Salivary flow rates were higher for non-diabetic patients then diabetic patients. Compared to baseline i.e. before denture placement, salivary flow rates were significantly higher immediately after and 2 months after denture placement in both non-diabetic and diabetic participants.

Conclusion - Stimulated whole salivary flow rates were significantly higher than the unstimulated whole salivary flow rates obtained before, immediately after, and after 2 months of complete denture placement in both non-diabetic and diabetic participants.

INTRODUCTION

Saliva is a complex biological fluid which plays a major role in local and systemic defense of the oral cavity and keeps oral mucosa healthy.[1]It also plays an important role in defense of the oropharyngeal region, and the upper gastrointestinaltract.[1] Saliva contributes to the maintenance of oro‑esophageal, mucosal integrity by lubrication, hydration, clearance, buffering and also performs several important functions such as mineralization, facilitating taste, tissue coating, and antimicrobial activity.[1]

Reduced salivary flow has deleterious effects on oral health.[2]It increases risk of dental diseases like dental caries, periodontitis, oral infections like candidiasis. It also induces symptoms like halitosis, burning sensation and oral soreness, difficulty in mastication and speech, dysphagia.[2]Hyposalivation affects the quality of life and can be caused by conditions like aging, use of certain drugs, treatment with radiation and certain diseases such as diabetes mellitus.[3]

Diabetes mellitus is a complex metabolic syndrome characterized by hyperglycemia and disturbances in the metabolism of carbohydrates, proteins, and lipids.[4]Type 1 or insulin dependent diabetes and type 2 or non insulin dependent diabetes are the two major types of diabetes.[4]Type 2 diabetes mellitus is the fifth most common chronic condition and the sixth leading cause of mortality among the elderly.[5]

Corresponding author:* **Dr.Khot Kalyani Jalindar
Postgraduate Student, Department of Prosthodontics, Coorg Institute of Dental Sciences, Karnataka, India

There is evidence that adverse hormonal, micro vascular, and neuronal changes in poorly controlled diabetes could contribute to salivary gland hypofunction inolder individuals.[5]Furthermore, salivary hypofunction canresult in dysphagia and dysgeusia, leading to alterations in dietary selection that may compromise nutritionalstatus.[5]

Diabetes mellitus has been associated with oral complications such as periodontal disease, hyposalivation and xerostomia.[3]It has been reported that the alterations in salivary flow rate and its compositions could affect the development, symptoms and severity of oral changes in diabetic patients.[4]

Studies have been done earlier in the literature concentrated on salivary flow rate and pH individually and their relevance in particular in dentate patients.[1] But no studies have been done on salivary flow rate for edentulous patients with diabetes mellitus wearing complete denture prosthesis and hence this study has been planned to compare between unstimulated and stimulated salivary flow rate before and after complete denture placement in diabetic and non-diabetic patients.

MATERIALS AND METHOD

The participants for this study were 40 edentulous individuals including both males and females with the age group of greater than 45 years with the need of prosthetic rehabilitation of complete denture were selected from the Department of Prosthodontics, Crown and Bridge and Implantology, Coorg Institute of Dental Sciences, Virajpet, Karnataka, India.

20 Edentulous healthy individuals and 20 patients diagnosed with type 2 diabetes mellitus without the habit of smoking and/or chewing tobacco who required complete denture prostheses having no previous experience of wearing complete dentures were included for this study. The proposed study was explained to each of the selected patients and his/her written consent was obtained prior to commencement of the study.
Completely edentulous 40 patients were divided into two groups :

- ✓ Experimental group: Patients with type 2 diabetes mellitus (n = 20)
- ✓ Control group : Healthy patients without any systemic disease (n = 20)

Inclusion Criteria

1. Completely edentulous patients in need of complete denture therapy
2. Patients with age equal to or greater than 45 years
3. Patients diagnosed with type 2 diabetes mellitus (n = 20)

Exclusion Criteria

1. Patients with history of any allergic or adverse reaction to the materials used in the study
2. Patients who were previous denture weares.
3. Patients who did not have previous medical record.
4. Patients with a history of or undergoing radiotherapy
5. Patients who refused to give informed consent.

Materials used

- ✓ Distilled water
- ✓ Paraffin wax

Armamentarium

- ✓ Disposable glass
- ✓ Glass funnel
- ✓ Graduated measuring jar

Method of Collection of Sample

The procedure selected for this study was spitting method for collecting resting (unstimulated) and stimulated whole saliva. The participants were asked to chew paraffin wax (Therma wax, Bose products, Howrah, West Bengal) i.e. mechanical method for stimulating whole saliva. The participients were asked to seat comfortably on the dental chair, with eyes open and head tilted forward. The participants were asked to rinse their mouths for 5 seconds with 10 mL distilled water. (Figure 1) Following the spitting out of the water and initial swallow, whole saliva was collected in graduated measuring jar (Figure 2) by spitting into a graduated measuring jar every 30 seconds with the help of glass funnel. (Figure 3 & 4).

The experiment was carried out until 5 mL of whole saliva was collected and collection time was recorded. The participants were instructed not to swallow any amount of saliva that was being produced during collection of sample.

The flow rates of whole saliva were measured at following different stages.

1. Unstimulated and stimulated whole saliva before complete denture placement
2. Unstimulated and stimulated whole saliva immediately after and 2 months after complete denture placement.

Flow rate will be calculated as

Salivary flow rate = Collected volume/ collection time

Statistical analysis was performed using using SPSS software. The data was collected and fed in SPSS (IBM version 23) for the statistical analysis. The descriptive statistics included mean and standard deviation. The inferential statistics included Independent t test and One Way ANOVA test for comparison.

RESULTS

This in-vivo study was carried out to compare and evaluate between unstimulated and stimulated whole salivary flow rate before denture placement, immediately and 2 months after complete denture placement in diabetic and non-diabetic patients.

Salivary flow rates for both the groupS were calculated at following stages-

Unstimulated salivary flow rate (USF) – 1) Before denture placement (Baseline)

2) Immediately after denture placement
3) 2 months after denture placement
Stimulated salivary flow rate (SSF) -1) Before denture placement (Baseline)
2) Immediately after denture placement
3) 2 months after denture placement

Salivary flow rate was expressed in ml/min. Statistical analysis was performed using using SPSS software. The data was collected and fed in SPSS (IBM version 23) for the statistical analysis. The descriptive statistics included mean and standard

deviation. The inferential statistics included Independent t test and One Way ANOVA test for comparison.

The results of the study were as follows

Descriptive statistical comparison of mean salivary flow rate (unstimulated and stimulated) between non-diabetic and diabetic participants in table 1 revealed that stimulated salivary flow rates were significantly higher than the unstimulated salivary flow rates obtained before, immediately after and 2 months after complete denture insertion. Table 1 also showed that unstimuated and stimulated salivary flow rate values were significantly higher in non-diabetic participants than diabetic participants at baseline (before denture insertion), immediately and 2 months after denture insertion. The same results were shown in Graph 1.

Descriptive statistical comparison of unstimulated and stimulated mean salivary flow rate among non-diabetic participants and among diabetic participants in table 2 showed that stimulated salivary flow rate values were significantly higher than unstimulated salivary flow rate for both diabetic and non-diabetic participants at baseline (before denture insertion), immediately and 2 months after denture insertion. Among non-diabetic group, values obtained were higher for stimulated salivary flow rate immediately after denture insertion followed by 2 months after denture insertion compared to baseline (before denture insertion). The results obtained were statistically significant. Among diabetic group, values obtained were higher for stimulated salivary flow rate immediately after denture insertion followed by 2 months after denture insertion compared to baseline (before denture insertion). The results obtained were highly significant.

Descriptive statistical comparison among unstimulated and among stimulated mean salivary flow rate at at baseline (before denture insertion), immediately and 2 months after denture insertion in both non-diabetic and diabetic patients in table 3 revealed that among unstimulated mean salivary flow rate, higher values were obtained after immediately denture insertion followed by 2 months after denture insertion compared to baseline (before denture insertion) in both non-diabetic and diabetic participants. The results obtained were highly significant. It also showed that among stimulated mean salivary flow rate, higher values were obtained after immediately denture insertion followed by 2 months after denture insertion compared to baseline (before denture insertion) in both non-diabetic and diabetic participants. The results obtained were highly significant.

Table 1 Descriptive statistical comparison of mean salivary flow rate (unstimulated and stimulated) between non-diabetic and diabetic participants at baseline (before denture insertion), immediately and 2 months after denture insertion

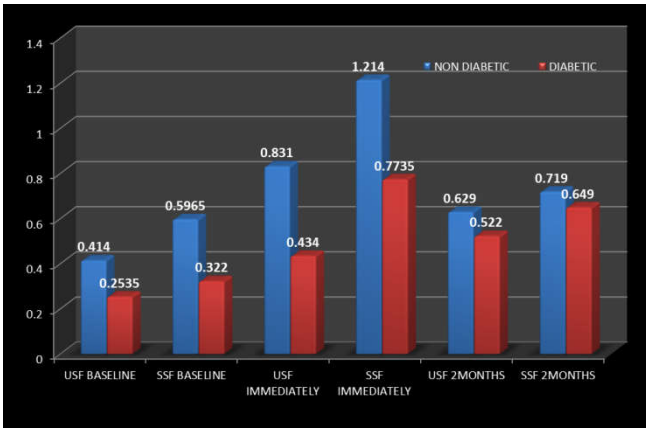
		Mean	Standard deviation	T	Significance
USF baseline	Non diabetic	.4140	.08702	7.368	0.005(H.S)
	Diabetic	.2535	.04380		
SSFbaseline	Non diabetic	.5965	.16122	7.295	0.000(H.S)
	Diabetic	.3220	.04819		
USF Immediately	Non diabetic	.8310	.21076	7.822	0.002(H.S)
	Diabetic	.4340	.08426		
SSF Immediately	Non diabetic	1.2140	.32954	5.462	0.000(H.S)
	Diabetic	.7735	.14658		
USF 2months	Non diabetic	.6290	.10244	3.957	0.000(H.S)
	Diabetic	.5220	.06429		
SSF 2months	Non diabetic	.7190	.11102	2.154	0.038(S)
	Diabetic	.6490	.09375		

Table 2 Descriptive statistical comparison of unstimulated and stimulated mean salivary flow rate among non-diabetic participants at baseline (before denture insertion), immediately and 2 months after denture insertion and among diabetic participants at baseline (before denture insertion), immediately and 2 months after denture insertion

			Mean	Standard deviation	T	Significance
Non diabetic	Baseline	USF	.4140	.08702	4.455	0.019(S)
		SSF	.5965	.16122		
	Immediately	USF	.8310	.21076	4.379	0.015(S)
		SSF	1.2140	.32954		
	2 months	USF	.6290	.10244	2.664	0.011(S)
		SSF	.7190	.11102		
Diabetic	Baseline	USF	.2535	.04380	4.704	0.000(H.S)
		SSF	.3220	.04819		
	Immediately	USF	.4340	.08426	8.980	0.000(H.S)
		SSF	.7735	.14658		
	2 months	USF	.5220	.06429	4.997	0.000(H.S)
		SSF	.6490	.09375		

Table 3 Descriptive statistical comparison among unstimulated and among stimulated mean salivary flow rate at at baseline (before denture insertion), immediately and 2 months after denture insertion in both non-diabetic and diabetic patients.

		Mean	Standard deviation	F	Significance
Non diabetic USF	Baseline	.4140	.08702	41.756	0.000(H.S)
	Immediately	.8310	.21076		
	2 months	.6290	.10244		
Non diabetic SSF	Baseline	.5965	.16122	43.655	0.000(H.S)
	Immediately	1.2140	.32954		
	2 months	.7190	.11102		
Diabetic USF	Baseline	.2535	.04380	85.486	0.000(H.S)
	Immediately	.4340	.08426		
	2 months	.5220	.06429		
Diabetic SSF	Baseline	.3220	.04819	100.094	0.000(H.S)
	Immediately	.7735	.14658		
	2 months	.6490	.09375		



Graph 1 Comparison of unstimulated salivary flow rate between non-diabetic and diabetic participants and stimulated salivary flow rate between non-diabetic and diabetic participants at baseline (before denture insertion), immediately and 2 months after denture insertion

Figure 1 Glass beaker with distilled water

Figure 2 Graduated measuring jar

Figure 3 Glass funnel

Figure 4 Method of collection of saliva sample

Discussion

Salivary function is critical for the maintenance of oral and systemic health.[1] It plays important role in digestion, mastication, taste, speech and protection of oral hard and softtissue.[6] Hence, any condition that disturbs saliva production or its composition will probably have broad negative sequele in the mouth and may result in systemic complications.[7] Patients suffering from dry mouth experience difficulty with eating, swallowing, speech, retention of dentures, taste alteration, oral hygiene, trauma and ulceration of the oral mucosa, a burningsensation of the mucosa, candidal infections.[1]In diabetic patients there is decrease in salivary secretion and andxerostomia or dry mouth can be associated symptoms.[6]

Salivary flow is termed resting (unstimulated) when noexogenous or pharmacological stimulation is present and istermed (stimulated) when secretion is promoted by mechanicalor gustatory stimuli or by pharmacological agents.[1]Since several factors can influence salivary secretion andcomposition, a precise standard for saliva collection must beestablished.[8] The spitting method appeared to be the most reproducible.[9,10] Hence, in the present study, spitting method for collection of whole saliva was used and mechanical method was used to stimulate whole saliva.

The results of the present study showed that an increase in mean unstimulated and stimulated salivary flow rate before completedenture placement to that of immediately after complete denture placement in both non-diabetic and diabetic patients. Also, mean stimulated salivary flow rate values were significantly higher than mean unstimulated salivary flow rate values. This could be due to the stimulation of the mucousglands in the posterior third of the palate because of denture

coverage, causing increase in salivary secretion.[11] Also, the dentures themselves act as mechanical stimulants which causes increase in salivary flow rate in both diabetic and non-diabetic patients.[1]

Yurdukoru *et al* evaluated assessment of wholesaliva flow rate in denture wearing patients and concluded that unstimulated wholesalivary flow rate immediately after denture insertion was1.5 to 2 times higher compared to the preinsertion values.[9] This study also indicates that there was a significantdecrease in the flow rate when compared between immediately after denture insertion and 2 months after dentureinsertion. The probable reason could be the factthat the salivary glands need to accommodate to the presence of new dentures, and the production of salivawould eventually return to normal following salivarygland adaptation. Eventual atrophy of the gland withcontractual fatigue would then reduce the mucoussecretion to an acceptable level.[12]

Furthermore, the values for unstimulated and stimulated salivary flow rate after 2 months of denture insertion remained significantly higher whencompared with the baseline values obtained before the completedenture placement, in both non-dibetic and diabetic participants. Also, mean stimulated salivary flow rate values were significantly higher than mean unstimulated salivary flow rate values. This suggests the importance of stimulation. Also, the dentures themselves act as mechanical stimulants which causes increase in salivary flow rate in both diabetic and non-diabetic patients.[1]

Sreebny LM *et al* has studied druginduced xerostomia in elderly individuals and concluded that the salivary flow rates of diabetic patients were consistently lower than non-diabetic persons.[13]

Vaziri *et al* evaluated salivary glucose, IgA and flow rate in diabetic patients and concluded that no significant differences were found in salivary IgA and glucose concentrations in diabetic patients and control subjects but significantly, lower salivary flow ratevalues were observed in diabetic patients when compared to the controls.[4]

In the present study, mean unstimulated and stimulated salivary flow rate values before denture insertion, immediately after denture insertion and 2 months after denture insertion were significantly higher in non-diabetic participants than in diabetic participants. This could be explained by the fact that the change in salivary flow in diabetic patients is caused by multiple factors like the changesin the parenchyma of the salivary gland, glycosuria caused by mild hyperglycemia, and diabetes complications such as neuropathy, angiopathy and metabolic dyscontrol, decreasing the activity of the enzymes located in the salivary glands and hence affecting itsfunction.[3]

This study had some limitations such as

1. Time of collection was not specific.
2. Sample size was small. A larger sample size could give statistically significant results.
3. It is practically difficult to obtain true unstimulated saliva because flow is always influenced by some kind of stimulation.

CONCLUSION

Within the limitations of this study, following conclusions were made

- Stimulated whole salivary flow rates were significantly higher than the unstimulated whole salivary flow rates obtained before, immediately after, and after 2 months of complete denture placement in both non-diabetic and diabetic participants.
- It was found that there were significant differences in unstimulated whole salivary flow rates obtained before, immediately after, and after 2 months of complete denture placement in both non-diabetic and diabetic participants.
- There were also significant differences in stimulated whole salivary flow rates obtained before, immediately after, and after 2 months of complete denture placement in both non-diabetic and diabetic participants.
- It was also found that both unstimulated and stimulated salivary flow rates were significantly higher after 2 months of complete denture placement compared to baseline that is before denture placement in non-diabetic and diabetic participants.
- This study also showed that unstimulated and stimulated salivary flow rates were significantly higher in non-diabetic participants than in diabetic participants, before, immediately after, and after 2 months of complete denture placement.

References

1. Muddugangadhar BC. A clinical study to compare between resting and stimulated whole salivary flow rate and Ph before and after complete denture placement in different age groups. J Indian Prosthodont Soc. 2015 Oct-Dec;15(4):356-66.
2. Dyasanoor S, Saddu S. Association of Xerostomia and Assessment of Salivary Flow Using Modified Schirmer Test among Smokers and Healthy Individuals: A Preliminutesary Study. J ClinDiagn Res. 2014;8(1):211–213.
3. Lima DLF, Carneiro SDRM, Barbosa FTdS, SaintrainMVdL, Moizan JAH, Doucet J. Salivary flow and xerostomia in older patients with type 2 diabetes mellitus. PLoS ONE 12(8): e0180891.
4. BakianianVaziri P, Vahedi M, Mortazavi H, AbdollahzadehSh, Hajilooi M. Evaluation of salivary glucose, IgA and flow rate in diabetic patients: a case-control study. JDent(Tehran)2010;7(1):13–18.
5. Elisa MA. Longitudinal analysis of salivary flow in control subjects and older adults with type 2 diabetes. . Oral Surg Oral Med Oral Pathol Oral RadiolEndod. 2001;91:166-73.
6. Ahadian H. Comparison of the Unstimulated whole Saliva Flow Rate in Diabetic Type II Patients with Healthy Individuals. Iranian J diabetes and obesity, VOLUME 6, NUMBER 2, 2014.
7. Mansson‐Rahemtulla B, Techanitiswad T, Rahemtulla F, McMillan TO, Bradley EL, Wahlin YB. Analyses of salivary components in leukemia patients receiving chemotherapy. Oral Surg Oral Med Oral Pathol 1992;73:35‐46.
8. Dawes C. Physiological factors affecting salivary flow rate, oral sugar clearance, and the sensation of dry mouth in man. J Dent Res 1987;66:648‐53.
9. Yurdukoru B, Terzioglu H, Yilmaz T. Assessment of whole saliva flow rate in denture wearing patients. J Oral Rehabil 2001;28:109‐12.

10. Tylenda CA, Ship JA, Fox PC, Baum BJ. Evaluation of submandibular salivary flow rate in different age groups. J Dent Res 1988;67:1225‑8.
11. Landa JS. Trouble shooting in complete denture prosthesis: Part IX. Salivation, stomatopyrosis and glossopyrosis. J Prosthet Dent 1961;11:244‑6.
12. Wang SL, Zhao ZT, Li J, Zhu XZ, Dong H, Zhang YG. Investigation of the clinical value of total saliva flow rates. Arch Oral Biol 1998;43:39‑43.
13. Sreenby LM, Yu A, Green A, Valdini A. Drug induced xerostomia in elderly individuals : An institutional Study.ContempClin Dent.2012;173-5.
14. Humphrey SP, Williamson RT. A review of saliva: Normal composition, flow, and function. J Prosthet Dent 2001;85:162‑9.
15. Atkinson JC, Grisius M, Massey W. Salivary hypofunction and xerostomia: Diagnosis and treatment. Dent Clin North Am 2005;49:309‑26.
16. Lais Santos Peres, DayaniGalato, Glaucia Helena Faraco de Medeiros. Relationship of salivary flow of diabetic patients. RSBO. 2016;13(2):91-7.
17. KrisztinaMarton, IldikoBoros, Pal Fejerdy, Melinda Madlena. Evaluation of unstimulated flow rates of whole and palatal saliva in healthy patients wearing complete dentures and in patients with Sjogren's syndrome. J Prosthet Dent 2004; 91:577-81.
18. Pedersen AM, Bardow A,Beier Jensen S, Nauntofte S. Saliva and gastrointestinal functions of taste, mastication, swallowing and digestion. J Oral Diseases (2002) 8, 117–129.
19. Streckfus CF, Welsh S, Brown RH, Marcus S, Cherry-Peppers G. Parotid function and composition of parotid saliva among elderly edentulous African-American diabetics. J Oral Pathol Med 1994; 23: 277-9.
20. Siribang PM, Tongchat S, Soisiri T, Somsak M, Umawadee C, Weerapan K. Xerostomia, Hyposalivation, and Oral Microbiota in Type 2 Diabetic Patients: A Preliminary Study. J Med Assoc Thai 2009; 92 (9): 1220-8.
21. Dodds MW, Johnson DA, Yeh CK. Health benefits of saliva: A review. J Dent2005;33:223‑33.
22. RM Lopez-Pintor. Xerostomia, Hyposalivation, and Salivary Flow in Diabetes Patients. J Diabetes Res 2016, 4372852. 2016.
23. Shekhar A, Das S, Bhattacharyya J, Goel P,Majumdar S, Ghosh S. J Indian Prosthodont Soc , 2018 (1), 53-60.
24. Aitken-Saavedra J, Rojas-Alcayaga G, Maturana - Ramirez A, Escobar-Alvarez A, Cortes-Coloma A, Reyes-Rojas M. Salivary gland dysfunctionmarkers in type 2 diabetes mellitus patient. J ClinExp Dent. 2015;7(4):501-5.
25. Atkinson JC, Grisius M, Massey W. Salivary hypofunction and xerostomia: Diagnosis and treatment. Dent Clin North Am 2005;49:309‑26.

How to cite this article:

Dr.Khot Kalyani Jalindar *et al* (2020) 'A Clinical Study to Compare Between Unstimulated and Stimulated Whole Salivary Flow Rate Before and After Complete Denture Placement in Diabetic and Non Diabetic Patients ', *International Journal of Current Advanced Research,* 09(03), pp. 21534-21539. DOI: http://dx.doi.org/10.24327/ijcar.2020. 21539.4235

****