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Original Research

Evaluation of salivary flow rate, pH and buffering capacity in pregnant and non pregnant women- A comparative study

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***ABSTRACT*:**

Background- Saliva plays an important part in the maintenance of oral health as it contains many innate and acquired factors with a protective role on the oral tissue. A variety of hormonal changes occur throughout the life of females with a sheer peak during the time of pregnancy. The present study was carried out to determine the changes in flow rate of saliva, ph and buffering capacity in pregnant & non pregnant females. **Materials & Methods-** The present study comprised of 45 pregnant female and 45 non pregnant females of the same age group. Both stimulated and non stimulated saliva was collected from the patients and was compared. The salivary flow, pH and buffering capacity were measured by GC saliva collection buffer kit. **Results-** The mean± SD unstimulated flow rate was 5.32 ±1.64 and 4.47±1.45 in non pregnant and pregnant patients. The mean± SD unstimulated salivary flow rate was 9.38±2.15 in pregnant patients and 7.76± 1.75 in non- pregnant patients. The mean pH was 6.20 ± 0.32 and 6.90 ± 0.36 in pregnant and non pregnant patients respectively. The mean buffering capacity was 7.34 ± 1.62 in pregnant females and 10.1 ± 1.40 in non pregnant females. **Conclusion-** A significant decrease in the flow rate of both stimulated and non stimulated saliva was seen in the present study. pH and buffering capacity of saliva was also less in pregnant females as compared to non pregnant females.

Keywords: Bicarbonate, Buffer, Pregnancy

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INTRODUCTION

Saliva plays an important part in the maintenance of oral health, as it contains many innate and acquired factors with a protective role on the oral tissue.[1] It plays key roles in lubrication, mastication, taste perception, prevention of oral infection and dental caries. There is increasing inclination towards using saliva samples for the diagnosis of oral and systemic diseases.[2] Many studies have indicated that hormones influence the composition of women's saliva.

A buffer is a solution that tends to maintain a constant pH. Whenever the pH starts falling after the ingestion of a substrate, it returns back to the original resting level after a period of time because of the inherent buffers in the saliva. Critical pH is the pH of the saliva below which the inorganic material of tooth starts dissolving and it varies according to the calcium and phosphate ion concentration. The value of critical pH is usually about 5.5 ranging anywhere between 5.2 and 5.7.[3]

Saliva contains water, organic and inorganic molecules which are exposed to hormonal changes in females. So, pregnancy, menstruation, and hormone replacement therapy can have a direct effect on the entire body including the metabolism of the periodontal tissues. During pregnancy, various complex interactions are occurring in the body, thereby changing the ph, biochemical composition and flow rate of saliva. Various hormones secreted by the body

during pregnancy like progesterone, estrogens and human gonadotropins are primarily responsible for this change.[4] The present study aimed at the comparison between salivary flow rate, ph and buffering capacity in Indian females.

MATERIALS & METHODS

This study was carried out on 45 healthy pregnant patients with gestational age of 3-9 months visiting the department of Oral medicine and Radiology, Dasmesh Institute of Research & Dental Sciences, Faridkot. 45 non pregnant females, none of whom were taking oral contraceptive pills were selected as control group. Subjects with salivary gland disorders and any other systemic diseases were excluded from the study. Ethical clearance was taken before the study from institutional ethical committee. An informed written consent was taken from all the participants prior to the study. Oral hygiene habits of the patients were recorded and information regarding the pregnancy trimester and use of medication was obtained from the patient's medical charts. Standardized saliva collection technique was followed to collect saliva samples from patients in early morning hours. Subjects were refrained from eating, smoking or drinking one hour prior to saliva collection. Patients were made to sit comfortably on the chairs with their heads tilted slightly forward and were then asked to expectorate the collected saliva in floor of mouth in sterile containers. The resting saliva flow was measured as ml/min. Stimulated saliva samples were collected by asking the patients to chew a piece of paraffin wax for 5 minutes and then expectorate in distilled containers. Each saliva sample was collected on ice. GC saliva collection buffer kit was used to measure salivary flow, ph and buffering capacity. The kit is provided with ph strips which measure the ph between 5 to 8. The ph strip provided with the kit is used to measure the ph by placing it in the saliva sample for 10 seconds. The color change of the strip was compared with the reference chart provided with the kit and recorded. For checking the buffering capacity of the saliva, saliva was pipetted from the collection cup on the test pad which changes its color in 2 minutes. This color change was compared with the standard chart and recorded. Statistical analysis was done with SPSS software version 17 using student's t test and p value of 0.05 was considered statistically significant.

RESULTS

Table I Mean unstimulated flow rate among pregnant and non pregnant females

Parameter	Pregnant		Non- pregnant		Unpaired T- test	
Unstimulated flow	Mean	SD	Mean	SD	T value	P value
	5.32	1.64	4.47	1.45	3.400	0.001

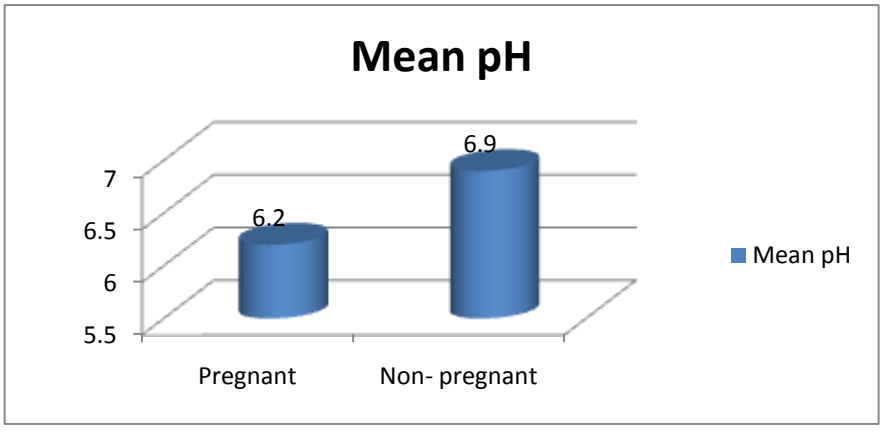
Table 1 shows that mean± SD unstimulated flow rate was 5.32 ±1.64 and 4.47±1.45 in non pregnant and pregnant patients respectively with p value 0.001 which was statistically significant.

Table 2 Mean stimulated flow rate among pregnant and non pregnant females

Parameter	Pregnant		Non- pregnant		Unpaired T- test	
Unstimulated flow	Mean	SD	Mean	SD	T value	P value
	9.38	2.15	7.76	1.75	0.320	0.002

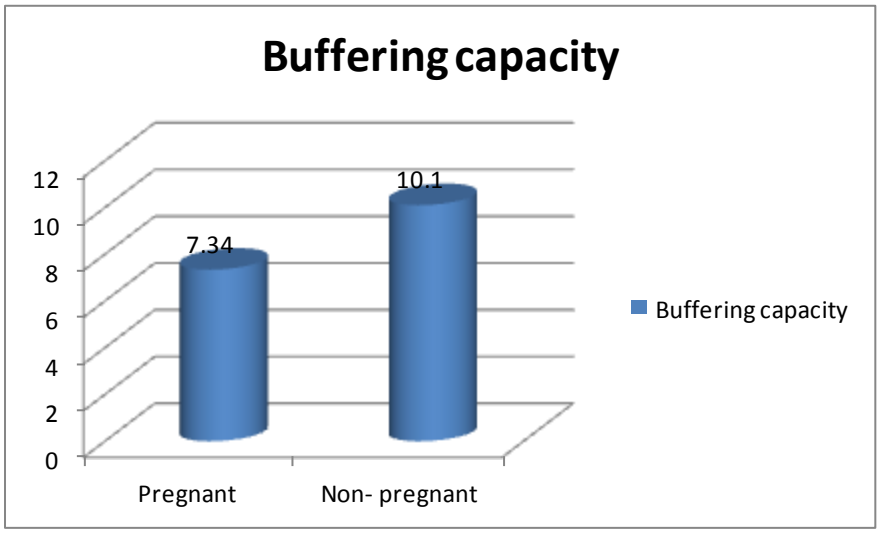
Table 2 shows that the mean± SD unstimulated salivary flow rate was 9.38±2.15 in pregnant patients and 7.76± 1.75 in non- pregnant patients. The difference was significant (P- 0.002).

Graph I Mean pH among pregnant and non pregnant females



Graph I shows that mean pH of 6.20 ± 0.32 and 6.90 ± 0.36 in pregnant and non pregnant patients with p value of 0.5 which was statistically non- significant.

Graph II Buffering capacity among pregnant and non pregnant females



Graph II shows mean buffering capacity of 7.34 ± 1.62 in pregnant females and 10.1 ± 1.40 in non pregnant females. The difference was statistically non significant (P- 0.1).

DISCUSSION

Saliva is regarded as one of the important component in maintaining oral health.[3,4] It contains various electrolytes, minerals, buffers, growth factors, immunoglobulins, cytokines, mucins and glycoproteins. Many studies have proved that saliva has a strong correlation with serum parameters, hence it can be used in detecting physiological and pathological changes in the body.[5,6,7] Pregnancy is the process which alters the composition and functions of all the systems of body with profound metabolic, biochemical and hormonal changes in the body. In the present study, we have found that salivary flow rate was lower in pregnant patients than non pregnant females. This is attributed to the increased human chorionic gonadotropins levels in body during pregnancy which leads to reduced salivary flow. Studies undertaken previously to estimate the stimulated and unstimulated salivary flow rate between pregnant and nonpregnant women have shown mixed results. The studies done by Laine and others shows no significant change in the salivary flow rate between the pregnant and non pregnant women.[8] One study showed significant increase in the salivary flow rate in the pregnant groups.[9] Studies conducted by Hugoson and Gonzalez et al showed reduced salivary flow in pregnant patients.[10,11]

Salivary flow rate has a definitive influence on the pH of saliva. At higher flow rate, there is an increased level of salivary pH because the bicarbonate concentration increases with elevated flow rate.[12,13] The decrease in pH in pregnant patients is attributed to increased progesterone in the body of pregnant patients which reduce the bicarbonate content in the saliva thereby reducing the pH and buffering capacity of saliva.[14]Also, its been postulated that alpha amylase activity increases during 10-21 weeks of gestation which leads to increased micro organism substitution and hence reduced pH.[15] It was found in our study that the salivary pH was lower in pregnant women than in non-pregnant women. The pH of saliva for both the groups was within the normal range of 5.5-7.4, according to the international reference values.[16] Rosenthal et al[17] compared the pH of saliva in pregnant and non-pregnant women; they reported that the mean pH value of saliva of pregnant women was 6.5 and that of non-pregnant women was 7.0. Decreased salivary pH in pregnant women was also reported in a previous study conducted by Kullander and Soneson.[18]

Laine et al.[8] reported that the salivary pH decreased toward late pregnancy, followed by a rapid increase after childbirth. Rockenbach et al.[3] reported that pregnant women had reduced level of salivary pH (6.7) than non-pregnant women (7.5). In the present study, buffering capacity in the pregnant females is less than non pregnant females in accordance with the previous studies.

Hegde et al[19] evaluated salivary flow rate, pH and buffering capacity of saliva in pregnant and non pregnant women. 30 pregnant women in their third trimester and 30 non pregnant women, in the age group of 19-34 years were recruited. The salivary flow, pH, and buffering capacity was measured using Saliva-check BUFFER kit (GC Corporation). Both unstimulated and paraffin stimulated saliva was measured for 5 min by asking the subjects to spit passively into a measuring jar provided in the kit. A statically significant increase in the salivary flow and a decrease in the pH and buffering capacity in the pregnant group when compare to the non pregnant group. The increase in the salivary flow rate in pregnant women could be attributed to the increase in the estrogen and progesterone concentration during pregnancy. The decrease

in the pH and buffer capacity is due to the decrease in the plasma HCO3 - ion concentration and an increase in amylase concentration during pregnancy. The limitation of the study is small sample size.

CONCLUSION

A significant decrease in the flow rate of both stimulated and non stimulated saliva was seen in the present study. pH and buffering capacity of saliva was also less in pregnant females as compared to non pregnant females. However to obtain a more conclusive confirmation of this hypothesis, more studies have to be carried out.

REFERENCES

1. Malamud D et al. Saliva as a diagnostic fluid. Dent Clin North Am 2012; 55:159-78.
2. Salvolini E, Di Giorgio R, Curatola. Biochemical modifications of human whole saliva induced by pregnancy. Br J Obstet Gynaecol 1998; 105: 656-60.
3. Rochenbach MI, Marinho SA, Veek EB. Salivary flow rates, pH and concentration of calcium, phosphate and s IgA in Brazilian non pregnant and pregnant patients. Head and face medicine 2006; 2: 44.
4. Loe H, Silness J Periodontal Disease in Pregnancy I: Prevalence and Severity. Acta Odontologica Scandinavica 1963; 21: 533-51.
5. Lenander M, Loimaranta V. Saliva and Dental Caries. Advances in Dental Research 2000; 14: 40-7.
6. Chiappin, S, Antonelli, G, Gatti R 2007. Saliva Specimen: A New Laboratory Tool for Diagnostic and Basic Investigation. Clinica Chimica Acta. 2007; 383 (2): 30-40.
7. Kulla A, Mikkonen M., Kotilainen R. 1982. The pH of Stimulated and Resting Saliva in Different Morphological Forms of the Tongue Surface in a Young Population. JMED Research Oral Surgery, Oral Medicine, Oral Pathology 1998; 53 (5): 466-8.
8. Laine M, Pienihakkinen K. Salivary Buffer Effect in Relation to Late Pregnancy & Postpartum. Acta Odontologica Scandinavica 2000; 58 (1): 8-10.
9. Naveen S, Asha ML, Shubha G 2014. Salivary flow rate, pH and buffering capacity in pregnant and non pregnant women – A comaparitive study. JMED Research 2014; 2-8.
10. Hugoson A. Salivary secretion in pregnancy. A longitudinal study of flow rate, total protein, sodium, potassium and calcium concentration in parotid saliva from pregnant women. Acta Odontol Scand 1972; 30:49-66.
11. González M, Montes de Oca L, Jiménez G. Changes in saliva composition of pregnant and non-pregnant patients. Perinatol Reprod Hum 2001; 15:195-201.
12. Rice DH. Advances in diagnosis and management of salivary gland diseases. West J Med 1984; 140:238-49.
13. Dawes C. Effects of diet on salivary secretion and composition. J Dent Res 2001; 49:1263-72.
14. Eliasson L, Carlen A, Laine, M. Minor Gland and Whole Saliva in Postmenopausal Women Using a Low Potency Oestrogen (Oestriol). Archives of Oral Biology 2003; 48(7): 511-7.
15. Alnuaimy T, Aldoski FS. Pregnancy Related Changes in Oral Health and Human Unstimulated Whole Saliva. Al Rafidain Dental Journal 2003; 3 (2) 108-15.
16. Tenovuo J, Lagerlof F. Saliva. In: Thylstrup A, Fejerskov O, editors. Textbook of Clinical Cariology. 2nd ed. Copenhagen: Munksgard 1994; 17-43.
17. Rosenthal SL, Rowen R, Vazakas AJ. Comparative analysis of saliva in pregnant and non pregnant women. Calcium and pH. J Dent Res 1999; 38:883-7.
18. Kullander S, Soneson B. Studies on saliva in menstruating, pregnant and post-menopausal women. Acta Endocrinol 1998; 48:329-36.
19. Hegde S, Thakur NS, Kohli S, Shukla V, Siddiqui A, Patel P, Payasi S. A comparative evaluation of salivary flow rate, pH, buffering capacity, calcium and total protein levels in pregnant and non pregnant women. J Adv Med Dent Scie Res 2016;4(4):92-95.