

Original Research Article

## **Check the amount of calcium, phosphorus, magnesium, chlorine, pH, Flow rate, glucose and total protein in the saliva of pregnant and non-pregnant women at the center of the family's control at Hamadan Fatemiyeh hospital**

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**Abstract:** Saliva is a fluid that rinses hard and soft tissues of the oral cavity and it is an important local factor in the oral defense. Saliva is a unique liquid and because of its simple collection rather than blood, is considered as a diagnostic tool for the past 10 years. Since pregnancy is associated with changes in metabolites during this period, decay can be the result of changes in salivary composition and environmental changes. Today the integration of medical and dental science to better health is considered. The aim of this study was to compare the rate of flow rate, pH, and total protein, the concentration of calcium, phosphorus, magnesium, chlorine, glucose and saliva in pregnant and non-pregnant women in Maternity Women Specialized Hospital of the city of Hamadan. This study in 2010 was performed on the 100 women in the age range of 18-36 years. Case group, was included 50 pregnant women and control group was consisted 50 non-pregnant women. Salivary Calcium concentration was measured by the pars Azmun company's kits by the cresolphthalein complexion photometric method. The amount of salivary chlorine by spectrophotometry was investigated. Total protein was determined by modi-Bruet method. UV Pars Azmun test kits in photometric method performed a measure of the phosphate amount. Xylidyblue method was used to determine the amount of magnesium. Graduated container was used to checking the amount of flow rate. PH meters were used In order to measure the pH of saliva. After entering data onto SPSS version 16, data was analyzed by t-test and chi-square test. Component of saliva such as total protein, Ca, P, Cl and glucose concentration of saliva isn't changing significantly in pregnant women before and after pregnancy, but flow rate amount increase in pregnancy period compare to before that.

**Keywords:** calcium, phosphorus, magnesium, chlorine, pH, Flow rate, glucose, total protein, saliva, pregnant woman.

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### **INTRODUCTION**

Saliva is an exocrine excretion containing water 99% and different type of electrolyte (Na, K, Ca, CL, Mg, CO<sub>3</sub>, and P) and proteins such as enzymes, immunoglobulins and other antimicrobial factors and substances such as saliva glycoproteins, albumin, many polypeptides and oligopeptides that is important for oral health. In addition, aluminum and nitrogen products such as urea exist in saliva. These components are responsible for different functions of saliva [1]. Quantitative and qualitative changes in saliva excretion may lead to local side effect (caries, mucositis, candidiasis, oral infection, chewing disorders) and extra

oral side effect (dysphasia, bad odor, weight loss). Usually xerostomia or dry mouth knows with saliva clinical decrease. The saliva buffering property is an important factor in saliva pH and dental demineralization equilibrium. Saliva buffering effect is associated with bicarbonate concentration that correlates with saliva flow rate. Another factor that can affect the flow rate and buffering property of saliva that can be noted are gender, smoking and alcohol consumption. Women are having smaller value of the flow rate. There are controversies on relationship between salivation and smoking or alcohol consumption [2]. Saliva has a fundamental role in maintaining the

physical-chemical integrity of enamel with demineralization and remineralization regulation. Saliva is the most important factor in controlling of enamel hydroxyapatite stability, concentrations of active calcium, phosphorus, free fluoride and PH. High concentrations of calcium and phosphorus in saliva ensure ionic exchange between saliva and tooth structure after tooth eruption. Remineralization of decayed teeth due to calcium and phosphate ions in saliva is possible before cavity forming. Calcium concentration of saliva change with salivary flow rate but it is not influenced by diet. The concentration of phosphorus ions depends on the pH and flow rate of saliva. As the flow of saliva increases, the concentration of inorganic phosphorus is reduced. The most important biological function of this ion is preservation of tooth structure. The other its function is, preserve buffering properties in relation to unstimulated salivary flow. The concentration of glucose in saliva in free mode is 0.5- 1 ml / 100ml. High concentration of glucose often occurs after eating or drinking. This subject is known that there is association between glucose concentration in blood and saliva, especially in diabetic patient, but because of that is not always significant, saliva is not used as a controlling tool for blood glucose evaluation. Saliva eliminates the extra carbohydrates with its mechanical action and as a result, it restricts glucose delivery to microorganism's biofilm. Higher saliva flow increases cleaning properties of saliva. So if a change in health status reducing the saliva flow, it may be effective in the self- cleaning of mouth [3]. According to investigations, appears to increase in magnesium as the most important intracellular ions, can be due to the increasing in mucosal cells desquamation during pregnancy period. Change in salivary magnesium level is an important clinical factor because of its association with preeclampsia [4]. Total protein content of saliva can be a reflection of total endocrine properties. Many salivary proteins have enzymatic function, such as  $\alpha$ -amylase enzyme that forms most of the contents of the secretion of parotid, and this element accounted about 50% of submandibular gland's total proteins too [5]. According to Rayment *et al* studies, total protein secretion in the salivary gland is very different from its value in endocrine secretions. Total protein concentration decreased just after the stimulation [6]. Since pregnancy is associated with metabolic changes, decay during this period can be the result of changes in salivary composition and the environmental changes. To understand these changes, a series of analyzes of saliva compositions have been performed during pregnancy [7].

Many studies have noted that hormones have an impact on salivary composition especially during ovulation time in women. Association between ovulation, pregnancy and parturition, and the levels of phosphate, calcium and magnesium have been

discovered [5, 7]. In addition, cyclic changes have seen in salicylic acid, glucose and electrolytes in saliva. Reducing in amount of pH, flow rate and electrolytes of saliva and IgA concentration have been reported in pregnancy period [8]. In one study was proposed relationship between changes in salivary protein of parotid and hormonal changes during pregnancy. Secretory proteins (Total protein) are made by a variety of cells [2]. Previous studies have shown that pregnancy may have adverse effects on oral health. Saliva is doing so many functions such as balancing the pH of mouth. Acidity balancing of saliva is affected during pregnancy. PH and buffering effects of saliva gradually reduced in late pregnancy and after delivery is restored to basic level [9]. Saliva is critical substance to keep the oral health and it has been used as a non-invasive source for the study of metabolism and elimination of many drugs [10]. Now, saliva is in progress as a specific diagnostic tool. Many investigators use sialometry and sialo-chemistry to identify systemic disease, public health control and as an risk index to association between oral health and systemic diseases [11]. However, because many factors can affect the secretion of saliva and its compounds, a standard collecting procedure should be determined to reach the noted examination and the actual function of salivary glands, and an effective instrument for controlling and maintaining health [1].

According to studies, there is no relationship between changes in blood and saliva, and although the amount of magnesium, phosphorus, and chlorine and blood osmolality does not change, salivary glands produce changed saliva (diverse saliva) independently. Changes in saliva calcium concentration weren't similar to blood [2]. The aim of this study was to comparison of flow Rate, pH, total protein, and the concentration of calcium, phosphorus, magnesium, chlorine, glucose and saliva in pregnant and non-pregnant women in Fatemiyeh Specialized Hospital of Obstetrics and Gynecology of Hamadan.

## MATERIAL AND METHODS

Present Study in 2010 was performed on 100 women lived in the city of Hamadan, had 36-18 years old. The control group included 50 pregnant women and case group contained of 50 non-pregnant women. case and control groups in terms of dry mouth, medications such as (OCP, smoking, Alcohol consumption and systemic disorders (heart disease, renal disease, hepatic disease, respiratory disease, metabolic disorders) were in similar situation. 2 hours after the last meal saliva samples were collected. To perform the test, the simulated or non-simulated saliva samples were collected in standard conditions in 5 minutes [14]. All samples transferred to the laboratory for measurement of certain indicators in less than one day. Until the beginning of the experiments, samples

were stored at a freezer with -30 ° C temperature. In all step of experiments, disposable tools will be used to prevent changes in the tests results. Calcium measurement was performed with Pars Azmun test kits by cresolphthalein complex one photometric method. Saliva chlorine content was determined by spectrophotometry techniques. Pars Azmun test kits in photometric method measured glucose amount of samples. Total protein was determined by modi-Bruet method. UV Pars Azmun test kits in photometric method performed measuring of the phosphate amount. Xylidyblue method was used to determine the amount of magnesium. Graduated container was used to checking the amount of flow rate. PH meters was used in order to measuring the pH of saliva. After entering data into SPSS version 16, data was analyzed by t-test

and chi-square test. In this study, subjects have had various conditions such as nutritional, psychological, social, and occupational variation that these factors have the ability to change the composition of saliva. but due to lack of time and cost , only cases such as smoking , drugs , systemic diseases (cardiovascular , renal , hepatic , respiratory and metabolic disease ) and other factors that have more effect on saliva were matched in patients.

**RESULTS**

Table 1 shows comparison results of salivary markers in both pregnant and non-pregnant women in this study. As it can be see, the only index between two groups was statistically significant. Index in pregnant group compared to non-pregnant was in lower level.

**Table-1: Comparing the mean, standard deviation, minimum and maximum amount of markers and t- test results**

marker	group	number	mean	Standard deviation	t-test results	p.value
glucose	1	50	5.98	8.98	t-1.01	0.314
	2	50	4.54	4.47	t-1.01	0.315
phosphorous	1	50	23.34	9.76	t-0.62	0.536
	2	50	24.90	14.80	t-0.62	0.536
calcium	1	50	8.26	8.43	t-0.16	0.873
	2	50	8.57	10.85	t-0.16	0.873
Total protein	1	50	59.42	23.75	t-0.84	0.399
	2	50	63.28	21.81	t-0.84	0.399
chlorine	1	50	27.21	10.66	t-0.41	0.679
	2	50	26.36	9.97	t-0.41	0.679
magnesium	1	50	0.42	0.30	t-0.97	0.335
	2	50	0.69	1.94	t-0.97	0.337
PH	1	50	6.40	0.63	t-0.92	0.359
	2	50	6.51	0.50	t-0.92	0.360
Flow rate	1	50	0.82	0.42	t-2.62	0.010
	2	50	0.62	0.30	t-2.62	0.010

**DISCUSSION**

Saliva is a fluid that washes hard and soft tissues of the oral cavity, and an important factor in local oral defense. Human saliva produced by three main salivary glands; parotid, submandibular and sub-lingual and a large number of minor salivary glands. Acinies are secretory units of these glands that contain cluster cells secreting the water, electrolytes, proteins and glycoproteins. Produced liquid is collected in ducts and then its content changed [12, 13]. Salivary composition can be affected by many factors such as endocrine origin, diet, using pharmacological agents and oral or systemic health. Saliva secretion is controlled by the sympathetic and parasympathetic systems [14]. Whole not stimulated saliva is made up of parotid, submandibular, sub-lingual and mucosal glands secretions, and sub-lingival fluid, desquamated epithelial cells, microorganisms, leukocytes, residues foods and blood [15]. Reduction in salivary flow effects on oral and dental health, and may cause some variable

non-specific symptoms. Salivary hypo function is associated with oral and mood disorders and requires immediate diagnosis and treatment [16]. Function of saliva is essential for oral and systemic health maintenance. Saliva is a special fluid and because of its simple collecting compared to blood, is considered as a diagnostic tool in the past 10 years. Also with measuring the free level of some drugs in saliva can evaluate the effectiveness and toxicity of it exactly like the plasma [17]. In the present study, we were chosen unstimulated saliva collecting method, because this type of saliva is secreted more than stimulated saliva during the day and it is important to oral health maintaining and as a reflection of the physiological condition of the oral cavity and the whole body. Because of difficulties in unstimulated saliva collecting due to environmental stimuli that may cause collecting a wide range of salivary flow rate; some researchers prefer to collect stimulated saliva; like Rayment and colleagues that were chosen stimulated and unstimulated saliva to

determine the concentration of total protein, flow rate and mucin [6]. In an update review research on saliva for FDI, there are still descendants on normal reference range of salivary flow rate. Although we have followed standard methods to collect saliva samples, we found a wide range of unstimulated salivary flow rate that may potentially affect the results [18]. In this study, consumption of any drugs in patients was examined to eliminate the effect of drug-induced saliva reduction. Laine explained that pregnancy doesn't causes significant changes in the levels of calcium or other minerals of tooth [19]. The results of this study showed that there are no significant differences in the pH, total protein, and concentration of calcium, phosphorus, magnesium, chlorine, glucose and saliva in pregnant and non-pregnant women. While the flow rate indicator has significant difference between the two groups, so that in the pregnancy is less than the non-pregnant group. Most previous studies such as research of Rockenbach and colleagues did not report difference between calcium and phosphorus concentrations in the saliva of pregnant and non-pregnant women, however, pregnant women had lower pH [18]. Hegde and partners showed that salivary flow rate, pH decreased during pregnancy than non-pregnant women. DMFT index a strong relationship with pH in pregnant women ( $P = 0.002$ ) and pregnant women ( $P = 0.01$ ), respectively. Calcium and protein levels in pregnant women compared with non-pregnant women reduced but statistically not significant [2]. Naveen S and colleagues demonstrated that Increase saliva flow rate in pregnant women could be attributed to increased concentrations of estrogen and progesterone during pregnancy. Reducing the pH and buffering capacity due to reduced activity in plasma  $\text{HCO}_3^-$  concentration and an increase in amylase levels during pregnancy [7]. Rio, Rute and colleagues presented pregnant women presented acidic non-stimulated saliva but neutral stimulated saliva pH, did not report any changes in saliva flow rate, as well as reduce the level of calcium in saliva, increased levels of salivary phosphate and a progressive decrease in salivary glucose levels during pregnancy also showed [20]. Salvolini and colleagues discovered cyclical changes during ovulation in salivary glucose but in our study such a situation has not been considered [21].

## CONCLUSION

The findings of our study show there are not significant differences in the pH, total protein, and the concentration of calcium, phosphorus, magnesium, chlorine and glucose of saliva between pregnant and non-pregnant women, but a decrease in salivary flow rate in pregnant women than non-pregnant women was observed.

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