The American Journal of Medical Sciences and Pharmaceutical Research (ISSN – 2689-1026)
Published: March 31, 2021 | **Pages:** 104-111
Doi: https://doi.org/10.37547/TAJMSPR/Volume03Issue03-15

IMPACT FACTOR 2021: 5. 64
OCLC - 1121105510

Influence Of Hypertension On The Physical And Chemical Parameters Of Oral Fluid

Tulkin Elnazarovich Zoirov
Doctor Of Medicine, Professor, Head Of The Department Of 2 Dentistry, Samarkand State Medical Institute, Samarkand, Uzbekistan

Parviz Rahmatilloyevich Usmanov
Assistant To The Department Of Dentistry No. 2, Samarkand State Medical Institute, Samarkand, Uzbekistan

Rakhmatillo Faizullaevich Usmanov
Md Assistant At The Department Of Oral And Maxillofacial Surgery, Samarkand State Medical Institute, Samarkand, Uzbekistan

Alim Bahriddinovich Turaev
Assistant To The Department Of Dentistry No. 2, Samarkand State Medical Institute, Samarkand, Uzbekistan

ABSTRACT

On the basis of comparative studies of physicochemical parameters of the oral fluid in patients with normal blood pressure, pre-hypertension, and clinically verified arterial hypertension, a violation of physicochemical parameters of the oral fluid has been identified: reduced rate of salivation, decrease in pH, increase in viscosity and surface tension, and reduced buffering capacity to neutralize acids and bases associated with high blood pressure. Decreased functional activity of the salivary glands may be a potential biomarker of hypertension. To assess their diagnostic value, the physicochemical parameters of oral fluid in the diagnosis of arterial hypertension require further research.

KEYWORDS

Hypertension, periodontitis, salivary gland

The American Journal of Medical Sciences and Pharmaceutical Research
(ISSN – 2689-1026)
Published: March 31, 2021 | **Pages:** 104-111
Doi: https://doi.org/10.37547/TAJMSPR/Volume03Issue03-15

IMPACT FACTOR
2021: 5. 64
OCLC - 1121105510

INTRODUCTION

Hypertension is one of the most important problems of modern medicine, generally affecting the elderly population, but with a clear tendency to rejuvenate. A steady increase in systolic BP ≥140 mmHg and/or diastolic BP ≥90 mmHg is diagnosed as arterial hypertension in adults. Hypertension is the most significant risk factor for morbidity and mortality from cardiovascular disease . Saliva (oral fluid) is the most important oral fluid and its physico-chemical parameters determine the level of functioning of all oral organs and tissues. Hypertension and daily intake of hypotensive drugs can initiate changes in the amount and quality of oral fluid secreted by the salivary glands. The physical parameters of saliva depend on the concentration of protein and/or inorganic mineralising components. Changes in the physico-chemical parameters of the oral fluid indicate abnormalities in its composition, which inevitably affect oral health and the integrity of the teeth. Because high BP has significant negative effects on many body systems, including the salivary glands, these effects need to be detailed. However, the prognostic value of physico-chemical measures of oral fluid for hypertension of varying severity remains unexplored.

PURPOSE OF THE STUDY

To assess the effect of arterial hypertension on salivary gland function and physico-chemical parameters of oral fluid.

MATERIALS AND METHODS OF RESEARCH

The diagnosis of arterial hypertension was made with a systolic BP greater than 140 mmHg and a diastolic BP greater than 90 mmHg.

Salivary gland function was studied in 3 groups of patients:

Group 1 consisted of 33 patients with normal BP (BP less than 120/80 mmHg, not taking hypotensive drugs);

Group 2 consisted of 34 patients with borderline hypertension (systolic BP in the range of 120-139 or diastolic BP in the range of 80-89 mmHg while taking antihypertensive medications);

Group 3 consisted of 35 patients with Stage I AH (systolic BP in the range of 140-159 or diastolic BP in the range of 90-99 mmHg against a background of taking hypotensive drugs). To improve the accuracy of measurements, BP was monitored twice. An automatic sphygmomanometer was used to eliminate differences between the different measurements. Participants in the present study were only hypertensive patients without systemic disease; patients with clinically diagnosed arterial hypertension were taking medication for high BP (such as ketonal, valsacor, normodipine, enalapril). Patients taking diuretics and statins were excluded from the study because of their ability to cause xerostomia.

The spitting method was used to collect unstimulated whole saliva. All saliva samples were collected at 25°C at 9-11 am. People were prohibited from eating, drinking, smoking or brushing their teeth for at least 90 minutes before sampling to reduce the effects of daily stress on saliva composition. Before sampling, participants were left sitting in a chair and asked to swallow all the saliva they had in their mouths. They were then asked not to swallow saliva for 5 minutes and to spit the collected saliva into sterilised cups provided by the researchers. The rate of unstimulated salivation was determined by spitting. The viscosity of the oral fluid was determined using

The American Journal of Medical Sciences and Pharmaceutical Research
(ISSN – 2689-1026)
Published: March 31, 2021 | **Pages:** 104-111
Doi: https://doi.org/10.37547/TAJMSPR/Volume03Issue03-15

IMPACT FACTOR
2021: 5. 64
OCLC - 1121105510

a viscosimeter (BK-4); surface tension according to Redinova T.L.2014. The pH of the oral fluid was measured on a pH-meter. The acid and basic buffer capacities of the oral fluid were determined according to V.K. Leontiev (1974). Clinical parameters, oral fluid parameters were expressed as either percentages or mean values ± standard deviation. Statistically significant differences were determined using Student's t-test. A value of <0.05 was considered significant. All analyses were performed using the statistical software package NCSS 2000 (NCSS, LLC, Kaysville, Utah, USA).

The results of this study demonstrated a negative effect of arterial hypertension on the physical and physico-chemical parameters of oral fluid. Patients with clinically verified borderline arterial hypertension and advanced hypertension showed a significant reduction in salivation rate, statistically more significant in patients with advanced hypertension: a 9.80% (P ≥ 0.05) and 25.29% reduction relative to healthy subjects, respectively (Table1, Figure 1)

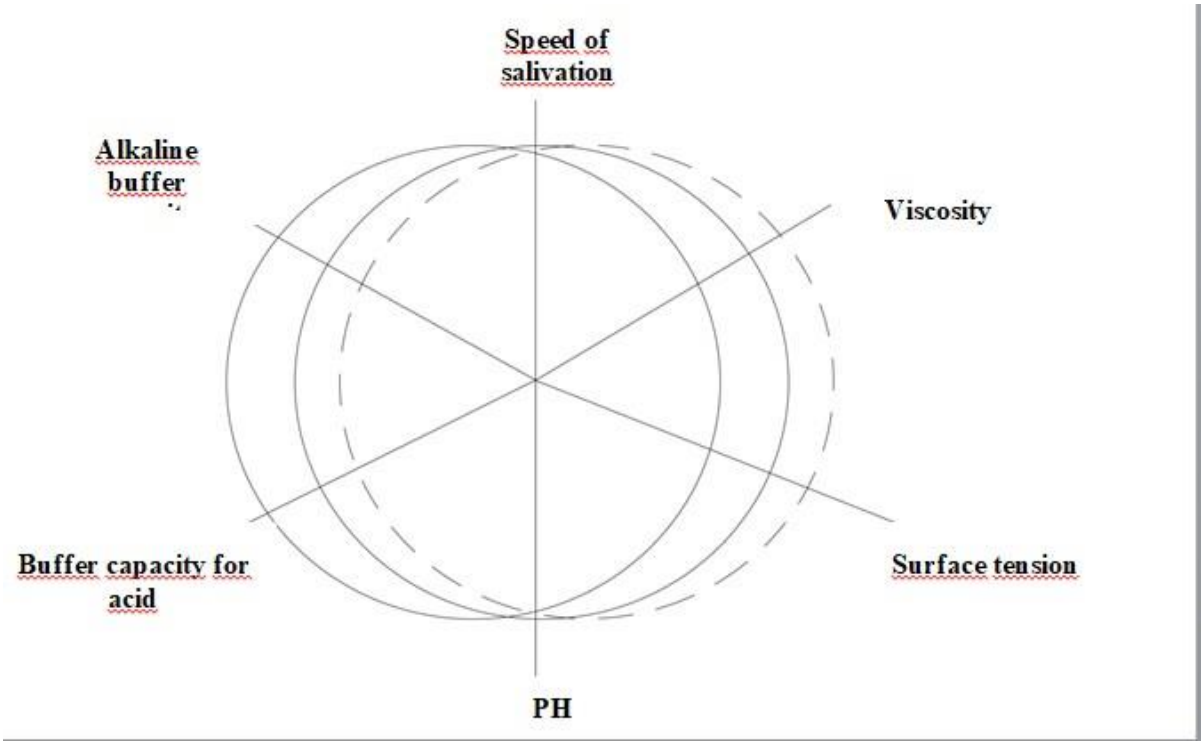
Table 1

Indicator	**No hypertension**	**Borderline hypertension BP 120-139/80-89**	**Stage 1 arterial hypertension BP 140-159/90-99**
Salivation rate	0,51±0,02	0,46±0,02	0,33±0,01
Viscosity U.L.	4,33±0,15 0,21	4,92±0,02	5,85±0,17
Surface tension	63,81±2,67	71,62±2,71	77,32±2,65
PH	7,1±0,27	6,7±0,27	6,27±0,25
Buffer capacity acid	8,23±0,41	7,03±0,28	6,51±0,17
Buffer capacity to alkali m/mol	48,32±1,65	43,31±1,95	36,82±1,17

The American Journal of Medical Sciences and Pharmaceutical Research
(ISSN – 2689-1026)
Published: March 31, 2021 | **Pages:** 104-111
Doi: https://doi.org/10.37547/TAJMSPR/Volume03Issue03-15

IMPACT FACTOR
2021: 5. 64
OCLC - 1121105510

Note: P<0.05 in relation to no hypertension ; V- P<0.05 in relation to borderline hypertension



- No hypertension

---- - Borderline hypertension

- Hypertension

Salivation rate	Borderline AH	Hypertension
	Up to 20	64,71
Viscosity	113,63	135,10
Surface tension	112,24	121,17
PH	94,37	87,32
Acid buffer capacity	85,42	79,10

The American Journal of Medical Sciences and Pharmaceutical Research
(ISSN – 2689-1026)
Published: March 31, 2021 | **Pages:** 104-111
Doi: https://doi.org/10.37547/TAJMSPR/Volume03Issue03-15

IMPACT FACTOR
2021: 5. 64
OCLC - 1121105510

Alkali buffer capacity	89,63	76,20

Table 2 Physico-chemical parameters of oral fluid in patients with different stages of hypertension (in relation to patients without hypertension)

Our results showed a decrease in the pH of the unstimulated oral fluid in patients with abnormal blood pressure compared to subjects with normal blood pressure: by 5.63% (P ≥ 0.05) with borderline hypertension and stage I hypertension by 12.68% (P ≥ 0.05). Statistical analysis of the findings showed that viscosity and surface tension of the oral fluid were higher in the hypertensive patient groups. An increase in BP was associated with statistically higher values of the physical characteristics of the oral fluid studied. Thus in patients with borderline hypertension oral viscosity was increased by 13.63% (P ≥ 0.05) and surface tension by 12.24% (P ≥ 0.05); n1 in patients with arterial hypertension the corresponding changes were 35.10% (P ≤) and 21.17% (P ≤). This increase in viscosity and surface tension of unstimulated oral fluid is associated with poor salivary flow, impaired cleansing and homeostatic equilibrium of the oral cavity.

At the same time in patients with hypertension a decrease in the neutralization capacity of oral fluid to acids and alkalis, more significant in patients with advanced stage of hypertension. Thus, the decrease of acid neutralizing buffering capacity in patients with borderline hypertension was reduced by 14,58% (P ≥ 0,05) ; and of alkaline neutralizing capacity by 10,17% (P ≥ 0,05); in patients with hypertension the corresponding dynamics were 20,18% (P ≤) and 23,80% (P ≤).

Oral fluid is important for oral health, exhibiting numerous protective functions such as lubrication, antimicrobial activity, control of dental mineralisation potential and others. Changes in oral fluid parameters reflect a person's systemic pathology. Hyposalivation is a symptom of many diseases (kidney disease, hypertension and diabetes). Significant changes in saliva secretion and its composition are also observed in anxiety, depressive disorders, stress and other systemic diseases. In this regard, oral fluid examination is becoming increasingly popular as a diagnostic tool for the evaluation of physiological and pathological conditions due to the ease of collection, non-invasiveness and low cost.

RESULTS OF THE STUDY

We have shown that abnormalities in the physico-chemical parameters of oral fluid (decreased salivation rate, decreased pH, increased viscosity and surface tension and decreased acid and alkaline buffering capacity) and hypertension are interrelated. It is known that a decrease in the salivation rate of oral fluid pH is associated with changes in its physical and chemical properties, negatively affecting oral organs and tissues. Obtained results are consistent with the research

The American Journal of Medical Sciences and Pharmaceutical Research
(ISSN – 2689-1026)
Published: March 31, 2021 | **Pages:** 104-111
Doi: https://doi.org/10.37547/TAJMSPR/Volume03Issue03-15

IMPACT FACTOR
2021: 5. 64
OCLC - 1121105510

findings of many authors who have shown the effect of hypertension on saliva. Association of pathogenetic mechanisms of arterial hypertension development with disturbance of functional activity of salivary glands, registered by change of indices of stimulated and not stimulated oral liquid is proved. Generally, researchers agree that an increase in both systolic and diastolic BP can lead to a decrease in unstimulated saliva pH in the hypertensive stage I and prehypertensive groups was significantly lower than in the normal pressure group. The decrease in oral fluid pH in hypertension has been attributed to a higher sympathetic activity and a lower parasympathetic activity controlling salivary secretion and resulting in a lower salivary secretion rate. Bicarbonate (the most important oral buffer) is more effective at higher salivation rates, while at lower salivation rates its concentration decreases dramatically, leading to a decrease in pH and salivary buffering capacity. In general, bicarbonate concentration is low in all salivary glands and increases with increasing salivary secretion rate, lower salivary secretion leads to lower bicarbonate concentrations .

This agrees well with our findings of reduced oral fluid buffering capacity in patients with stage I hypertension and prehypertension.

The pH of the oral fluid is known to depend on oral fluid volume and secretion rate, with salivation rate and pH largely determining oral fluid chemistry and function. Reduced salivation rate in patients with high blood pressure results in lower pH and reduced buffer capacity. The buffer capacity of the oral fluid is involved in pH regulation, enamel mineral exchange and oral hygiene, which is important in preventing the progression of oral pathologies such as dental caries and periodontitis.

CONCLUSIONS

Thus, in patients with high arterial pressure disturbances of physico-chemical parameters of oral liquid are registered: decrease in salivation rate, decrease in pH level, increase in viscosity and surface tension and decrease in acid and alkali neutralisation buffer capacity. Prolonged disruption of salivary gland function can lead to impaired cleansing and moisturising properties, which can ultimately lead to colonisation of the oral cavity by both pathogenic and opportunistic microorganisms and initiate a severe course of oral pathology, including periodontal disease.

1. Hypertension reduces the functional activity of the salivary glands. Patients with hypertension should receive additional specialised dental care.
2. Salivary gland function indicators may be a potential biomarker of hypertension. However, further studies are needed to assess their diagnostic value in a larger group of patients

REFERENCES

1. Ameena Ryhan Diajil, Lamia Ibrahim Sood, Rasha Abbas Azeez A Salivary α-Amylase Level in Relation to the Oral Health Parameters among Children in Baghdad City // Journal of baghdad college of dentistry, 2016, Volume 28, Issue 2, pages 40-46
2. Akhmedov R.M., Mirkhojaev I.A., Khamdamov B.Z. Morphostructural changes in the liver in the elderly and old age // Conference proceedings. Journal of Problems of Biology and Medicine.-–2016.-№3,1(90).-C.18.56.

Published: March 31, 2021 | **Pages:** 104-111
Doi: https://doi.org/10.37547/TAJMSPR/Volume03Issue03-15

IMPACT FACTOR
2021: 5. 64
OCLC - 1121105510

3. Azimov M. I., Shomurodov K.E. A technique for Cleft Palate Repair. Journal of research in health science. Vol. 1, No. 2, 2018, pp. 56-59.
4. Bekzhanova O.E., Rizaev E.A. Unity of systemic pathogenetic mechanisms of development of somatic pathology and periodontal diseases // Medical Journal of Uzbekistan. 2019. №3. C. 85-88.
5. Fotina I.A. Comparative analysis of biochemical indicators of blood serum and saliva in healthy and diabetic patients:Avtoref. d.m., Nizhny-Novgorod, 2012. - 28c.
6. Fotina I.A. Informative changes in biochemical parameters of oral fluid and blood serum in type II diabetes // Bulletin of new medical technologies. - 2011. - №4. - C. 184-186
7. González J, Valls N., Brito R., RodrigoR. Essential hypertension and oxidative stress: New insights 2014 Jun 26;6(6):353-66. doi: 10.4330/wjc.v6.i6.353.
8. Kologrivova I. V., Koshelskaya O. A., Suslova T. E., Vinnitskaya I. V., Kravchenko E. S., Trubacheva O. A. Interrelation of inflammatory factors and metabolic parameters in obesity in patients with high and very high risk arterial hypertension // Russian Journal of Cardiology 2018; 23 (5): 27-33
9. Kumar J, Teoh SL, Das S and Mahakknaukrauh P (2017) Oxidative Stress in Oral Diseases: Understanding Its Relation with Other Systemic Diseases. Front. Physiol. 8:693. doi: 10.3389/fphys.2017.00693
10. Kamalova M. I., Islamov Sh. E., Khaydarov N.K.// MORPHOLOGICAL CHANGES IN BRAIN VESSELS IN ISCHEMIC STROKE. Journal of Biomedicine and Practice 2020, vol. 6, issue 5, pp.280-284
11. Khamdamov B.Z. Indicators of immunocitocine status in purulent-necrotic lesions of the lover extremities in patients with diabetes mellitus.//American Journal of Medicine and Medical Sciences, 2020 10 (7) 473-478 DOI: 10.5923/j.ajmm.2020.-1007.08
12. Madhloom B. N., Diajil A. R Oxidative Stress Status in Hypertensive Patients on Capoten Treatment International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Volume 7 Issue 2, February 2018 . – P 442 -450.
13. Madhloom B. N., Diajil A. R.Oxidative stress status in hypertensive patients on amlodipine treatment // J Bagh College Dentistry. – 2020. - Vol. 32(1). – P.1 -9.
14. Pogodina A. V., Valyavskaya O. V., Kolesnikova L.R., Rychkova L.V., Kolesnikov S. I. Arterial hypertension and periodontitis: key aspects of comorbidity. Arterial hypertension. 2019;25(6):682-692. doi:10.18705/1607-419X-2019-25-6-682-692
15. Prasanthi B, Kannan N, Patil RR. Effect of diuretics on salivary flow, composition and oral ealth status: A clinico-biochemical study. Ann Med Health Sci Res 2014;4(4):549-53.
16. Sazonova OV,Myakisheva YV,Borodina LM,Ginzburg MM,Gavrushin MM,Gorbachev DA,Frolova OV Diagnostic informativeness of oral fluid analysis to assess metabolic status in obese patients // Science and Innovation in Medicine. - 2018. - 3(11). - C.21 - 24.

Published: March 31, 2021 | **Pages:** 104-111
Doi: https://doi.org/10.37547/TAJMSPR/Volume03Issue03-15

IMPACT FACTOR
2021: 5. 64
OCLC - 1121105510

17. Skutnik-Radziszewska A., Maciejczyk M., Fejfer K., Krahel J., Flisiak I., Kołodziej U., Zalewska A. Salivary Antioxidants and Oxidative Stress in Psoriatic Patients: Can Salivary Total Oxidant Status and Oxidative Status Index Be a Plaque Psoriasis Biomarker? Oxid. Med. Cell. Longev. 2020;2020:9086024. doi: 10.1155/2020/9086024. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
18. Small H.,Y., Migliarino S., Czesnikiewicz-Guzik M., Guzik T. J. // Hypertension: Focus on autoimmunity and oxidative stress Free Radical Biology and MedicineVolume 125, September 2018, Pages 104-115
19. Shomurodov K.E., Comparative assessment of the influence of different methods of palatoplasty on the growth and development of the upper jaw in children with congenital cleft palate. European Science Review. – Vienna. Prague. – 2018. - №5-6. – P.7-11
20. Vernerová A., Krčmová L.K., Melichar B., Švec F. Non-invasive determination of uric acid in human saliva in the diagnosis of serious disorders Clin Chem Lab Med. Received October 15, 2020; accepted November 12, 2020; published online November 30, 2020 https://doi.org/10.1515/cclm-2020-1533