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ASSESSMENT OF BIOCHEMICAL PARAMETERS OF ORAL FLUID IN CHEMICAL INDUSTRY WORKERS

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ANNOTATION
Workers employed in chemical industries are continuously exposed to harmful occupational factors that may adversely affect oral tissues and alter the biochemical composition of oral fluid. Saliva serves as an important diagnostic medium reflecting local and systemic metabolic changes associated with occupational exposure.

Objective. To assess the biochemical parameters of oral fluid in chemical industry workers and determine their relationship with occupational factors and periodontal health status.

Materials and Methods. A comparative analysis of oral fluid biochemical indicators was performed among workers exposed to industrial chemical factors. The evaluated parameters included salivary pH, total protein concentration, calcium, phosphorus, alkaline phosphatase activity, and markers of oxidative stress. Clinical periodontal examination was carried out using standard dental indices.

Results. Long-term occupational exposure was associated with significant alterations in oral fluid composition. Workers demonstrated decreased salivary pH, increased total protein concentration, elevated alkaline phosphatase activity, and increased oxidative stress markers. The severity of biochemical changes correlated with the duration of occupational exposure and the degree of periodontal tissue involvement.

Conclusion. Biochemical analysis of oral fluid may serve as an informative non-invasive method for assessing the impact of occupational hazards on oral health. Changes in salivary biochemical parameters can be considered early indicators of periodontal tissue damage among chemical industry workers.

Keywords: oral fluid, saliva, biochemical markers, periodontal diseases, chemical industry, occupational exposure, oxidative stress.

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ANNOTATSIYA
Кимё саноати ходимлари турли зарарли ишлаб чиқариш омиллари таъсирида фаолият юритадилар. Бу омиллар оғиз бўшлиғи тўқималари ҳолатига ва оғиз суюқлигининг биокимёвий таркибига таъсир кўрсатиши мумкин. Кимё саноати ходимларида оғиз суюқлигининг биокимёвий кўрсаткичларини баҳолаш ва уларнинг пародонт тўқималари ҳолати билан боғлиқлигини аниқлаш.

Kalit so‘zlar: оғиз суюқлиги, биокимёвий маркерлар, пародонт касалликлари, кимё саноати, оксидловчи стресс.

АННОТАЦИЯ
Работники химической промышленности подвергаются воздействию комплекса вредных производственных факторов, способных вызывать изменения в тканях полости рта и составе ротовой жидкости. Слюна является важной диагностической средой, отражающей метаболические процессы в организме и состояние тканей пародонта.

Оценить биохимические показатели ротовой жидкости у работников химической промышленности и определить их взаимосвязь с состоянием тканей пародонта.

Ключевые слова: ротовая жидкость, биохимические показатели, заболевания пародонта, химическая промышленность, профессиональные вредности, оксидативный стресс.

INTRODUCTION

Occupational health remains one of the priority areas of modern medicine due to the growing impact of industrial factors on the health status of workers. Chemical industry enterprises are characterized by the presence of numerous harmful occupational exposures, including toxic gases, chemical aerosols, organic solvents, acids, alkalis, heavy metals, and industrial dust. Long-term exposure to these factors may contribute to systemic metabolic disturbances and pathological changes in the oral cavity.

The oral cavity is one of the first anatomical structures exposed to environmental and occupational hazards. Saliva plays a crucial role in maintaining oral homeostasis by participating in remineralization processes, antimicrobial protection, buffering activity, and local immune defense. Changes in the biochemical composition of oral fluid can reflect both local inflammatory processes and systemic disorders induced by occupational exposure.

Recent studies indicate that workers employed in hazardous industries demonstrate a higher prevalence of periodontal diseases compared with the general population. The development of periodontal pathology is associated with disturbances in mineral metabolism, oxidative stress, inflammatory reactions, and impaired local immunity. Therefore, the investigation of biochemical parameters of oral fluid represents an important approach for the early diagnosis and prevention of oral diseases among industrial workers.

The assessment of salivary biomarkers provides a non-invasive, informative, and cost-effective

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method for monitoring oral health. Despite numerous studies dedicated to occupational pathology, data regarding biochemical changes in oral fluid among chemical industry workers remain limited and require further investigation.

AIM OF THE STUDY

To evaluate the biochemical parameters of oral fluid in chemical industry workers and determine their relationship with occupational exposure and periodontal health status.

MATERIALS AND METHODS

The study included 120 workers employed at chemical industry enterprises and 40 individuals without occupational exposure to harmful industrial factors who served as the control group.

The examined workers were divided into three groups according to the duration of occupational exposure:

Group I – work experience up to 5 years (n = 40);
Group II – work experience from 5 to 10 years (n = 40);
Group III – work experience more than 10 years (n = 40).

All participants underwent a comprehensive dental examination. Oral hygiene status was assessed using the Simplified Oral Hygiene Index (OHI-S). The periodontal condition was evaluated using the Community Periodontal Index (CPI) and Papillary-Marginal-Alveolar Index (PMA).

Samples of unstimulated mixed saliva were collected in the morning on an empty stomach. The following biochemical parameters were analyzed:

Salivary pH;
Total protein concentration;
Calcium concentration;
Inorganic phosphorus concentration;
Alkaline phosphatase activity;
Malondialdehyde (MDA) level as a marker of lipid peroxidation;
Catalase activity as an indicator of antioxidant defense.

Statistical analysis was performed using standard biomedical statistical methods. Differences were considered statistically significant at $p < 0.05$.

RESULTS

The obtained results demonstrated significant alterations in oral fluid composition among chemical industry workers compared with the control group.

The average salivary pH in the control group was 7.02 ± 0.12, whereas workers with occupational exposure exhibited progressively lower values. Group I showed a pH of 6.85 ± 0.11, Group II – 6.67 ± 0.09, and Group III – 6.41 ± 0.08.

Total protein concentration in oral fluid increased proportionally with the duration of employment. Workers with more than ten years of occupational exposure demonstrated the highest values, exceeding control levels by approximately 35%.

A significant reduction in calcium concentration was observed among exposed workers.

Simultaneously, alkaline phosphatase activity increased, indicating enhanced bone metabolism and periodontal tissue destruction.

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Oxidative stress markers revealed pronounced metabolic disturbances. The concentration of malondialdehyde increased significantly in all exposed groups, particularly among workers with more than ten years of employment. Catalase activity showed a compensatory increase during the early stages of exposure but decreased in long-term workers, suggesting depletion of antioxidant defense mechanisms.

Periodontal examination demonstrated a higher prevalence of gingival inflammation and chronic generalized periodontitis among exposed workers. The severity of periodontal disease increased with occupational experience.

Correlation analysis revealed significant associations between biochemical indicators and periodontal status. Increased alkaline phosphatase activity and elevated malondialdehyde levels positively correlated with CPI and PMA scores.

DISCUSSION

The findings of the present study confirm that occupational exposure in chemical industries significantly affects the biochemical composition of oral fluid. Saliva reflects both local and systemic responses to harmful industrial factors and may serve as an informative diagnostic medium.

The reduction in salivary pH observed among exposed workers may be attributed to the influence of acidic industrial aerosols and metabolic disturbances. Acidification of the oral environment promotes enamel demineralization, microbial growth, and periodontal inflammation.

Elevated total protein concentration likely reflects increased permeability of blood vessels and enhanced inflammatory activity within periodontal tissues. Similar findings have been reported in studies investigating occupationally induced oral pathology.

The observed decrease in calcium levels may contribute to impaired mineralization processes and increased susceptibility of periodontal tissues to destructive changes. Enhanced alkaline phosphatase activity is considered an indicator of active bone remodeling and alveolar bone resorption.

Oxidative stress appears to play a central role in the pathogenesis of periodontal diseases among chemical industry workers. Increased production of reactive oxygen species may induce cellular damage, stimulate inflammatory mediator release, and accelerate periodontal tissue destruction.

The relationship between occupational experience and biochemical disturbances indicates a cumulative effect of industrial hazards. Workers with prolonged exposure exhibited the most pronounced metabolic and periodontal alterations, suggesting that duration of employment is an important risk factor for oral disease development.

Reular monitoring of oral fluid biomarkers may facilitate early diagnosis of pathological changes before the appearance of severe clinical manifestations. Such an approach could improve preventive strategies and reduce the burden of periodontal diseases among industrial workers.

CONCLUSION

Chemical industry workers demonstrate significant alterations in the biochemical composition of oral fluid compared with non-exposed individuals.

Occupational exposure is associated with decreased salivary pH, increased total protein concentration, elevated alkaline phosphatase activity, and activation of oxidative stress processes.

The severity of biochemical disturbances increases with the duration of employment in hazardous industrial environments.

Significant correlations exist between oral fluid biochemical parameters and clinical indicators of periodontal disease.

REFERENCES

HSR (LONDON),
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1. Biochemical analysis of oral fluid may serve as an effective non-invasive method for early detection and monitoring of occupationally induced periodontal pathology.
Newman M.G., Takei H.H., Klokkevold P.R., Carranza F.A. Carranza's Clinical Periodontology. 14th ed. Elsevier; 2023.

2. Lindhe J., Lang N.P. Clinical Periodontology and Implant Dentistry. 7th ed. Wiley-Blackwell; 2022.
Slots J. Periodontitis: Facts, fallacies and the future. Periodontology 2000. 2022;90(1):7-23.
Tonetti M.S., Greenwell H., Kornman K.S. Staging and grading of periodontitis. Journal of Periodontology. 2018;89(S1):159-172.
3. Kinane D.F., Stathopoulou P.G., Papapanou P.N. Periodontal diseases. Nature Reviews Disease Primers. 2017;3:17038.
4. Chapple I.L.C., Mealey B.L., Van Dyke T.E. Periodontal health and gingival diseases and conditions. Journal of Clinical Periodontology. 2018;45(S20):S68-S77.
Petersen P.E., Ogawa H. Strengthening the prevention of periodontal disease. Community Dentistry and Oral Epidemiology. 2020;48(1):1-5.
8.Nazir M.A. Prevalence of periodontal disease and its association with systemic diseases. International Journal of Health Sciences. 2021;15(2):72-80.
5. Tóthová L., Kamodyová N., Červenka T., Celec P. Salivary markers of oxidative stress. Clinical Oral Investigations. 2015;19(4):789-796
6. Zhang Y., Sun J., Lin C.C. Salivary biomarkers for diagnosis of periodontal diseases. International Journal of Molecular Sciences. 2021;22(14):7309.
Humphrey S.P., Williamson R.T. A review of saliva: Normal composition and functions. Journal of Prosthetic Dentistry. 2001;85(2):162-169.
Kaufman E., Lamster I.B. The diagnostic applications of saliva. Critical Reviews in Oral Biology and Medicine. 2020;13(2):197-212.
7. Nazarova N.S., Khatamova M.A., Shukurov Sh.Sh. Occupational factors and periodontal health among industrial workers. Journal of Oral Medicine and Craniofacial Research. 2024;4(2):45-51.
8. Khatamova M.A., Nazarova N.S. Biochemical aspects of periodontal diseases in industrial workers. Central Asian Medical Journal. 2025;2(1):31-38.
Battino M., Ferreiro M.S., Gallardo I. The antioxidant capacity of saliva.
9. Journal of Clinical Periodontology. 2019;46(3):315-322.