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Description of Parodont Diseases in Law Enforcement Officers

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Abstract: Parodont (periodontal) diseases are characterized by a wide range of clinical manifestations and frequent coexistence with other systemic conditions, making them a significant medical and social problem. This study aimed to describe the clinical, hygienic, and microbiological characteristics of parodont disease among law enforcement officers using clinical-dental, microbiological, and statistical methods. Subjective and objective dental examinations were carried out among personnel applying for treatment at the dental polyclinic of the Ministry of Internal Affairs, and microbiological analysis of oral fluid and periodontal-pocket exudate was performed using standardized culture-based identification. The examined population comprised 122 patients (32 men aged 18–30, 56 men aged 31–44, 13 women aged 18–30, and 21 women aged 31–44) who met inclusion criteria and provided written consent. All patients (100% of cases) exhibited clinical-symptomatic complaints characteristic of gingivitis, and the KPO caries index averaged 17.94±0.23. Culture-based microbiological analysis identified pigment-forming periodontopathogens of the "red complex" — Porphyromonas gingivalis (65% of cases) and Tannerella forsythia (78% of cases) — alongside Fusobacterium nucleatum, Prevotella intermedia, and Candida species. Quantitative analysis confirmed elevated titers of cariogenic and periodontopathogenic microorganisms, including B. gingivalis (7.29±0.28 log CFU/ml) and S. epidermidis (6.6±0.37 log CFU/ml). These findings indicate a substantial microbiological basis for dysbiotic shifts underlying parodont inflammation in this occupational population and underscore the need for continuous monitoring and supportive periodontal care rather than one-time therapy alone.

Keywords: parodont disease; gingivitis; oral microbiota; red complex; law enforcement officers; culture identification; KPO index

1. Introduction

The prevalence of parodont diseases is characterized by a wide range of clinical manifestations and by frequent combination with other diseases of the body, making the problem a common medical and social concern. Pathological processes in the tissues of the oral cavity can become foci of chronic infection and, through disruption of gingival function, contribute to deterioration in the functioning of internal organs and exacerbation of chronic systemic disease. Parodont diseases therefore have not only local but also systemic effects: clinical evidence links parodont disease to metabolic and inflammatory processes in the body, including elevated blood glucose consistent with an association with diabetes mellitus, as well as changes in cholesterol and vitamin D levels consistent with an association with cardiovascular disease and metabolic disorders [1], [2].

Standardized diagnostic and classification frameworks for periodontal and peri-implant diseases and conditions have been developed to unify case definitions across clinical and research settings [3]. At the microbiological level, subgingival bacterial species organize into characteristic complexes that differ between periodontal health and disease, with certain pigmented anaerobic species — collectively termed the "red complex" — showing the strongest association with periodontal destruction [4]; low-abundance species within such complexes can act as keystone pathogens capable of remodeling a normally benign microbiota into a dysbiotic, disease-associated community [5].

Evidence from longitudinal studies of oral microbiota following periodontal treatment indicates that individual patient characteristics significantly influence microbial recovery: pathogenic species, including members of the red complex, typically decrease after therapy while beneficial bacteria increase, confirming the microbiological effectiveness of periodontal treatment; however, the microflora has been observed to partially regenerate over time, indicating a risk of disease recurrence and underscoring that a single course of therapy is insufficient without continuous monitoring and supportive care [6].

The prevention of gingivitis constitutes the primary stage in the prevention of parodont disease, and for this reason gingivitis prevention is one of the important areas of dentistry. In preventing the development of gingivitis, the focus is on oral hygiene: regular removal of the pellicle that forms on the tooth surface prevents the inflammatory process, and patients are therefore taught correct dental-cleaning technique and provided individual hygiene recommendations. Occupational populations subject to chronic psychological and physical stress, including law enforcement personnel, have been shown to exhibit poorer periodontal status than the general population, underscoring the relevance of systematic description of parodont disease within this occupational group [7].

The purpose of this study was to assess the effect of occupational conditions among law enforcement officers on inflammatory processes of parodont tissue, using clinical-dental, microbiological, and statistical methods to characterize the clinical presentation, hygienic status, and oral microbial composition of this population before and after treatment.

2. Methods

2.1 Study Population

Subjective and objective examinations were carried out among 112 personnel aged 18–44 who applied for treatment at the dental polyclinic of the Ministry of Internal Affairs. The statistical and microbiological analysis was subsequently carried out with the participation of 122 patients who met the inclusion criteria and provided written consent; of these, 32 were men aged 18–30, 56 were men aged 31–44, 13 were women aged 18–30, and 21 were women aged 31–44. Gender distribution was examined in relation to disease spread, consistent with reported sex-related differences in periodontal disease severity and susceptibility [8].

2.2 Subjective and Objective Examination

During interrogation, attention was paid to taste disorders, dry mouth, unpleasant taste in the mouth, and salivary detachment, and complaints regarding the oral mucosa, teeth, and jaws were recorded. Objective examination of the teeth assessed color, staining, the presence of cracked or broken teeth, increased or decreased sensitivity, and tremor. Examination of the oral organs and tissues proceeded in sequence through the tooth row, bite, parodont status, and the presence and condition of dental fillings and prostheses. Clinical-instrumental assessment used indices to objectify dental-health status quantitatively and qualitatively, with recording of gingival and plaque findings following standardized criteria [9] and caries intensity calculated according to the KPO index following WHO methodology for oral health surveys [10].

2.3 Microbiological Sampling

Microbiological analyses were carried out on oral fluid and extracts from gum pockets at the bacteriological laboratory of the Ministry of Internal Affairs. During biomaterial collection, the following requirements were strictly observed: rinsing of the oral cavity with medication was not allowed; patients did not brush their teeth before sampling; biomaterial was taken at least 2 hours after eating; and collected material was delivered to the bacteriological laboratory within 30 minutes. Saliva samples were collected by the spitting method into a sterile test tube in a volume of 1 ml; sediment from tooth-gum pockets was collected using a sterile cotton swab and placed into a sterile test tube containing 1 ml of saline solution.

2.4 Culture and Identification

Collected biomaterial was examined by planting on artificial nutrient media according to the Gold method. For cultural analysis, 0.1 ml of saliva, 0.1 ml of the physiological-solution mixture, and material from the gum pocket were placed on the nutrient medium and evenly distributed over sterile agar Petri dishes using a pipette. Plates were incubated under thermostat conditions at 37 °C, and resulting colonies were identified to species level. Blood agar was used for identification of oral microflora, Saburo (Sabouraud) medium for fungi of the genus Candida, and selective media for Enterobacteria; additional media from HiMedia (India) were used for identification and differentiation of other microorganism types as required. Further identification and differentiation followed Bergey's Manual of Determinative Bacteriology [11].

Colony morphology was used to distinguish bacterial groups: coagulase-positive staphylococci (S. aureus) and coagulase-negative staphylococci (S. epidermidis, S. saprophyticus) were assessed by colony characteristics, while Micrococcus colonies were distinguished by yellow or pink coloration. S. aureus and S. epidermidis strains demonstrated hemolytic activity, evident as hemolysis rings around colonies, whereas no such activity was observed for micrococcal species. β-hemolytic streptococci exhibited mucoid, rough, or smooth and shiny colony morphology with transparent lysis rings a few millimeters in diameter, while α-hemolytic streptococci produced a bluish, translucent hemolysis zone. Neisseria strains typically formed round, shiny, yellow-colored colonies, and Acinetobacter formed relatively large, white, shiny colonies with a small hemolysis ring. Corynebacterium colonies were small, round, and opaque with a dense-creamy structure and pigmentation ranging from light yellowish to dark-yellowish or brown, without hemolytic activity. Candida colonies were high, cream-like, shiny, and flat, appearing initially white and fading over time — morphological features characteristic of these fungi and consistent with their recognized role as opportunistic oral colonizers that can shift from commensal to pathogenic status in periodontal pockets [12].

2.5 Statistical Analysis

Research materials were subjected to statistical processing using parametric and non-parametric analysis methods. Initial data collection, correction, systematization, and visualization were carried out in Microsoft Office Excel 2016; statistical analysis was implemented using IBM SPSS Statistics v.26.

3. Results

3.1 Demographic Distribution

Of the 122 patients examined, 32 were men aged 18–30, 56 were men aged 31–44, 13 were women aged 18–30, and 21 were women aged 31–44, indicating a predominance of men, particularly within the 31–44 age group.

3.2 Clinical and Anamnestic Findings

Clinical-anamnestic surveys identified complaints associated with changes in parodont tissue. Tooth pain was reported by 5.74% of patients (n=7), and tooth sensitivity by 12.29% (n=15). Halitosis was noted in 6.56% (n=8) of patients; many had become so accustomed to the odor that they no longer perceived it themselves, and none associated it with unsatisfactory oral hygiene, instead attributing it to a possible sign of gastritis — a pattern consistent with the established role of bacterially generated volatile sulfur compounds as the principal cause of oral malodor in gingivitis and periodontitis [13]. A sensation of aching and itching in the gums was reported by 36.88% of patients (n=45), and oral dryness by 9.84% (n=12).

Food impaction between teeth was reported by 25.41% of patients (n=31), tooth mobility by 1.64% (n=2), and inefficient chewing by 3.28% (n=4). Complaints regarding dental-row condition and aesthetic defects were reported by 9.84% (n=12). Overall, all patients (100% of cases) exhibited clinical-symptomatic complaints characteristic of gingivitis. While no clear differences in the prevalence of dental disease were identified between patients, differences in severity were significant, with inflammatory disease of parodont tissue present in 100% of cases.

3.3 Caries and Hygienic Indices

The KPO index, reflecting caries intensity, was 17.94±0.23. Of its components, the “O” (missing/removed teeth) indicator averaged 5.21±0.12, teeth affected by active caries averaged 3.32±0.07, and the “P” (filled) indicator averaged 9.41±0.17 teeth.

3.4 Oral Microbiota Composition

Microbiological examination of mixed saliva samples identified fungi of the genus Candida, along with periodontopathogenic species Tannerella forsythia and Fusobacterium nucleatum. Microbial associations involving pigment-forming periodontopathogens Prevotella intermedia and Porphyromonas gingivalis were also identified, together with α-hemolytic streptococci, Enterococcus faecalis, and Haemophilus influenzae. Porphyromonas gingivalis was identified in 65% of cases, and Tannerella forsythia in 78% of patients, indicating that anaerobic periodontopathogens of the “red complex” were common within the study group. Metabolic activity of these anaerobic species generates volatile sulfur-retaining compounds, including methanethiol, hydrogen sulfide, and dimethyl sulfide.

Patients with clinically observed inflammation in parodont tissues exhibited significantly greater microflora diversity in tooth-gum pockets than healthy individuals with no detected parodont changes. Material from the tooth-gum pocket contained anaerobic microflora V. parvula, L. salivarius, B. dentium, P. niger, and B. gingivalis; this microflora is present in most normal human oral flora but increases at foci of inflammation and in association with pathological and prepathological processes. In research groups, gram-negative anaerobic conditionally pathogenic spore-forming periodontopathogenic species (L. buccalis, F. nucleatum, and Fusobacterium spp.) were identified, along with pathogenic aerobes (S. aureus, S. epidermidis, S. mutans, Neisseria spp.) and aerobic/facultative-anaerobic gram-positive non-spore-forming rods (C. xerosis and C. pseudodiphtericum).

Quantitative analysis showed dominance of streptococcal and staphylococcal species: S. mutans 3.34±0.18 log CFU/ml, S. epidermidis 6.6±0.37 log CFU/ml, and S. aureus 6.02±0.24 log CFU/ml, indicating a high level of colonization by conditionally pathogenic coccal flora. Corynebacterium species were also identified at high titers — C. xerosis at 6.54±0.32 log CFU/ml and C. pseudodiphtericum at 5.37±0.21 log CFU/ml — reflecting active participation of resident flora in oral microbiocenosis. Microorganisms of periodontopathogenic significance were detected at high titers:

Neisseria spp. 5.63±0.17, Fusobacterium spp. 4.98±0.24, F. nucleatum 5.27±0.28, B. dentium 5.84±0.31, and B. gingivalis 7.29±0.28 log CFU/ml.

4. Discussion

The findings of this study confirm that parodont disease is highly prevalent among law enforcement officers, with all examined patients (100%) presenting clinical-symptomatic complaints characteristic of gingivitis and with substantial microbiological evidence of dysbiosis. The high detection rates of Porphyromonas gingivalis (65%) and Tannerella forsythia (78%), together with elevated titers of Fusobacterium nucleatum and other periodontopathogenic species, are consistent with the established role of red-complex organisms as central drivers of periodontal tissue destruction, and support a keystone-pathogen model in which low-abundance but highly virulent species can disproportionately remodel the oral microbial community toward a disease-associated state.

The co-detection of Candida species alongside these bacterial periodontopathogens is noteworthy: although Candida is a normal commensal of the oral cavity, cross-kingdom interactions between Candida and periodontopathogenic bacteria such as P. gingivalis have been reported to influence biofilm virulence, and systematic evidence suggests a modest but consistent association between Candida colonization and chronic periodontitis. This raises the possibility that fungal-bacterial interactions contribute, alongside bacterial dysbiosis, to the inflammatory burden observed in this population, though the magnitude of this contribution requires further targeted investigation.

The demographic distribution of the study population, with men outnumbering women overall and particularly within the 31–44 age group, is consistent with broader epidemiological evidence of greater periodontal disease susceptibility and severity among men, which has been attributed to a combination of biological, behavioral, and oral-hygiene factors rather than any single determinant. The occupational context of law enforcement service, characterized by irregular routines and elevated psychological stress, may compound this susceptibility, reinforcing the case for targeted preventive dental programs within this workforce.

The observed link between parodont disease and systemic biomarkers — elevated glucose, altered cholesterol, and altered vitamin D — together with the tendency of periodontopathogenic microflora to partially regenerate after treatment, underscores that periodontal care in this population cannot rely on one-time therapy alone. Consistent with contemporary treatment guidelines that emphasize a stepwise approach incorporating supportive periodontal care following active therapy, continuous monitoring and maintenance appear necessary to prevent relapse of dysbiotic microbial communities [14]. Advances in salivary and microbiome-based diagnostics may, in the future, allow earlier and more precise identification of patients at risk of recurrence, complementing the culture-based methods used in this study [15].

This study has limitations, including its cross-sectional design for the microbiological comparison, reliance on culture-based identification rather than molecular sequencing, and the absence of long-term follow-up to confirm the durability of post-treatment microbial changes. Future research should incorporate longitudinal follow-up and molecular microbiome profiling to validate and extend these findings.

5. Conclusion

This study demonstrates a high level of colonization by conditionally pathogenic coccal flora and by periodontopathogenic species of the “red complex” in the oral cavity of law enforcement officers, alongside active participation of resident Corynebacterium flora in oral microbiocenosis. Neisseria spp., Fusobacterium spp., F. nucleatum, B. dentium, and B. gingivalis were detected in high titers, indicating

a substantial microbiological basis for dysbiotic shifts and inflammatory processes in the periodontal pockets of this population. Together with the clinical finding that inflammatory parodont disease was present in 100% of cases, these results confirm that parodont disease in this occupational group is closely linked to both microbiological dysbiosis and systemic metabolic and inflammatory processes, supporting the case for continuous monitoring and supportive periodontal care rather than isolated, one-time treatment.

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