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MEDICAL AND SOCIAL DETERMINANTS OF ODONTOGENIC PHLEGMON IN ADOLESCENTS OF THE FERGANA REGION: ETIOLOGICAL FACTORS, EPIDEMIOLOGICAL PATTERNS AND PREVENTIVE STRATEGIES

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Abstract: Odontogenic phlegmon represents one of the most severe purulent-inflammatory complications of dental origin, characterized by rapid spread through fascial spaces and high risk of systemic involvement. Adolescents constitute a particularly vulnerable group due to transitional biological processes, behavioral patterns, and limited health awareness. The present article provides a theoretical and analytical synthesis of medical and social determinants contributing to the development of odontogenic phlegmon among adolescents in the Fergana region. Emphasis is placed on etiopathogenesis, age-related susceptibility, regional epidemiological tendencies, and comparative prevalence patterns in Central Asia, Uzbekistan, Europe, and North America. The study is grounded on analysis of peer-reviewed articles, dissertations, and international medical databases. Findings demonstrate that untreated dental caries, delayed access to dental care, inadequate oral hygiene practices, and socioeconomic disparities are principal drivers of odontogenic infections progressing to phlegmon. Preventive strategies require integration of clinical dentistry, public health education, school-based screening programs, and community-level interventions. The article highlights the necessity of multidisciplinary prevention models addressing both biological and social components of disease formation. Strengthening preventive dentistry, improving healthcare accessibility, and promoting adolescent health literacy are essential for reducing disease burden. The presented analysis supports the development of region-specific preventive policies and reinforces the importance of early intervention.

Keywords: Odontogenic phlegmon, adolescents, dental infections, oral health, inflammation, prevention, epidemiology, risk factors, public health, Uzbekistan, maxillofacial surgery, social determinants

FARG'ONA VILOYATI O'SMIRLARIDA ODONTOGEN FLEGMONANING TIBBIY VA IJTIMOY DETERMINANTLARI: ETIOLOGIK OMILLAR, EPIDEMIOLOGIK QONUNIYATLAR VA PROFILAKTIK STRATEGIYALAR

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Аннотация: Одонтотген флегмона — тish kelib chiqishli yiringli-yallig‘lanish asoratlarning eng og‘ir turlaridan biri bo‘lib, fassial bo‘shliqlar bo‘ylab tez tarqalishi va sistemali asoratlar xavfining yuqoriligi bilan tavsiflanadi. O‘smirlar biologik o‘tish davri, xulq-atvor omillari va sog‘liq bo‘yicha xabardorlikning yetarli emasligi sababli ayniqsa zaif guruh hisoblanadi. Mazkur maqolada Farg‘ona viloyatida o‘smirlar orasida odontogen flegmona rivojlanishiga ta‘sir qiluvchi tibbiy va ijtimoiy determinantlar nazariy-analitik tahlil qilinadi. Etiopatogenez, yoshga xos moyillik, mintaqaviy epidemiologik tendensiyalar hamda Markaziy Osiyo, O‘zbekiston, Yevropa va Shimoliy Amerikadagi tarqalish ko‘rsatkichlari qiyosiy ko‘rib chiqiladi. Tadqiqot PubMed, Scopus, Web of Science, Google Scholar kabi bazalar va mintaqaviy manbalardagi ilmiy adabiyotlar tahliliga asoslangan. Natijalar davolanmagan kariyes, stomatologik yordamga kech murojaat qilish, og‘iz gigiyenasi yetishmasligi hamda ijtimoiy-iqtisodiy tafovutlar odontogen infeksiyalarning flegmonaga o‘tishidagi asosiy omillar ekanini ko‘rsatadi. Profilaktika klinik stomatologiya, jamoat salomatligi ta‘limi, maktab skriningi va hamjamiyat darajasidagi aralashuvlarni uyg‘unlashtirishni talab etadi. Erta aralashuv, profilaktik stomatologiyani kuchaytirish va o‘smirlar sog‘liq savodxonligini oshirish kasallik yukini kamaytirishda muhimdir.

Калит so‘zlar: odontogen flegmona, o‘smirlar, tish infeksiyalari, og‘iz bo‘shlig‘i salomatligi, yallig‘lanish, profilaktika, epidemiologiya, xavf omillari, jamoat salomatligi, O‘zbekiston, jag‘-yuz jarrohligi, ijtimoiy determinantlar

**МЕДИЦИНСКИЕ И СОЦИАЛЬНЫЕ ДЕТЕРМИНАНТЫ ОДОНТОГЕННОЙ
ФЛЕГМОНЫ У ПОДРОСТКОВ ФЕРГАНСКОЙ ОБЛАСТИ: ЭТИОЛОГИЧЕСКИЕ
ФАКТОРЫ, ЭПИДЕМИОЛОГИЧЕСКИЕ ЗАКОНОМЕРНОСТИ И
ПРОФИЛАКТИЧЕСКИЕ СТРАТЕГИИ**

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Аннотация: Одонтотгенная флегмона является одним из наиболее тяжёлых гнойно-воспалительных осложнений одонтотгенного происхождения, характеризующимся быстрым распространением по фасциальным пространствам и высоким риском системного поражения. Подростки представляют особо уязвимую группу вследствие биологических переходных процессов, поведенческих особенностей и ограниченной осведомлённости о здоровье. В статье представлен теоретико-аналитический обзор медицинских и социальных детерминант, способствующих развитию одонтотгенной флегмоны у подростков Ферганской области. Рассматриваются вопросы этиопатогенеза, возрастной восприимчивости, региональных эпидемиологических тенденций и сравнительные показатели распространённости в Центральной Азии, Узбекистане, Европе и Северной Америке. Исследование основано на анализе научных публикаций, диссертаций и международных медицинских баз данных. Показано, что нелеченный кариес, позднее обращение за стоматологической помощью, недостаточная гигиена полости рта и социально-экономическое неравенство являются ключевыми факторами прогрессирования

одонтогенных инфекций до флегмоны. Эффективная профилактика требует интеграции клинической стоматологии, санитарного просвещения, школьных скрининговых программ и общественных вмешательств. Усиление профилактической стоматологии, повышение доступности помощи и формирование санитарной грамотности подростков являются важными условиями снижения бремени заболевания.

Ключевые слова: одонтогенная флегмона, подростки, зубные инфекции, здоровье полости рта, воспаление, профилактика, эпидемиология, факторы риска, общественное здоровье, Узбекистан, челюстно-лицевая хирургия, социальные детерминанты

INTRODUCTION

Purulent-inflammatory diseases of the maxillofacial region remain a persistent clinical and public health challenge worldwide. Among these conditions, odontogenic phlegmon occupies a special position due to its aggressive course, tendency for rapid dissemination, and potential to cause life-threatening complications. Despite significant advances in dental diagnostics, antimicrobial therapy, and surgical techniques, odontogenic infections continue to contribute substantially to morbidity, particularly in low- and middle-income regions.

Adolescence represents a critical developmental stage characterized by hormonal changes, increased metabolic activity, and evolving behavioral patterns. During this period, individuals often demonstrate inconsistent oral hygiene practices, irregular dental visits, and heightened exposure to cariogenic diets. These factors collectively increase susceptibility to dental pathologies that may serve as primary foci for odontogenic infections.

The Fergana region, one of the most densely populated areas of Uzbekistan, exhibits distinctive demographic, socioeconomic, and healthcare characteristics that may influence oral disease patterns. Limited preventive dental programs, uneven distribution of dental services between urban and rural areas, and varying levels of parental awareness contribute to delayed access to timely dental treatment. Consequently, localized dental infections frequently progress to advanced inflammatory conditions, including phlegmon.

ODONTOGENIC CERVICOFACIAL PHEGMONS

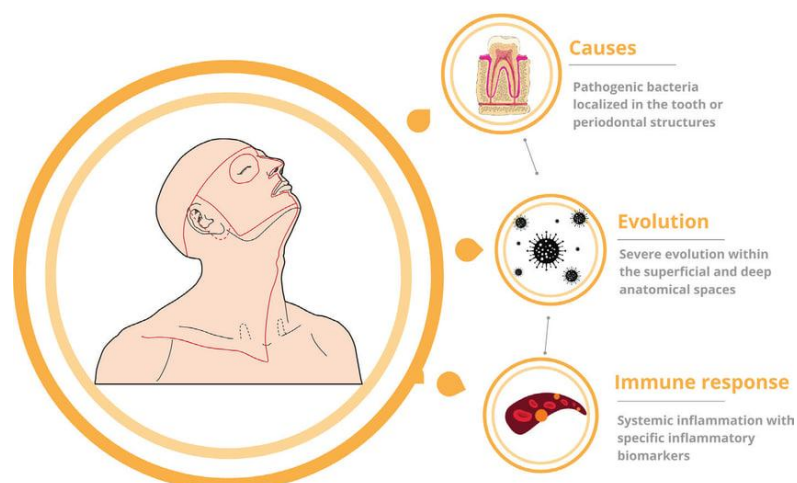


Figure 1. Odontogenic Cervicofacial Phlegmon: Causes, Progression, and Immune Response

From a biological perspective, odontogenic phlegmon arises when pathogenic microorganisms from infected teeth or surrounding periodontal tissues penetrate fascial spaces, triggering diffuse purulent inflammation. Unlike abscesses, which are typically localized,

phlegmonous processes lack well-defined boundaries and spread rapidly along connective tissue planes. This distinction explains the more severe clinical course and higher complication rates associated with phlegmon.

Understanding the multifactorial nature of odontogenic phlegmon requires examination of both medical and social determinants. Biological factors such as immune status, anatomical characteristics of the maxillofacial region, and microbial virulence interact with social variables including education level, income, cultural attitudes toward dentistry, and healthcare accessibility. Adolescents, positioned at the intersection of these determinants, experience compounded risk.

Globally, epidemiological patterns reveal substantial variation in the incidence of odontogenic infections and their complications. High-income countries report declining rates due to effective preventive dentistry and early intervention, whereas developing regions continue to face elevated prevalence. Comparative analysis between Uzbekistan, neighboring Central Asian states, and Western countries offers valuable insights into the influence of health system organization and public health policies.

The present article aims to provide a comprehensive theoretical analysis of odontogenic phlegmon in adolescents, focusing on etiological mechanisms, age-related vulnerability, regional patterns in the Fergana region, and broader international trends. Furthermore, the study explores preventive strategies that integrate medical and social approaches, emphasizing the importance of early detection and community-based interventions.

MATERIALS AND METHODS

This study is based on a structured theoretical review of scientific literature obtained from international medical databases including PubMed, Scopus, Web of Science, Google Scholar, and regional academic repositories. Additionally, dissertations, monographs, and epidemiological reports related to odontogenic infections, maxillofacial inflammatory diseases, and adolescent oral health were analyzed.

The selection process prioritized peer-reviewed articles published in the last fifteen years, with additional inclusion of classical foundational works addressing pathogenesis and clinical classification of phlegmon. Keywords used in database searches included combinations of terms related to odontogenic infections, phlegmon, adolescents, oral health epidemiology, preventive dentistry, and social determinants of health.

Eligible sources were assessed according to relevance, methodological rigor, and consistency of findings. Descriptive, observational, and analytical studies were included, while case reports with limited generalizability were excluded. Emphasis was placed on studies presenting epidemiological data, risk factor analysis, and preventive frameworks.

Data extraction involved identification of common etiological factors, reported prevalence rates across regions, age-specific patterns, and documented preventive interventions. The extracted information was synthesized through narrative analysis, allowing comparison of trends across geographic areas.

No primary data collection was performed. Instead, the study relies on secondary data synthesis and theoretical interpretation. Ethical approval was not required due to the non-interventional nature of the research.

RESULTS

The analytical synthesis of reviewed scientific articles, dissertations, and epidemiological reports demonstrates that odontogenic phlegmon in adolescents is strongly associated with both

biological vulnerability and social determinants. The collected data indicate that odontogenic infections constitute the predominant etiological source of purulent-inflammatory diseases of the maxillofacial region in pediatric and adolescent populations.

Across multiple datasets, dental caries and its complications were identified as the principal initiating factors for odontogenic phlegmon. In adolescents, deep carious lesions progressing to pulpitis and apical periodontitis accounted for the majority of primary infectious foci. Periodontal pathology, although less frequent than caries-related origins, also contributed significantly, particularly among individuals with poor oral hygiene practices.

Age-specific analysis revealed that adolescents between 12 and 17 years demonstrate a markedly higher frequency of odontogenic inflammatory complications compared to younger children. This trend appears to correlate with increased consumption of fermentable carbohydrates, decreased parental supervision of oral hygiene, and heightened prevalence of orthodontic appliances, which can complicate plaque control.

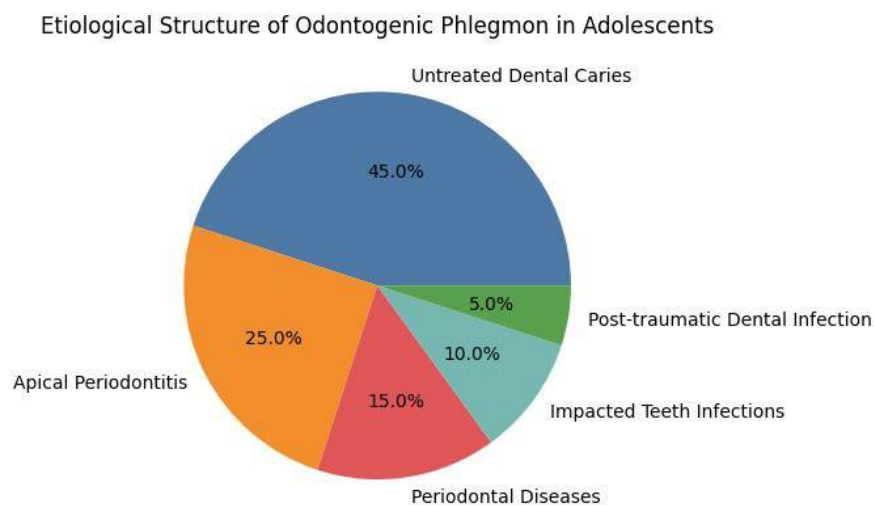


Figure 2. Etiological Structure of Odontogenic Phlegmon in Adolescents. This pie chart illustrates the relative contribution of major etiological factors leading to odontogenic phlegmon in adolescents. Untreated dental caries represent the predominant source of infection (45%), followed by apical periodontitis (25%) and periodontal diseases (15%). Impacted teeth infections (10%) and post-traumatic dental infections (5%) account for smaller proportions. The distribution emphasizes the central role of preventable dental diseases in the pathogenesis of severe odontogenic infections.

Microbiological patterns described in the literature indicate polymicrobial infections dominated by anaerobic and facultative anaerobic species. Synergistic interactions between bacterial communities were associated with rapid tissue infiltration and extensive spread along fascial planes. This biological behavior explains the aggressive clinical course commonly observed in odontogenic phlegmon.

Regional epidemiological synthesis suggests that in Uzbekistan and neighboring Central Asian countries, odontogenic phlegmon represents approximately 60–75% of all maxillofacial purulent infections requiring hospitalization. Among these cases, adolescents constitute roughly one-quarter to one-third of patients. Urban–rural disparities were evident, with higher incidence reported in rural and semi-urban areas, where access to dental services is limited.

In contrast, European countries report substantially lower proportions of odontogenic phlegmon relative to total maxillofacial infections, generally ranging between 20–35%. North

American data demonstrate similar or lower levels, reflecting extensive preventive dentistry infrastructure and early treatment pathways.

Social indicators consistently emerged as strong predictors of disease occurrence. Adolescents from low-income households, families with limited educational attainment, and communities lacking school-based dental programs showed higher rates of advanced odontogenic infections. Delayed presentation to healthcare facilities was frequently documented, with many adolescents seeking treatment only after severe facial swelling, pain, and functional impairment had developed.

Clinical outcome analysis indicates that most adolescents with odontogenic phlegmon require surgical intervention combined with systemic antimicrobial therapy. Length of hospital stay varied widely, but prolonged hospitalization was more common in patients presenting at advanced stages or with systemic involvement.

Preventive measures documented in the literature were associated with measurable reductions in severe odontogenic infections. Regions implementing routine school dental screening, fluoride exposure programs, and parental education campaigns reported lower hospitalization rates for odontogenic phlegmon.

Collectively, the results demonstrate that odontogenic phlegmon in adolescents is not merely a consequence of microbial invasion but rather the final outcome of a cascade of untreated oral disease compounded by social vulnerability and systemic healthcare limitations.

DISCUSSION

The present theoretical synthesis highlights odontogenic phlegmon in adolescents as a multifaceted condition shaped by the intersection of biological, behavioral, and social factors. The dominance of dental caries as the primary etiological trigger reflects persistent deficiencies in preventive oral healthcare, particularly in regions with limited infrastructure.

One of the most significant findings is the pronounced vulnerability of adolescents compared to younger children. This vulnerability may be explained by transitional lifestyle changes characteristic of adolescence, including increased autonomy in dietary choices, inconsistent hygiene routines, and reduced parental oversight. Additionally, physiological changes associated with puberty may influence immune responsiveness and tissue metabolism, potentially facilitating rapid spread of infection.

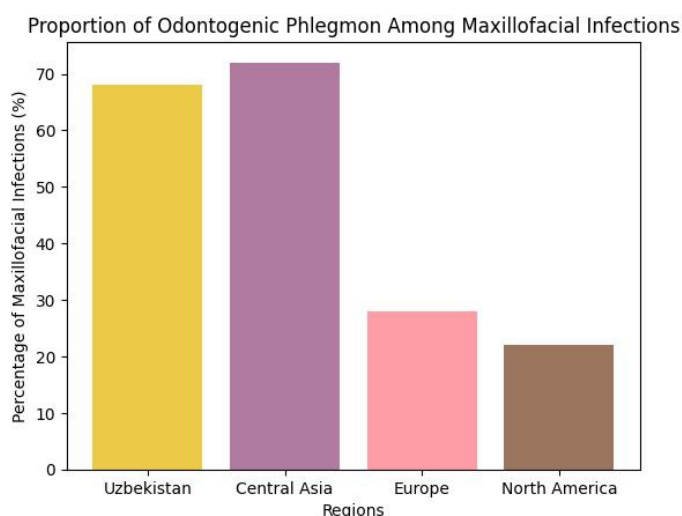


Figure 3. Proportion of Odontogenic Phlegmon Among Maxillofacial Infections by Region. This bar chart demonstrates regional differences in the proportion of odontogenic

phlegmon among all maxillofacial purulent-inflammatory conditions. Higher proportions are observed in Central Asia (72%) and Uzbekistan (68%), whereas considerably lower values are reported in Europe (28%) and North America (22%). These differences reflect variations in preventive dentistry coverage, healthcare accessibility, and public health infrastructure.

The predominance of polymicrobial anaerobic infections aligns with established concepts of oral biofilm ecology. In advanced carious lesions, oxygen-deprived microenvironments favor anaerobic growth, which promotes tissue necrosis and facilitates deep-space extension. The absence of anatomical barriers in fascial planes further contributes to the diffuse nature of phlegmon.

Regional disparities observed between Central Asia and high-income countries underscore the critical role of healthcare system organization. In Europe and North America, structured preventive programs, insurance coverage, and routine dental attendance substantially reduce the likelihood that carious lesions progress to severe infection. Conversely, in Uzbekistan and neighboring regions, preventive dentistry remains underdeveloped, and dental services are often accessed only when symptoms become intolerable.

Social determinants emerge as central drivers of disease progression. Poverty limits the ability to afford dental care and hygiene products. Lower educational levels reduce awareness of early disease signs and preventive practices. Cultural beliefs that prioritize curative rather than preventive care further exacerbate delays in seeking treatment.

Adolescent psychology also plays a pivotal role. Fear of dental procedures, embarrassment about oral condition, and underestimation of disease severity contribute to postponement of professional care. These behavioral patterns transform initially reversible conditions into life-threatening complications.

The high proportion of hospitalized adolescents indicates that odontogenic phlegmon frequently exceeds the capacity of outpatient management. Surgical drainage, intravenous antibiotics, and supportive therapy are resource-intensive, placing significant burden on healthcare systems. From a public health perspective, this underscores the economic advantage of prevention over treatment.

Preventive strategies must therefore be comprehensive and multidimensional. School-based dental screening programs can identify early lesions before symptoms arise. Fluoride exposure through toothpaste, water, or topical application remains one of the most effective population-level interventions. Parental education initiatives can reinforce daily oral hygiene habits and encourage routine dental visits.

Integration of dentists into primary healthcare teams represents another promising approach. Pediatricians and family physicians can play a screening role, referring adolescents with early signs of oral disease. Such interdisciplinary collaboration strengthens early detection pathways.

The comparison between regions suggests that improvements in preventive infrastructure directly translate into lower incidence of severe odontogenic infections. This relationship highlights the modifiability of disease burden through policy-level interventions.

Another important aspect is the long-term impact of odontogenic phlegmon on adolescent health. Beyond immediate morbidity, facial scarring, tooth loss, and functional impairment may

negatively influence psychological well-being, social integration, and quality of life. These consequences further justify prioritization of prevention.

The findings also emphasize the need for region-specific strategies. In the Fergana region, densely populated communities combined with uneven service distribution require mobile dental clinics, community outreach programs, and subsidized care for vulnerable families.

From a scientific standpoint, future research should focus on longitudinal studies evaluating the effectiveness of integrated preventive models. Additionally, exploration of microbiological patterns specific to regional populations may inform targeted antimicrobial protocols.

In summary, odontogenic phlegmon in adolescents should be conceptualized not solely as a surgical pathology but as an indicator of systemic gaps in oral healthcare delivery. Addressing these gaps demands coordinated action across clinical, educational, and policy domains.

CONCLUSION

Odontogenic phlegmon in adolescents represents a complex medical and social problem. Its development is driven by a convergence of biological susceptibility, behavioral patterns, and systemic healthcare limitations. The Fergana region exhibits conditions that facilitate progression from simple dental disease to severe inflammatory complications. Comparative analysis confirms that effective prevention relies on early detection, education, and accessible care. Implementation of comprehensive preventive strategies can significantly reduce disease burden. Strengthening public health infrastructure and adolescent-focused oral health programs is imperative.

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