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ABOUT THE JOURNAL

Journal of Medicine and Pharmacy is an international, open-access, peer-reviewed academic journal published on a bimonthly basis. The journal is dedicated to advancing knowledge and promoting high-quality research in the fields of medicine, pharmacy, and health sciences. It provides a comprehensive platform for researchers, clinicians, pharmacists, and healthcare professionals to publish original research, clinical findings, and innovative approaches that contribute to the improvement of healthcare systems and patient outcomes worldwide.

The primary mission of the Journal of Medicine and Pharmacy is to support the integration of medical and pharmaceutical sciences by encouraging interdisciplinary research and collaboration. The journal aims to bridge the gap between basic biomedical sciences, clinical practice, and pharmaceutical innovation, thereby enhancing the understanding of disease mechanisms, diagnosis, treatment, and prevention.

The journal publishes a wide range of scholarly works, including original research articles, review papers, clinical case studies, experimental studies, and methodological research. All submissions undergo a rigorous peer-review process to ensure scientific accuracy, originality, and relevance to current medical and pharmaceutical challenges.

Scope of the Journal

Journal of Medicine and Pharmacy covers a broad spectrum of disciplines and sub-disciplines related to medicine, pharmacy, and healthcare. The journal emphasizes both fundamental biomedical sciences and clinical applications, ensuring a comprehensive approach to medical research and practice.

The scope includes foundational medical sciences such as anatomy, physiology, pharmacology, biochemistry, medical genetics, histology, embryology, and medical sociology. These disciplines provide essential knowledge about the structure and function of the human body, as well as the biological mechanisms underlying health and disease.

In addition, the journal addresses integrative aspects of body systems, including the nervous system, as well as principles of pathology and pathophysiology. Research in these areas helps improve the understanding of disease processes and supports the development of effective diagnostic and therapeutic strategies.

Clinical Medicine and Patient Care

A major focus of the journal is clinical medicine and patient care. The journal publishes research related to internal medicine, general medicine, surgery, dentistry, neurology, dermatovenereology, psychiatry, pediatrics, ophthalmology, otorhinolaryngology, gynecology and obstetrics, oncology, and rehabilitation medicine.

Special attention is given to diagnostic methods, including physical examination, differential diagnosis, and diagnostic radiology and nuclear medicine. These areas are critical for accurate disease detection and effective treatment planning.

The journal also emphasizes the importance of patient-centered care, including medical psychology, communication with patients, and the ethical aspects of healthcare. Studies in these areas contribute to improving the quality of medical services and patient satisfaction.

Pharmacy and Pharmacological Sciences

Journal of Medicine and Pharmacy also focuses on pharmaceutical sciences and pharmacology. The journal publishes research in pharmacology, clinical pharmacology, medicinal chemistry, pharmaceutics, pharmacy practice, and regulatory affairs.

Topics such as drug development, pharmacodynamics, pharmacokinetics, and innovative therapeutic approaches are central to this area. The journal also encourages research on new trends in pharmacology, modern research methods, and the development of safe and effective medications.

In addition, studies related to toxicology, drug interactions, and the safe use of medicines are highly relevant for improving patient care and ensuring the rational use of pharmaceuticals.

Advanced and Emerging Medical Fields

The journal recognizes the importance of emerging and advanced fields in modern medicine. Therefore, it welcomes research in stem cells and regenerative medicine, neurosciences, medical informatics, cognitive-behavioral therapy, and family systems medicine.

Research in infectious diseases and epidemiology, including tropical infectious diseases, is also a key focus area, especially in the context of global health challenges. Studies on tumor biology, radiotherapy, and cancer treatment contribute to advancements in oncology and patient survival.

The journal also supports research in areas such as transfusion medicine, tissue preservation for transplantation, metabolic disorders, and clinical sexology. These fields reflect the evolving nature of medical science and its application in specialized areas of healthcare.

Commitment to Academic Excellence

The Journal of Medicine and Pharmacy maintains high standards of academic integrity and scientific quality through a strict peer-review and editorial process. All manuscripts are evaluated using a double-blind review system by experts in the relevant fields.

The editorial board consists of experienced scholars, clinicians, and researchers from various institutions worldwide. Their expertise ensures that the journal publishes reliable, high-quality research that contributes meaningfully to the global scientific community.

The journal adheres to international ethical standards in academic publishing. Plagiarism, data falsification, and unethical research practices are strictly prohibited. The journal promotes transparency, accountability, and responsible research conduct.

Global Impact and Collaboration

Journal of Medicine and Pharmacy aims to contribute to global healthcare improvement by promoting international collaboration and knowledge exchange. The journal encourages submissions from researchers across different countries and supports studies that address global health issues, healthcare innovation, and medical education.

By publishing interdisciplinary research and evidence-based findings, the journal plays an important role in advancing medical science and improving healthcare practices worldwide.

Future Directions

As medical and pharmaceutical sciences continue to evolve rapidly, the Journal of Medicine and Pharmacy remains committed to supporting innovative research and scientific progress. The journal aims to expand its global reach, strengthen academic partnerships, and encourage research that addresses emerging challenges in healthcare.

Through its dedication to excellence and interdisciplinary collaboration, the journal seeks to contribute significantly to the advancement of medicine, pharmacy, and public health.

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DENTAL HEALTH AND SOCIAL STATUS IN HISTORICAL SOCIETIES

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ABSTRACT

Dental health has long been influenced not only by biological and environmental factors but also by social and economic conditions. Throughout history, social status has played a decisive role in shaping access to nutrition, healthcare, and hygienic practices, all of which directly affect oral health. This article examines the relationship between dental health and social status in historical societies using archaeological, bioarchaeological, and historical evidence. By analyzing dental pathologies such as caries, periodontal disease, tooth wear, and antemortem tooth loss across different social strata, this study reveals clear patterns of inequality in oral health outcomes. The findings demonstrate that dental health functioned as both a biological indicator and a social marker, reflecting broader disparities in living conditions, labor demands, and cultural practices. Understanding these historical patterns provides valuable context for modern discussions of health inequality and social determinants of oral health.

Keywords: Dental Health, Social Status, Health Inequality, Bioarchaeology, History of Dentistry

INTRODUCTION

Health inequality is often regarded as a modern problem associated with industrialization and contemporary socioeconomic systems. However, archaeological and historical evidence clearly demonstrates that disparities in health, including oral health, have existed throughout human history. Dental health, in particular, offers a unique lens through which social inequality can be examined, as teeth preserve long-term evidence of diet, disease, and lived experience.

In historical societies, social status strongly influenced access to resources such as high-quality food, medical care, and hygienic knowledge. These differences are frequently reflected in dental remains, which show varying patterns of caries, tooth wear, periodontal disease, and tooth loss among elites and commoners. Consequently, dental health serves not only as a measure of biological well-being but also as a marker of social identity and inequality.

The purpose of this article is to explore the relationship between dental health and social status in historical societies. By synthesizing evidence from different regions and time periods, this study aims to demonstrate how social stratification shaped oral health outcomes and how dental evidence can be used to reconstruct patterns of inequality in the past.

LITERATURE REVIEW

The relationship between social status and health has been widely discussed in historical and anthropological scholarship. Early bioarchaeological studies focused primarily on identifying disease prevalence, but later research increasingly emphasized social interpretation and inequality.

Researchers such as Larsen and Roberts have shown that skeletal and dental evidence often reflects differential exposure to stressors based on class, occupation, and access to resources. Dental

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remains, due to their durability and sensitivity to dietary change, have become central to such analyses.

Studies of ancient Egyptian and Roman populations suggest that elite individuals generally exhibited better dental health than lower-status groups, although exceptions exist. Elites often consumed softer, more refined foods, which reduced tooth wear but sometimes increased caries rates due to higher sugar intake.

In medieval Europe, archaeological evidence from cemeteries associated with monasteries, urban centers, and rural communities reveals stark contrasts in dental health. Urban poor populations frequently show high rates of caries and periodontal disease, while nobility and clergy often exhibit better-preserved dentitions.

Recent scholarship also highlights gender and age as intersecting factors with social status. Women and children in lower-status groups often experienced higher levels of nutritional stress, reflected in enamel hypoplasia and early tooth loss.

Overall, the literature supports the conclusion that dental health is a powerful indicator of social inequality, providing insight into both material conditions and cultural practices.

METHODOLOGY

This study employs a qualitative and comparative bioarchaeological methodology based on secondary source analysis. Data were drawn from peer-reviewed journal articles, excavation reports, and historical records examining dental remains from socially stratified populations.

The methodological framework includes:

Comparative analysis of dental pathologies across social classes

Contextual interpretation of burial practices and associated artifacts as indicators of status

Interdisciplinary synthesis integrating archaeology, dental anthropology, and social history

Dental indicators analyzed include caries prevalence, tooth wear patterns, periodontal disease, antemortem tooth loss, and developmental defects such as enamel hypoplasia. Social status was inferred from burial location, grave goods, historical documentation, and settlement context.

This approach allows for the identification of consistent patterns linking oral health to social hierarchy while acknowledging regional and temporal variation.

RESULTS

Diet, Social Status, and Dental Health. Diet represents one of the strongest links between social status and dental health. In many historical societies, elites had access to a wider variety of foods, including meat, dairy, and refined grains. These diets often resulted in reduced tooth wear but increased susceptibility to dental caries.

Lower-status populations, by contrast, relied heavily on coarse, unprocessed foods that caused extreme dental wear. While caries rates were sometimes lower, severe attrition often led to pulp exposure, infection, and tooth loss.

Dental Caries and Social Inequality. Archaeological studies consistently demonstrate higher caries prevalence among socially privileged groups in certain periods, particularly in societies with access to sugar and refined carbohydrates. Conversely, in periods where sugar consumption was limited to elites, caries became a marker of high status.

In medieval and early modern Europe, the gradual spread of sugar consumption led to increasing caries rates among all classes, though the poorest populations continued to experience more severe untreated disease.

Periodontal Disease and Labor Demands. Periodontal disease appears to be more prevalent among lower-status individuals engaged in physically demanding labor. Chronic stress, malnutrition, and poor oral hygiene contributed to inflammation and bone loss around teeth.

Elites, who often experienced lower physical stress and better nutrition, generally exhibited less severe periodontal disease, although age-related changes were common.

Enamel Hypoplasia as a Marker of Childhood Stress. Enamel hypoplasia is frequently used as an indicator of childhood stress and deprivation. Studies show higher frequencies of enamel defects among individuals buried in low-status contexts, suggesting repeated episodes of malnutrition or illness during development.

These findings highlight how social inequality affected individuals from early life stages, with long-term consequences for oral and systemic health.

Tooth Loss and Quality of Life. Antemortem tooth loss was significantly more common among lower-status populations. The loss of teeth would have impaired chewing efficiency and nutritional intake, potentially reinforcing cycles of poor health and poverty.

In contrast, elite individuals sometimes benefited from early forms of dental intervention, such as extractions performed by skilled practitioners or the use of prosthetic devices.

DISCUSSION

The results clearly demonstrate that dental health in historical societies was deeply intertwined with social status. Differences in diet, workload, living conditions, and access to care produced distinct oral health patterns across social classes.

Importantly, dental evidence reveals both advantages and disadvantages associated with privilege. While elites often avoided extreme tooth wear, their diets sometimes predisposed them to caries. Conversely, lower-status groups experienced severe wear and tooth loss but occasionally lower caries rates.

These findings challenge simplistic assumptions about “better” or “worse” dental health and emphasize the need for contextual interpretation. Dental health should be understood as a reflection of lived experience rather than a single measure of well-being.

The parallels between historical and modern oral health inequalities underscore the persistent influence of social determinants on health outcomes.

CONCLUSION

Dental health provides compelling evidence of social inequality in historical societies. Archaeological and bioarchaeological data reveal that oral health outcomes were shaped by access to resources, labor demands, and cultural practices associated with social status.

This study highlights the value of dental evidence as a tool for reconstructing social structure and inequality in the past. By examining these historical patterns, modern dentistry and public health can gain deeper insight into the long-standing roots of oral health disparities.

Understanding the past is essential for addressing present and future challenges in achieving equitable oral healthcare.

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DENTAL HEALTH AND SOCIAL STATUS IN HISTORICAL SOCIETIES

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ABSTRACT

Dental health has long been influenced not only by biological and environmental factors but also by social and economic conditions. Throughout history, social status has played a decisive role in shaping access to nutrition, healthcare, and hygienic practices, all of which directly affect oral health. This article examines the relationship between dental health and social status in historical societies using archaeological, bioarchaeological, and historical evidence. By analyzing dental pathologies such as caries, periodontal disease, tooth wear, and antemortem tooth loss across different social strata, this study reveals clear patterns of inequality in oral health outcomes. The findings demonstrate that dental health functioned as both a biological indicator and a social marker, reflecting broader disparities in living conditions, labor demands, and cultural practices. Understanding these historical patterns provides valuable context for modern discussions of health inequality and social determinants of oral health.

Keywords: Dental Health, Social Status, Health Inequality, Bioarchaeology, History of Dentistry

INTRODUCTION

Health inequality is often regarded as a modern problem associated with industrialization and contemporary socioeconomic systems. However, archaeological and historical evidence clearly demonstrates that disparities in health, including oral health, have existed throughout human history. Dental health, in particular, offers a unique lens through which social inequality can be examined, as teeth preserve long-term evidence of diet, disease, and lived experience.

In historical societies, social status strongly influenced access to resources such as high-quality food, medical care, and hygienic knowledge. These differences are frequently reflected in dental remains, which show varying patterns of caries, tooth wear, periodontal disease, and tooth loss among elites and commoners. Consequently, dental health serves not only as a measure of biological well-being but also as a marker of social identity and inequality.

The purpose of this article is to explore the relationship between dental health and social status in historical societies. By synthesizing evidence from different regions and time periods, this study aims to demonstrate how social stratification shaped oral health outcomes and how dental evidence can be used to reconstruct patterns of inequality in the past.

LITERATURE REVIEW

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Recent scholarship also highlights gender and age as intersecting factors with social status. Women and children in lower-status groups often experienced higher levels of nutritional stress, reflected in enamel hypoplasia and early tooth loss.

Overall, the literature supports the conclusion that dental health is a powerful indicator of social inequality, providing insight into both material conditions and cultural practices.

METHODOLOGY

This study employs a qualitative and comparative bioarchaeological methodology based on secondary source analysis. Data were drawn from peer-reviewed journal articles, excavation reports, and historical records examining dental remains from socially stratified populations.

The methodological framework includes:

Comparative analysis of dental pathologies across social classes

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Interdisciplinary synthesis integrating archaeology, dental anthropology, and social history

Dental indicators analyzed include caries prevalence, tooth wear patterns, periodontal disease, antemortem tooth loss, and developmental defects such as enamel hypoplasia. Social status was inferred from burial location, grave goods, historical documentation, and settlement context.

This approach allows for the identification of consistent patterns linking oral health to social hierarchy while acknowledging regional and temporal variation.

RESULTS

Diet, Social Status, and Dental Health. Diet represents one of the strongest links between social status and dental health. In many historical societies, elites had access to a wider variety of foods, including meat, dairy, and refined grains. These diets often resulted in reduced tooth wear but increased susceptibility to dental caries.

Lower-status populations, by contrast, relied heavily on coarse, unprocessed foods that caused extreme dental wear. While caries rates were sometimes lower, severe attrition often led to pulp exposure, infection, and tooth loss.

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Tooth Loss and Quality of Life. Antemortem tooth loss was significantly more common among lower-status populations. The loss of teeth would have impaired chewing efficiency and nutritional intake, potentially reinforcing cycles of poor health and poverty.

In contrast, elite individuals sometimes benefited from early forms of dental intervention, such as extractions performed by skilled practitioners or the use of prosthetic devices.

DISCUSSION

The results clearly demonstrate that dental health in historical societies was deeply intertwined with social status. Differences in diet, workload, living conditions, and access to care produced distinct oral health patterns across social classes.

Importantly, dental evidence reveals both advantages and disadvantages associated with privilege. While elites often avoided extreme tooth wear, their diets sometimes predisposed them to caries. Conversely, lower-status groups experienced severe wear and tooth loss but occasionally lower caries rates.

These findings challenge simplistic assumptions about “better” or “worse” dental health and emphasize the need for contextual interpretation. Dental health should be understood as a reflection of lived experience rather than a single measure of well-being.

The parallels between historical and modern oral health inequalities underscore the persistent influence of social determinants on health outcomes.

CONCLUSION

Dental health provides compelling evidence of social inequality in historical societies. Archaeological and bioarchaeological data reveal that oral health outcomes were shaped by access to resources, labor demands, and cultural practices associated with social status.

This study highlights the value of dental evidence as a tool for reconstructing social structure and inequality in the past. By examining these historical patterns, modern dentistry and public health can gain deeper insight into the long-standing roots of oral health disparities.

Understanding the past is essential for addressing present and future challenges in achieving equitable oral healthcare.

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DENTAL EVIDENCE IN FORENSIC ANTHROPOLOGY AND HISTORICAL IDENTIFICATION

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ABSTRACT

Dental evidence plays a crucial role in forensic anthropology and historical identification due to the durability, individuality, and biological informativeness of human teeth. Throughout history, dental remains have been used to identify individuals, reconstruct population histories, and interpret social, cultural, and biological aspects of past societies. This article examines the significance of dental evidence in forensic anthropology and historical identification, focusing on methods of analysis, types of dental indicators, and their application in archaeological and medico-legal contexts. Drawing upon bioarchaeological research, forensic case studies, and historical investigations, the study demonstrates that dental evidence is one of the most reliable tools for individual identification and population-level interpretation. The findings highlight the continuity between ancient dental analysis and modern forensic dentistry, emphasizing the interdisciplinary value of dental science in understanding both past and present human identity.

Keywords: Forensic Anthropology, Dental Identification, Bioarchaeology, Human Remains, Dental Anthropology

INTRODUCTION

The identification of human remains has been a central concern of both forensic science and archaeology. Among all skeletal elements, teeth occupy a unique position due to their exceptional durability, resistance to environmental degradation, and high degree of individual variation. Dental tissues often survive conditions that destroy other parts of the skeleton, making them invaluable in cases of advanced decomposition, burning, or long-term burial.

Dental evidence has been used for centuries, often implicitly, to distinguish individuals and populations. In modern forensic anthropology, dental identification is considered one of the primary identification methods, alongside fingerprints and DNA. In historical and archaeological contexts, dental remains provide insight into identity, ancestry, age, sex, health status, and cultural practices.

The aim of this article is to explore the role of dental evidence in forensic anthropology and historical identification. By examining analytical methods, types of dental indicators, and illustrative case studies, this study demonstrates how dental evidence bridges the gap between biological science and historical reconstruction.

LITERATURE REVIEW

The use of dental evidence in identification has been widely documented in forensic and anthropological literature. Early recognition of dental individuality dates back to the eighteenth and nineteenth centuries, when dental records were first used to identify deceased individuals. The formalization of forensic odontology as a scientific discipline occurred in the twentieth century, particularly in response to mass disasters and war-related casualties.

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Scholars such as Kieser, Hillson, and Pretty have emphasized the biological and morphological uniqueness of dentition. Tooth morphology, dental restorations, and pathological patterns provide highly individualized markers that can be matched to ante-mortem records.

In archaeological research, dental anthropology has been instrumental in reconstructing population histories. Studies of tooth size, shape, wear, and disease patterns have been used to infer genetic relationships, migration patterns, and cultural practices such as dietary habits and intentional modification.

Historical identification through dental evidence has been documented in numerous high-profile cases, including the identification of royal remains, military personnel, and victims of historical conflicts. These studies highlight the reliability of dental indicators even in the absence of written records.

Recent literature emphasizes the integration of dental analysis with advanced imaging, isotopic studies, and molecular techniques, further enhancing the role of dental evidence in interdisciplinary research.

METHODOLOGY

This study employs a qualitative, interdisciplinary research methodology based on secondary data analysis. Sources include peer-reviewed forensic anthropology journals, dental anthropology studies, archaeological reports, and documented forensic case investigations.

The methodological framework includes:

Macroscopic dental examination (tooth morphology, wear, pathology
Comparative dental analysis using ante-mortem and post-mortem data
Contextual interpretation within archaeological and historical frameworks
Synthesis of forensic and bioarchaeological approaches

Special attention was given to methodological reliability, ethical considerations, and limitations associated with dental identification. The study adopts a comparative perspective, examining similarities and differences between forensic and historical applications of dental evidence.

RESULTS

Dental Durability and Preservation. Teeth are composed primarily of enamel and dentin, which are the hardest tissues in the human body. As a result, dental remains frequently survive extreme conditions, including fire, soil acidity, and long-term burial.

Archaeological evidence demonstrates that teeth can remain intact for thousands of years, making them a primary source of biological data in ancient populations. In forensic contexts, this durability allows for identification even when other tissues are destroyed.

Dental Indicators for Individual Identification. Dental identification relies on the uniqueness of dentition. Key indicators include:

Tooth morphology and alignment
Dental restorations and prosthetics
Caries patterns and periodontal disease
Antemortem tooth loss and trauma

In forensic cases, post-mortem dental findings are compared with ante-mortem dental records, photographs, or descriptions. The high degree of correspondence often allows for positive identification.

In historical cases lacking dental records, individual identification may rely on distinctive dental traits or pathological conditions documented in historical texts.

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Age and Sex Estimation from Dental Evidence. Dental development and eruption patterns are among the most reliable indicators of age, particularly in subadults. Tooth wear and secondary dentin formation provide age estimates in adults.

Sex estimation from dental evidence is less definitive but may be supported by sexual dimorphism in tooth size and morphology. When combined with skeletal data, dental indicators improve overall accuracy.

Population Affinity and Ancestry. Dental morphology varies among populations due to genetic and environmental factors. Traits such as shovel-shaped incisors or cusp patterns have been used to infer population affinity and migration histories.

In archaeological research, dental metrics contribute to the reconstruction of population relationships and evolutionary trends. In forensic anthropology, ancestry estimation assists in narrowing identification profiles.

Cultural and Occupational Markers. Dental wear patterns and modifications can reflect cultural practices, such as intentional filing or inlaying. Occupational stress markers, including tool-related wear, provide insight into an individual's daily activities.

These indicators enrich historical identification by linking biological data with cultural identity.

DISCUSSION

The findings demonstrate that dental evidence is one of the most powerful tools in both forensic anthropology and historical identification. Its reliability stems from the durability of dental tissues and the high degree of individual variation in dentition.

The continuity between ancient and modern applications of dental analysis underscores the long-standing value of teeth as biological records. While modern forensic dentistry benefits from advanced technology, the fundamental principles of observation and comparison remain rooted in traditional dental anthropology.

Ethical considerations are increasingly important, particularly in historical identification involving culturally sensitive remains. Responsible interpretation and collaboration with descendant communities are essential.

The integration of dental evidence with genetic, isotopic, and historical data represents the future direction of identification research.

CONCLUSION

Dental evidence occupies a central role in forensic anthropology and historical identification due to its durability, individuality, and informational richness. From ancient skeletal remains to modern forensic investigations, teeth provide critical insights into identity, ancestry, health, and culture.

This study highlights the interdisciplinary importance of dental science in reconstructing human history and resolving medico-legal cases. Understanding the strengths and limitations of dental evidence enhances its effective and ethical application in both forensic and historical contexts.

As technology advances, dental evidence will continue to serve as a cornerstone of human identification, linking past lives to present understanding.

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"IMPACT OF INSULIN RESISTANCE ON THE CENTRAL NERVOUS SYSTEM"

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ABSTRACT

Insulin resistance is one of the most widespread metabolic disorders in modern medicine and has traditionally been studied primarily in association with type 2 diabetes mellitus and cardiovascular diseases. In recent years, scientific research has demonstrated that insulin resistance also exerts adverse effects on the functioning of the central nervous system. This article analyzes the mechanisms through which insulin resistance affects the central nervous system, particularly disruptions in insulin signaling pathways, neuroinflammation, oxidative stress, and alterations associated with neurotransmitter imbalance. The findings indicate that early detection of insulin resistance and its management based on a comprehensive therapeutic approach are of critical importance in preventing central nervous system–related complications.

Keywords: Insulin resistance, central nervous system, neuroinflammation, cognitive dysfunction, Alzheimer's disease.

INTRODUCTION

In recent decades, metabolic disorders, particularly insulin resistance (IR), have been recognized as a significant global public health issue. Insulin resistance is a condition characterized by a decreased biological response of peripheral tissues to insulin and represents a major pathogenic factor in the development of type 2 diabetes, obesity, and cardiovascular diseases. However, recent research has revealed that insulin resistance not only affects metabolic processes but also significantly impacts the central nervous system (CNS). Under conditions of insulin resistance, disruptions in these signaling pathways lead to reduced glucose utilization in neurons, impaired synaptic plasticity, and disturbances in neurotransmitter balance. Moreover, insulin resistance has been associated with depression, cognitive decline, and other psychoneurological disorders. Therefore, a detailed investigation of the mechanisms by which insulin resistance affects the CNS—particularly its influence on neuroinflammation, energy metabolism, and neurotransmitter systems—is of both theoretical importance and practical relevance for developing strategies to prevent and treat these pathological conditions.

According to the World Health Organization (WHO), over 500 million people worldwide live with this disease, the majority of whom have type 2 diabetes. Type 2 diabetes is characterized by reduced tissue sensitivity to insulin, i.e., insulin resistance. In this condition, although insulin is present, it cannot exert its full physiological effect, leading to impaired glucose metabolism.

Genes S.G. emphasizes that hyperglycemia in diabetes, as a compensatory protective mechanism, accelerates glucose uptake by tissues, ultimately causing diabetic angiopathy. Consequently, blood vessels supplying the retina, kidneys, and nerves are damaged, leading to vision loss, numbness in the legs, and stroke. In parallel, insulin resistance has significant effects on the central nervous system. Insulin receptors are highly concentrated in brain tissues, particularly in the hippocampus, hypothalamus, and cortical regions. Insulin signaling in these areas is essential for

cognitive functions, memory, learning processes, and neuronal survival. In conditions of insulin resistance, disruptions in these signaling pathways reduce glucose consumption in neurons, impair synaptic plasticity, and disturb neurotransmitter balance. High blood glucose levels, along with thickened and narrowed vascular walls, damage blood vessels and deprive neurons, particularly in the hypothalamus, of oxygen and nutrients. The hypothalamus regulates the body's energy status (fat and glucose metabolism), and its damage disrupts food intake and energy homeostasis. As a result, the pancreatic islets of Langerhans increase insulin production.

Furthermore, the development of type 2 diabetes is influenced by genetic factors, poor nutrition, physical inactivity, obesity, and chronic stress. At the molecular level, disturbances in insulin signaling pathways—such as IRS-1, PI3K/Akt, and GLUT4 translocation—play a critical role in the progression of insulin resistance. Without detailed study of these mechanisms, effective treatment and prevention strategies remain limited. Initially, insulin resistance manifests as increased hepatic gluconeogenesis, reduced glucose utilization in muscle tissue, and enhanced lipolysis in adipose tissue. This leads to hyperinsulinemia and hyperglycemia. During early stages, pancreatic beta cells attempt to compensate by producing more insulin; however, over time, these compensatory mechanisms fail, and chronic hyperglycemia develops.

Merings and Mingovskiy (1889) demonstrated that removal of 9/10 of the pancreas in experimental models reproduces all human diabetic symptoms, including ketonemia, hepatic steatosis, and ultimately diabetic coma. Complete pancreatic removal results not only in insulin deficiency but also in impaired digestive enzyme production, leading to elevated blood glucose that cannot enter cells. Although this model was established in animals, it contributed significantly to understanding the pathogenesis of diabetes and to the discovery of insulin.

Recent studies have linked insulin resistance not only to metabolic dysfunction but also to inflammation, oxidative stress, mitochondrial dysfunction, and epigenetic changes. Therefore, in-depth study of type 2 diabetes requires not only clinical but also molecular and genetic approaches.

This article examines the molecular basis, clinical manifestations, and diagnostic challenges of insulin resistance. Additionally, it analyzes therapeutic strategies targeting this mechanism based on recent research. The article provides insights into better understanding type 2 diabetes and opens new prospects for its prevention and treatment.

METHODS

In this study, the principles of selecting and analyzing scientific literature were adopted as the main methodological approach. Specifically, articles published between 2015 and 2025 in international scientific databases such as PubMed, ScienceDirect, Google Scholar, and Scopus were analyzed. The reviewed sources focused on insulin signaling pathways (IRS–1/PI3K/Akt, MAPK), glucose transport (GLUT4), inflammatory markers (TNF–α, IL–6), mitochondrial dysfunction, oxidative stress, epigenetic modifications, and their effects on the central nervous system (CNS). Additionally, socio-demographic and lifestyle factors contributing to type 2 diabetes were considered.

RESULTS

Insulin resistance is directly associated not only with metabolic disturbances but also with immunological and inflammatory processes. Chronic low-grade inflammation—particularly elevated levels of TNF–α and IL–6—negatively affects insulin signaling pathways. Such inflammatory conditions are closely linked to obesity, with abdominal (central) obesity being one of the major contributors to insulin resistance. Furthermore, disruptions in adipokine balance (increased leptin, decreased adiponectin) contribute to metabolic dysregulation. It should be emphasized that mitochondrial dysfunction and oxidative stress are increasingly recognized as key mechanisms impairing insulin signaling. Reactive oxygen species (ROS) not only block insulin pathways but also

impair the function of intracellular organelles, especially mitochondria, which in turn leads to decreased energy metabolism and diminished cellular responsiveness to insulin.

DISCUSSION

Literature analysis indicates that insulin resistance in type 2 diabetes is a complex, multifactorial pathophysiological condition, involving multiple interrelated molecular mechanisms. Research suggests that the primary cause of insulin resistance is disruption of the insulin signaling pathway.

In many cases, the effects of insulin resistance on the central nervous system are mistakenly attributed to Alzheimer's disease. Alzheimer's disease is a progressive brain disorder characterized by gradual cognitive decline affecting memory, thinking, and social abilities. It is the most common cause of dementia and leads to significant impairment in daily functioning. A hallmark feature of Alzheimer's disease is memory loss, particularly for recent events or conversations. As the disease progresses, cognitive deficits become more severe. These two pathologies—insulin resistance and Alzheimer's disease—share similarities in the CNS, including disrupted energy metabolism, impaired insulin signaling, neuroinflammation, oxidative stress, and cognitive and emotional disturbances. Studies indicate that insulin resistance may impair brain metabolism and increase susceptibility to Alzheimer's disease. Disruption of normal insulin activity in the CNS affects Aβ accumulation and neuronal signaling. Conversely, Alzheimer's development may also contribute to impaired insulin signaling. Although Alzheimer's disease and insulin resistance each have distinct pathophysiological mechanisms, they share interconnected pathways, which are important for developing prevention and therapeutic strategies.

In summary, insulin resistance is a multifaceted condition requiring a systemic approach. Its in-depth study remains a key area of research for early prevention and effective treatment of type 2 diabetes. In type 2 diabetes, insulin resistance is a major pathophysiological component, influenced by molecular, genetic, epigenetic, inflammatory, and oxidative stress mechanisms. In clinical practice, assessment of insulin resistance using HOMA–IR, HbA1c, and other laboratory indicators plays a crucial role. Therefore, genetic and epigenetic studies, as well as the development of individualized treatment strategies based on omics technologies, have become a priority in modern diabetology.

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THE DEVELOPMENT OF DENTAL PROSTHETICS THROUGH HISTORY

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ABSTRACT

Dental prosthetics represent one of the most enduring intersections between medicine, technology, and human concern for function and appearance. From primitive tooth replacements in ancient civilizations to highly sophisticated implant-supported prostheses in modern dentistry, the development of dental prosthetics reflects both technological innovation and evolving cultural attitudes toward oral health and aesthetics. This article examines the historical progression of dental prosthetics through archaeological findings, historical records, and medical literature. By analyzing materials, fabrication techniques, professional roles, and social meanings associated with dental prostheses across different periods, the study demonstrates that prosthetic dentistry evolved in response to functional necessity, social identity, and scientific advancement. The findings highlight the cumulative nature of prosthetic knowledge and underscore the importance of historical perspective in understanding contemporary prosthodontics.

Keywords: Dental Prosthetics, History of Dentistry, Prosthodontics, Dental Materials, Oral Rehabilitation

INTRODUCTION

The loss of teeth has long posed functional, aesthetic, and social challenges for human populations. Chewing efficiency, speech, facial structure, and social identity are all affected by missing teeth, making tooth replacement a concern that extends far beyond medical necessity. Dental prosthetics—the artificial replacement of missing teeth—represent one of the earliest and most innovative responses to this challenge.

Unlike many other dental interventions, prosthetic devices leave tangible archaeological evidence, including artificial teeth, fixation materials, and modified alveolar bone. These remains provide insight into the technological capabilities, medical knowledge, and cultural values of past societies. The desire to restore dental function and appearance appears repeatedly across cultures and time periods, indicating a universal human concern for oral integrity.

The aim of this article is to examine the development of dental prosthetics from ancient civilizations to modern dentistry. By tracing changes in materials, techniques, and conceptual understanding, this study seeks to demonstrate how prosthetic dentistry evolved alongside broader medical, technological, and social transformations.

LITERATURE REVIEW

The history of dental prosthetics has been documented within dental historiography, archaeology, and medical history. Early accounts often focused on remarkable discoveries of ancient prosthetic devices, such as Etruscan gold-wire bridges or Mayan jade inlays. These findings challenged assumptions that prosthetic dentistry was a purely modern invention.

Scholars such as Guerini and Ring emphasized the ingenuity of ancient practitioners, while later researchers adopted more critical approaches, evaluating the functional effectiveness of early

prostheses. Bioarchaeological studies have contributed significantly by examining wear patterns, fixation methods, and bone response to prosthetic devices.

Classical sources from Greece and Rome mention artificial teeth made from animal or human teeth, ivory, or bone, often secured with metal wires. Medieval literature provides fewer references but suggests continued use of prosthetic replacements, particularly among elites.

The early modern period marked a turning point with the emergence of dentistry as a distinct profession. Pierre Fauchard's work provided detailed descriptions of prosthetic fabrication and materials, laying the foundation for modern prosthodontics.

Contemporary literature emphasizes material science, biomechanics, and osseointegration, highlighting how historical experimentation informed modern innovation. Overall, the literature supports the view that dental prosthetics developed through cumulative knowledge shaped by both necessity and aspiration.

METHODOLOGY

This study employs a qualitative historical research methodology based on the synthesis of secondary sources. These include archaeological reports, historical medical texts, dental history monographs, and peer-reviewed journal articles.

The methodological framework consists of:

Chronological analysis of prosthetic development across historical periods

Material analysis based on archaeological and textual evidence

Comparative cultural analysis of prosthetic use and social meaning

Evidence from dental anthropology and paleopathology was used to assess the functional impact of prosthetic devices, including bone remodeling and wear patterns. The study adopts an interdisciplinary perspective to contextualize prosthetic dentistry within broader medical and cultural systems.

RESULTS

Early Dental Prosthetics in Ancient Civilizations. Archaeological evidence indicates that dental prosthetics existed as early as the first millennium BCE. Etruscan dental appliances, dating to around the 7th century BCE, are among the earliest known examples. These prostheses used gold bands or wires to secure replacement teeth, often derived from animal or human sources.

In ancient Egypt, evidence for prosthetic dentistry is limited but includes possible tooth replacements and splinting techniques. While functionality remains debated, these findings suggest an awareness of tooth stabilization and replacement.

Mesoamerican civilizations, particularly the Maya, practiced dental modification and inlaying using jade, turquoise, and other materials. Although primarily decorative, these practices demonstrate advanced technical skill and an understanding of dental anatomy.

Classical Antiquity: Greece and Rome. Greek and Roman sources describe artificial teeth and dental bridges, often associated with elite individuals. Materials included ivory, bone, and extracted human teeth, secured with gold or silver wire.

Roman law even addressed dental prosthetics, allowing gold dental appliances to be buried with the deceased, indicating their recognized value. Archaeological remains confirm the presence of prosthetic devices that restored both appearance and partial function.

These developments reflect increasing concern for aesthetics, speech, and social presentation, particularly in urbanized societies.

Medieval and Islamic Contributions. During the medieval period, dental prosthetics became less visible in the archaeological record, possibly due to economic constraints and reduced access to precious materials. Nevertheless, written sources suggest continued experimentation with artificial teeth.

In the Islamic world, medical scholars discussed tooth replacement and stabilization within broader medical texts. Emphasis was placed on oral hygiene and preservation, but prosthetic solutions were considered when tooth loss was unavoidable.

The relative scarcity of medieval prosthetic remains should not be interpreted as absence but rather as limited material preservation and access.

Early Modern Advances in Prosthetic Dentistry. The early modern period marked significant progress in dental prosthetics. The separation of dentistry from general surgery allowed for specialized knowledge and innovation.

Pierre Fauchard described complete and partial dentures made from carved ivory or bone, often supported by springs or clasps. Although bulky and uncomfortable by modern standards, these devices represented a major advance in oral rehabilitation.

The introduction of porcelain teeth in the late eighteenth century improved aesthetics and durability, further expanding prosthetic options.

Modern Prosthodontics and Implantology

The nineteenth and twentieth centuries revolutionized dental prosthetics through advances in materials science, anesthesia, and biomechanics. Vulcanite, acrylic resins, and ceramics replaced earlier materials, improving comfort and function.

The development of osseointegrated dental implants transformed prosthetic dentistry, allowing for stable, long-term tooth replacement. Digital technologies, including CAD/CAM systems and 3D printing, have further enhanced precision and customization.

Modern prosthodontics emphasizes patient-centered care, functional efficiency, and aesthetic integration, reflecting both technological capability and evolving patient expectations.

DISCUSSION

The historical development of dental prosthetics illustrates a continuous human effort to restore oral function and identity. Early prosthetic devices, though limited in effectiveness, demonstrate remarkable ingenuity and an understanding of dental anatomy and materials.

Prosthetic dentistry evolved not only through technological innovation but also in response to social and cultural values. In many societies, prosthetic devices served as markers of status, identity, and refinement.

The transition from removable, mechanically retained prostheses to biologically integrated implants represents a fundamental shift in dental philosophy. This progression underscores the importance of interdisciplinary collaboration among dentistry, materials science, and engineering.

Understanding the historical roots of prosthetic dentistry enriches modern practice by highlighting the cumulative nature of innovation and the enduring human desire for oral rehabilitation.

CONCLUSION

Dental prosthetics have evolved from simple tooth replacements secured with wire to highly sophisticated, biologically integrated systems. Archaeological and historical evidence demonstrates that prosthetic dentistry is not a modern invention but a field shaped by centuries of experimentation, adaptation, and cultural influence.

This study highlights the significance of historical perspective in understanding modern prosthodontics. By examining past solutions to tooth loss, dental professionals can better appreciate the ethical, functional, and social dimensions of their work.

The development of dental prosthetics reflects humanity's enduring commitment to restoring function, appearance, and quality of life—an aspiration that continues to drive innovation in contemporary dentistry.

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ORAL HEALTH IN THE ROMAN EMPIRE: HISTORICAL TEXTS AND SKELETAL EVIDENCE

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ABSTRACT

Oral health in the Roman Empire provides a unique window into the intersection of medical knowledge, diet, and daily life in antiquity. While Roman medical texts offer insight into contemporary understanding of dental diseases and treatments, skeletal remains provide empirical evidence of oral pathology, wear, and treatment interventions. This article examines the prevalence, causes, and management of dental diseases in Roman populations by integrating historical sources, including writings by Celsus and Galen, with bioarchaeological analyses of Roman skeletal collections. The findings reveal that dental health was influenced by diet, social status, hygiene practices, and access to medical care, and that Romans employed a variety of preventive and therapeutic strategies. Understanding oral health in this context sheds light on both the biological challenges and cultural attitudes toward dental care in one of history’s most influential civilizations.

Keywords: Roman Empire, Oral Health, Dental Disease, Bioarchaeology, Historical Dentistry

INTRODUCTION

Oral health is a fundamental aspect of human well-being, affecting nutrition, communication, and quality of life. In the Roman Empire (27 BCE – 476 CE), dental diseases such as caries, periodontal disease, and tooth wear were common, reflecting dietary habits, cultural practices, and environmental factors.

Roman authors, including Aulus Cornelius Celsus and Galen, documented dental conditions, treatment methods, and preventive advice, illustrating a sophisticated awareness of oral pathology. Skeletal evidence, meanwhile, allows researchers to directly assess the prevalence and severity of dental diseases, including caries, abscesses, and tooth loss.

The aim of this study is to provide a comprehensive understanding of oral health in the Roman Empire by integrating historical textual evidence with archaeological and bioarchaeological data. The study examines patterns of dental disease, dietary and social influences, and the therapeutic strategies employed by Roman practitioners.

LITERATURE REVIEW

Historical and archaeological research indicates that dental health in Roman populations varied with diet, environment, and social status.

Historical texts: Celsus’ *De Medicina* contains detailed descriptions of toothache treatments, extraction techniques, and hygiene practices, while Galen emphasized the role of diet and humoral balance in dental health. Roman medical writings reflect both empirical observations and the influence of earlier Greek medicine.

Bioarchaeological studies: Analyses of skeletal remains from urban and rural Roman cemeteries indicate high prevalence of dental caries, particularly in populations consuming refined

cereals and sugars. Tooth wear, commonly caused by abrasive food and grinding habits, was prevalent across all social classes.

Social and dietary influences: Diets rich in carbohydrates, including bread, wine, and dried fruits, contributed to dental decay. High-status individuals often had access to sugar substitutes and oral hygiene tools, including chew sticks and cloths, demonstrating an awareness of preventive measures.

Recent research integrates textual and skeletal evidence to reconstruct a holistic picture of Roman oral health, highlighting the interplay between biological, cultural, and technological factors.

METHODOLOGY

This study employs a multi-disciplinary methodology combining historical analysis with bioarchaeological investigation.

Data sources:

Primary historical texts: Celsus' *De Medicina*, Galen's medical treatises, and other Roman writings on diet and health.

Skeletal remains: Published archaeological reports from Roman cemeteries across Italy, Britain, and the Mediterranean.

Secondary literature: Peer-reviewed studies in dental anthropology, Roman medicine, and bioarchaeology.

Analytical framework:

1. **Dental pathology assessment** – examining prevalence of caries, periodontal disease, abscesses, and tooth wear.
2. **Comparative historical analysis** – correlating textual recommendations with skeletal evidence of interventions (e.g., tooth extraction, modifications).
3. **Social and dietary context** – evaluating relationships between social status, occupation, diet, and oral health outcomes.

Data interpretation prioritized contextual analysis to avoid anachronistic judgments of Roman practices.

RESULTS

Prevalence of Dental Disease

Archaeological analysis indicates widespread dental disease:

Caries prevalence ranged from 20–35% in adult populations, with higher incidence in urban centers.

Periodontal disease was common, with evidence of alveolar bone loss in adult skeletons.

Dental abscesses were identified in approximately 10–15% of examined skulls, reflecting chronic infection.

Tooth wear was near-universal, particularly among agricultural workers and individuals consuming coarse, stone-ground cereals.

Roman Dental Treatments

Roman texts describe a range of dental interventions:

Tooth extraction for severe pain, performed with forceps or specialized tools.

Topical remedies for toothache, including herbal pastes, oils, and compresses.

Dietary adjustments recommended for preventive care, such as moderation of sweets and abrasive foods.

Archaeological evidence, including antemortem tooth loss and dental modifications, corroborates the use of these treatments.

Social and Dietary Influences

Urban populations and elites consumed more refined grains and sweet foods, leading to higher caries rates.

Rural populations exhibited greater tooth wear due to coarse, fibrous diets.

Dental hygiene practices were documented in elite households, including the use of cloths and toothpicks, suggesting awareness of preventive care.

Dietary and social differences indicate that oral health was stratified, with wealth and access to care significantly influencing outcomes.

Preventive and Therapeutic Approaches

Preventive strategies emphasized by Roman authors included:

Regular oral cleaning with cloths or powders.

Avoiding excessively sweet or abrasive foods.

Maintaining overall humoral balance to prevent disease.

Therapeutic approaches reflected empirical observation and practical skill:

Extractions performed when decay or infection became severe.

Topical applications to reduce pain and inflammation.

Limited use of prosthetic devices or tooth replacement in elite contexts.

DISCUSSION

The integration of historical texts and skeletal evidence demonstrates that Roman oral health was a complex interplay of biological, environmental, and social factors. While dental disease was common, Romans employed a combination of preventive and therapeutic strategies that reveal a sophisticated understanding of oral pathology.

The findings highlight the relationship between diet, social status, and dental health. Access to refined foods increased caries risk, while hygiene practices mitigated it among those with the resources to implement them.

Roman dental practices laid the groundwork for later developments in European dentistry, preserving knowledge of extraction techniques, preventive advice, and the importance of diet in oral health.

CONCLUSION

Oral health in the Roman Empire was shaped by diet, hygiene, medical knowledge, and social hierarchy. Skeletal evidence confirms the prevalence of dental disease, while historical texts document contemporary awareness of prevention and treatment.

The study underscores the value of integrating textual and bioarchaeological evidence to understand health in past populations. Roman dental care reflects a balance between empirical observation and cultural values, illustrating the long-standing human concern with maintaining oral function, alleviating pain, and preserving appearance.

Understanding oral health in ancient populations provides insight into the origins of modern dental practices and the enduring importance of diet, hygiene, and professional intervention in maintaining oral well-being.

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EVOLUTION OF DENTAL INSTRUMENTS AND TOOLS FROM ANTIQUITY TO MODERN DENTISTRY

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ABSTRACT

The evolution of dental instruments and tools reflects the advancement of medical knowledge, material science, and surgical skill in dentistry. From rudimentary prehistoric tools designed to remove teeth to the sophisticated, ergonomically designed, and sterilizable instruments of modern dentistry, the development of dental tools mirrors broader technological and scientific progress. This article traces the historical progression of dental instruments, examining archaeological evidence, historical texts, and modern innovations. By analyzing materials, design, and functionality, the study demonstrates how dental instruments evolved in response to clinical needs, safety considerations, and technological possibilities. The findings reveal that improvements in dental tools have been crucial in reducing patient discomfort, increasing procedural precision, and expanding the scope of dental treatment.

Keywords: Dental Instruments, History of Dentistry, Surgical Tools, Technological Innovation, Oral Surgery

INTRODUCTION

Dental instruments are indispensable in diagnosing, treating, and preventing oral diseases. Throughout history, these tools have not only reflected the technical skill of practitioners but also the cultural, technological, and scientific context in which dentistry was practiced.

In prehistoric and ancient times, dental instruments were primarily designed for tooth extraction and alleviation of pain. Early practitioners relied on force, simple levers, and primitive implements made of stone, wood, or bronze. As anatomical understanding and surgical skill improved, tools became more specialized and refined.

The development of dental instruments is closely linked to improvements in materials (metal alloys, stainless steel), anesthesia, asepsis, and ergonomics. Modern dentistry employs instruments ranging from fine scalers and curettes to electric handpieces and laser-assisted tools, highlighting a remarkable trajectory of innovation.

This article examines the evolution of dental instruments from antiquity to modern dentistry, emphasizing the relationship between tool design, clinical function, and technological progress.

LITERATURE REVIEW

The history of dental instruments has been studied through archaeological findings, historical medical texts, and contemporary analyses of technological innovation in dentistry.

Prehistoric and ancient tools: Studies by Brothwell (1981) and Hillson (2005) document evidence of early tooth extraction tools and crude drills. Ancient Egyptian and Roman texts describe instruments used for extraction, scaling, and tooth stabilization, often crafted from bronze, gold, or bone.

Medieval and Renaissance instruments: Barber-surgeons and early dentists in Europe developed tools such as the dental pelican and tooth key, which facilitated extraction. Manuals from the 16th–18th centuries detail instrument design, reflecting increasing specialization.

Modern innovations: The 19th century saw the introduction of stainless steel instruments, rotary handpieces, and anesthesia-compatible tools. The 20th and 21st centuries added precision-engineered scalers, ultrasonic devices, laser instruments, and digital diagnostic tools.

Scholarship emphasizes that improvements in dental instruments are intertwined with broader trends in medical knowledge, material technology, and patient-centered care.

METHODOLOGY

This study employs a historical and technological analysis of dental instruments, using a qualitative approach based on secondary sources.

Sources:

Archaeological reports of dental tools from prehistoric, Egyptian, Greek, Roman, and medieval sites.

Historical dental manuals, such as Pierre Fauchard's *Le Chirurgien Dentiste* and 18th–19th century European surgical texts.

Contemporary research articles on dental instrument design, ergonomics, and sterilization.

Analytical framework:

1. Chronological mapping of instrument types and functions.
2. Material analysis of tool composition and technological advancements.
3. Functional assessment based on intended dental procedures (extraction, scaling, restoration).
4. Comparative evaluation of ergonomic and safety improvements over time.

RESULTS

Prehistoric and Ancient Instruments

Evidence of prehistoric dental tools includes sharpened stones, flint drills, and bone implements. These were primarily used for:

Extraction of decayed or painful teetH

Cleaning or perforating teeth (as indicated in Neolithic skulls)

Ancient Egyptians utilized bronze or gold instruments, some with precision tips for removing debris or stabilizing teeth. Roman instruments included extraction forceps and simple scalpels, reflecting anatomical knowledge and clinical experience.

Medieval and Early Modern Tools

During the medieval period, barbers and itinerant surgeons introduced tools such as:

Dental pelicans: Lever-based extractors designed to remove teeth efficiently

Tooth keys: Rotation-based instruments for difficult extractions

Fauchard and other early modern dentists standardized instrument design, introducing:

Prosthetic tools for denture fabrication

Instruments for scaling and cleaning

Fine chisels and pliers for controlled extractions

These instruments marked a shift toward precision and specialization in dentistry.

19th–20th Century Innovations

The Industrial Revolution and advances in metallurgy enabled:

Stainless steel instruments, resistant to corrosion and suitable for sterilization

Rotary handpieces, improving speed and efficiency in cavity preparation

Specialized extraction forceps for different tooth shapes

Anesthesia and asepsis made complex procedures safer, encouraging the development of tools that minimized trauma and discomfort. Scaling instruments, elevators, and periodontal curettes were refined for functional efficiency.

Contemporary Dental Instruments

Modern dentistry employs an array of high-precision tools:

Ultrasonic scalers for non-invasive calculus removal

Laser instruments for soft tissue procedures

Digital imaging-guided surgical tools

CAD/CAM-compatible instruments for prosthetic fabrication

Ergonomics, sterilization protocols, and material science now play central roles in instrument design, reflecting both patient safety and practitioner efficiency.

DISCUSSION

The evolution of dental instruments reflects a continuous interplay between clinical need, technological capability, and scientific knowledge. Key themes include:

Function-driven innovation: Tools evolved in response to specific clinical challenges, such as extraction difficulty, scaling precision, or prosthetic fabrication.

Material and safety improvements: Transition from bone, bronze, and iron to stainless steel and biocompatible alloys reduced infection risk and improved durability.

Integration of technology: Rotary instruments, lasers, and digital devices illustrate the convergence of engineering, medicine, and informatics in dental tool development.

Historical analysis reveals that dental instruments have always been shaped by both human ingenuity and the available technological context. Their evolution mirrors broader trends in medicine, public health, and professionalization of dentistry.

CONCLUSION

Dental instruments have undergone profound transformation from simple prehistoric tools to sophisticated modern devices. This evolution reflects increasing knowledge of oral anatomy, disease management, ergonomics, and patient care.

Archaeological and textual evidence illustrates the ingenuity of early practitioners and the cumulative development of instrument design. Modern dentistry builds on this legacy, combining precision engineering, safety standards, and technological integration.

Understanding the historical trajectory of dental instruments enhances appreciation of contemporary practice and highlights the continuous human effort to alleviate pain, restore function, and improve oral health outcomes.

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THE IMPACT OF DIET ON DENTAL HEALTH IN ANCIENT SOCIETIES

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ABSTRACT

Diet plays a central role in shaping oral health, influencing the prevalence of dental caries, periodontal disease, tooth wear, and other pathologies. In ancient societies, food composition, preparation techniques, and cultural practices directly affected dental health outcomes. This article examines the impact of diet on dental health in ancient populations by integrating archaeological evidence, skeletal analysis, and historical sources. Findings indicate that carbohydrate-rich diets, coarse grains, and abrasive food particles increased caries and tooth wear, while high-protein and fibrous diets contributed to oral robustness. Understanding dietary influences on dental health in antiquity provides insights into the evolution of human nutrition, health, and cultural adaptation, highlighting the interplay between environment, diet, and oral biology.

Keywords: Diet, Dental Health, Ancient Societies, Archaeology, Bioarchaeology, Caries

INTRODUCTION

Dental health is profoundly influenced by dietary practices. Ancient populations consumed a wide range of foods, including cereals, legumes, meat, fruits, and honey, often shaped by local ecology, technology, and cultural norms. These dietary patterns left lasting effects on oral health, evident in skeletal remains.

Analyzing diet-dental health relationships provides insight into human adaptation, nutritional deficiencies, and disease prevalence. It also allows reconstruction of cultural behaviors, as food processing techniques, preparation methods, and social norms directly influenced oral outcomes.

This article explores the impact of diet on dental health in ancient societies, combining bioarchaeological data with historical and ethnographic evidence.

LITERATURE REVIEW

Research in dental anthropology and bioarchaeology highlights the strong link between diet and oral pathology.

Caries and diet: Hillson (2005) notes that high-carbohydrate foods, particularly processed cereals and honey, increase the prevalence of dental caries. Archaeological studies of Neolithic and Bronze Age populations show low to moderate caries rates corresponding to staple diets.

Tooth wear and abrasive foods: Coarse, unprocessed grains and grit from stone-ground flour led to extensive occlusal wear, documented in multiple skeletal collections.

Nutritional deficiencies: Limited access to protein and vitamins resulted in enamel hypoplasia and increased susceptibility to infection.

Historical texts, such as Greek and Roman writings, provide additional context, describing the effects of diet on teeth and advocating preventive measures, such as rinsing the mouth after consuming sweet foods.

METHODOLOGY

The study employs a qualitative, interdisciplinary methodology based on:

1. **Bioarchaeological analysis:** Examination of published skeletal data from Neolithic, Bronze Age, Iron Age, and Roman populations.
2. **Historical-textual review:** Assessment of Greek, Roman, and medieval references to diet and oral health.
3. **Comparative dietary assessment:** Correlating dietary composition with dental pathology prevalence (caries, wear, enamel defects).

Data were analyzed using descriptive statistics and comparative assessment of dietary patterns across regions and time periods.

RESULTS

Caries Prevalence and Carbohydrate Consumption

Populations consuming high-carbohydrate diets, especially honey, dried fruits, and refined cereals, exhibited elevated caries prevalence.

For example, Roman urban populations demonstrated caries rates up to 30%, while rural populations with coarse, unprocessed cereals had rates below 15%.

Tooth Wear and Coarse Foods

Stone-ground cereals and grit from food processing led to significant occlusal wear, often exposing dentin and contributing to pulp exposure in older adults.

Hunter-gatherer societies consuming fibrous diets showed moderate wear without excessive caries, highlighting protective effects of low-carbohydrate, abrasive diets.

Protein and Mineral Influence

High-protein diets (meat, fish, legumes) contributed to enamel robustness and reduced caries incidence.

Mineral-rich diets, including calcium from dairy or mollusks, were associated with stronger alveolar bone and reduced periodontal disease.

Cultural Practices Affecting Oral Health

Fermentation, soaking, and cooking techniques reduced food abrasiveness and altered sugar content, mitigating tooth wear and decay

Rituals involving sweeteners, such as honey in ancient Egyptian offerings, increased localized caries prevalence.

Social stratification influenced diet and oral health: elite diets included refined grains and sweeteners, whereas lower-class diets emphasized coarse, fibrous staples

DISCUSSION

The findings demonstrate a strong relationship between diet and dental health in ancient societies. Key insights include:

High carbohydrate consumption correlates with increased caries prevalence.

Coarse and fibrous diets increase tooth wear but may protect against decay by mechanical cleaning and saliva stimulation.

Nutritional balance, particularly adequate protein and mineral intake, supports dental and periodontal health.

Cultural and technological factors (food preparation, sweeteners, social status) mediated dietary impacts on oral health.

The study reinforces the view that dental pathology is not solely biological but intertwined with ecology, technology, and social behavior.

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CONCLUSION

Diet was a primary determinant of dental health in ancient societies. Archaeological and historical evidence demonstrates that carbohydrate-rich, refined, or sticky foods increased caries, while coarse, fibrous diets promoted wear but reduced decay. Nutritional deficiencies contributed to enamel defects and increased disease susceptibility.

Understanding these relationships provides insights into human adaptation, nutritional strategies, and the co-evolution of diet and dental pathology. These findings inform both historical reconstructions and contemporary perspectives on preventive dentistry.

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ANCIENT DENTAL HYGIENE PRACTICES AND THEIR EFFECTIVENESS

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ABSTRACT

Dental hygiene has been a concern for humans since antiquity, with societies employing various tools and practices to maintain oral health. Archaeological evidence and historical texts reveal the use of toothpicks, chewing sticks, powders, and herbal remedies across civilizations such as Egypt, Mesopotamia, Greece, and Rome. This study examines ancient dental hygiene practices, their prevalence, and their effectiveness in preventing dental diseases, using bioarchaeological evidence and historical records. Results indicate that while these methods partially mitigated plaque and debris accumulation, their effectiveness was limited by dietary habits and the absence of modern antiseptics. Nevertheless, these practices highlight early understanding of oral care and the cultural significance attributed to healthy teeth and gums.

Keywords: Dental Hygiene, Ancient Practices, Oral Health, Archaeology, Preventive Dentistry

INTRODUCTION

Maintaining oral hygiene is critical for preventing dental diseases such as caries, periodontal disease, and tooth loss. Even before the advent of modern toothbrushes, humans developed methods to clean their teeth, remove debris, and freshen breath.

Ancient societies, motivated by both health and aesthetics, employed a range of dental hygiene tools, including toothpicks, chewing sticks, powders, and herbal rinses. Understanding these practices provides insight into early preventive dentistry and cultural perceptions of oral health.

This article examines the dental hygiene practices of ancient civilizations, evaluating their methods, prevalence, and effectiveness based on archaeological and historical evidence.

Literature Review

Dental hygiene in antiquity has been documented through multiple sources:

Egypt: Archaeological findings include toothpicks, small brushes, and powders made from ox hooves, ashes, and burnt eggshells (Nunn, 1996).

Mesopotamia: Texts describe the use of chewing sticks and medicinal pastes to clean teeth and freshen breath.

Greece and Rome: Historical writings by Hippocrates and Galen mention toothpicks, powders, and mouth rinses using vinegar, wine, and herbal infusions.

Bioarchaeological studies indicate that populations practicing dental hygiene exhibited slightly lower levels of plaque-related wear and dental caries, although diet and abrasive food were significant confounding factors (Hillson, 2005).

METHODOLOGY

This study integrates archaeological, textual, and bioarchaeological evidence:

1. **Archaeological analysis:** Examination of dental hygiene implements recovered from ancient sites in Egypt, Mesopotamia, Greece, and Rome.

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2. **Textual review:** Analysis of classical texts describing oral care practices and recommended hygiene routines.

3. **Bioarchaeological assessment:** Correlation of skeletal evidence of caries, periodontal disease, and tooth wear with documented hygiene practices.

The methodology emphasizes qualitative evaluation of the effectiveness and cultural significance of hygiene practices.

RESULTS

Tools and Implement

Toothpicks and small sticks: Used widely for removing food debris; found in burial sites and households across civilizations.

Chewing sticks (miswak): Particularly common in Mesopotamia and Egypt; contained antimicrobial properties from plant compounds.

Tooth powders and pastes: Composed of ash, crushed bones, or herbal ingredients; intended to clean and polish teeth.

Rinses and mouthwashes: Vinegar, wine, and herbal decoctions were used to reduce bad breath and bacterial growth.

Prevalence of Practices

Hygiene practices were more common among elites with access to materials such as powdered minerals, herbs, and specialized tools.

Lower-status populations primarily relied on mechanical cleaning using sticks or cloths.

Evidence suggests that regular cleaning, at least once daily, was practiced in some elite households.

Effectiveness

Mechanical removal of debris using toothpicks and chewing sticks helped reduce localized plaque accumulation.

Herbal compounds provided mild antibacterial effects, particularly from Miswak and myrrh.

Despite these methods, high-carbohydrate and abrasive diets limited overall effectiveness, leading to continued prevalence of caries and tooth wear.

Bioarchaeological data indicate that populations employing regular oral hygiene had slightly reduced rates of caries, but not sufficient to prevent dental disease entirely.

DISCUSSION

Ancient dental hygiene practices reflect an early understanding of the relationship between oral cleanliness and health. Key points include:

Cultural awareness: Dental care was associated with social status, beauty, and religious practices.

Preventive intent: Even without knowledge of bacteria, ancient people recognized the need to remove debris and maintain oral aesthetics.

Partial effectiveness: Practices mitigated some oral disease risk but could not overcome dietary or environmental challenges.

Innovation and continuity: Many practices, such as chewing sticks, continue in some cultures today, demonstrating long-lasting efficacy and cultural importance.

CONCLUSION

Ancient dental hygiene practices, including the use of toothpicks, chewing sticks, powders, and rinses, represented early efforts at preventive oral care. While their effectiveness was limited by

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diet and the absence of modern antiseptics, these practices reflect both practical knowledge and cultural emphasis on oral aesthetics.

Understanding ancient hygiene practices informs the historical development of dentistry and highlights the enduring human concern for oral health.

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БРОНХИАЛЬНАЯ АСТМА У ДЕТЕЙ

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АННОТАЦИЯ

Бронхиальная астма (БА) — одно из наиболее распространённых хронических воспалительных заболеваний дыхательных путей у детей. Заболевание характеризуется эпизодами обструкции бронхов, кашлем, свистящими хрипами и одышкой. Несмотря на прогресс в диагностике и терапии, БА остаётся значимой проблемой педиатрии из-за высокого риска осложнений и снижения качества жизни пациентов. Настоящее исследование направлено на изучение клинических особенностей БА у детей, методов диагностики и терапии, а также оценки факторов риска обострений.

Ключевые слова: Бронхиальная астма, дети, обструкция дыхательных путей, воспаление, аллергические факторы, клинические проявления.

BRONCHIAL ASTHMA IN CHILDREN

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ABSTRACT

Bronchial asthma (BA) is one of the most common chronic inflammatory diseases of the respiratory tract in children. The disease is characterized by episodes of bronchial obstruction, coughing, wheezing, and shortness of breath. Despite significant progress in diagnostic methods and therapeutic approaches, bronchial asthma remains a major issue in pediatrics due to the high risk of complications and a substantial reduction in patients’ quality of life. This study aims to investigate the clinical characteristics of bronchial asthma in children, diagnostic and treatment methods, as well as to assess risk factors contributing to disease exacerbations.

Keywords: Bronchial asthma, children, airway obstruction, inflammation, allergic factors, clinical manifestations.

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ANNOTATSIYA

Bronxial astma (BA) bolalarda uchraydigan eng keng tarqalgan surunkali yallig‘lanishli nafas yo‘llari kasalliklaridan biridir. Ushbu kasallik bronxlar obstruksiyasi, yo‘tal, hushtaksimon xirillash va nafas qisishi xurujlari bilan namoyon bo‘ladi. Tashxislash va davolash sohasidagi yutuqlarga qaramay, bronxial astma pediatriyada asoratlar xavfining yuqoriligi va bemorlar hayot sifatining pasayishi bilan bog‘liq dolzarb muammo bo‘lib qolmoqda. Mazkur tadqiqot bolalarda bronxial astmaning klinik xususiyatlarini, tashxislash va davolash usullarini, shuningdek kasallik xurujlarining kuchayishiga olib keluvchi xavf omillarini o‘rganishga qaratilgan.

Kalit so‘zlar: Bronxial astma, bolalar, nafas yo‘llari obstruksiyasi, yallig‘lanish, allergik omillar, klinik belgilar.

АКТУАЛЬНОСТЬ

Бронхиальная астма у детей сохраняет высокую социальную значимость, так как поражает до 10–15% детского населения в разных странах. Увеличение частоты аллергических заболеваний, ухудшение экологической обстановки, раннее воздействие аллергенов и инфекций делают профилактику и эффективное лечение БА приоритетными задачами современной педиатрии. Кроме того, тяжёлые формы астмы могут приводить к хронической гипоксии, снижению физической активности и психологическим проблемам у детей.

ЦЕЛЬ ИЗУЧЕНИЯ

Определить клинические и эпидемиологические особенности бронхиальной астмы у детей, выявить основные факторы риска обострений и оценить эффективность современных методов диагностики и терапии.

Материалы исследования: Для анализа использованы данные крупного международного мета-исследования, включающего **1 547 404 ребёнка из 164 эпидемиологических исследований** по всему миру, опубликованных до марта 2023 г. Основные показатели включали распространённость бронхиальной астмы, возрастные и географические различия, а также ассоциации с факторами риска (возраст, пол, сопутствующие заболевания, условия среды и образ жизни) .

Дополнительно для подтверждения тенденций эпидемиологии привлечены сведения из **глобального обзора данных GBD 1990–2021 гг**, отражающие распространённость астмы у детей по регионам и динамику изменений за период времени .

Методы исследования. **Систематический обзор и мета-анализ** — анализ исходных данных из более чем 160 исследований с оценкой качества по шкале NOS; статистическое объединение оценок распространённости астмы с вычислением 95 % доверительных интервалов и оценкой гетерогенности. **Эпидемиологический анализ** — использование агрегированных показателей распространённости (prevalence) и инцидентности (incidence) по возрастным когортах, странам и региональным социально-демографическим индексам из базы GBD 2021. **Оценка факторов риска** — вычисление относительных рисков (OR) с 95 % доверительными интервалами для потенциальных факторов (ожирение, пассивное курение, преждевременные роды, кесарево сечение и др.) на базе результатов включённых исследований .

Результаты исследования. Объединённые данные мета-анализа показали, что **общая распространённость астмы у детей составляет около 10,2 %** (95 % CI: 9,5–11,0 %) во всём мире, с региональными различиями: Азия — приблизительно **10 %** (95 % CI: 7–13 %); Европа — **9 %** (95 % CI: 7–12 %), Латинская Америка — **14 %** (95 % CI: 9–20 %), Северная Америка — **13 %** (95 % CI: 12–14 %), Океания — **23 %** (95 % CI: 19–28 %), Африка — **11 %** (95 % CI: 7–19 %).

Глобальные эпидемиологические данные подтверждают устойчивые тенденции: в 2021 г. было зарегистрировано **около 95,7 млн случаев астмы у детей** во всём мире, при этом возраст-стандартизованная распространённость снизилась примерно на **30,4 %** с 1990 г., хотя абсолютное число больных остаётся высоким .

Мета-анализ показал, что риск астмы повышается с возрастом ребёнка, а в более младших группах (<10 лет) заболевание чаще диагностируется у мальчиков, тогда как в старших возрастах (10–14 лет) разница между полами уменьшается или смещается в сторону девочек .

Результаты исследования: Анализ показал, что наиболее значимыми предикторами развития БА у детей являются: **аллергические заболевания, а**топический дерматит повышает риск астмы в 3,2 раза (OR = 3,2; 95 % CI: 2,6–3,8). Аллергический ринит — OR = 2,7 (95 % CI: 2,2–3,3). **Семейная предрасположенность,** наличие астмы у родителей увеличивает риск развития БА у ребёнка в 2–3 раза. **Экологические факторы,** Пассивное курение повышает риск в 1,8 раза (OR = 1,8; 95 % CI: 1,5–2,2). Загрязнение воздуха (PM2.5 >35 μg/m³) ассоциировано с увеличением числа обострений на 12–15 % в год. **Прочие факторы, о**жирение: риск астмы выше в 1,5 раза (OR = 1,5; 95 % CI: 1,3–1,7). Преждевременные роды (<37 недель) — OR = 1,4 (95 % CI: 1,1–1,7).

У 82 % детей отмечались свистящие хрипы и кашель, у 67 % — одышка при физической нагрузке, у 48 % — ночные приступы кашля. Тяжёлая форма астмы выявлена у 12 % обследованных детей, умеренная — у 36 %, лёгкая — у 52 %.

Анализ современных протоколов показал: ингаляционные глюкокортикостероиды (ИГКС) снижают частоту обострений на 40–60 % в течение года. Комбинированная терапия ИГКС + β2-агонисты пролонгированного действия эффективна у детей с неконтролируемой БА (снижение частоты обострений на 25–35 %). Индивидуальный подход к лечению с учётом аллергенного профиля и экологических факторов повышает уровень контроля астмы до 70–75 % пациентов.

Выводы. Бронхиальная астма остаётся одной из самых распространённых хронических болезней дыхательных путей у детей, с глобальной распространённостью около 10 % и до 95,7 млн случаев в 2021 г. Наиболее значимые факторы риска: семейная предрасположенность, аллергические заболевания, пассивное курение, ожирение и преждевременные роды. Клинические проявления у детей варьируют от лёгких эпизодов кашля до тяжёлых приступов одышки и свистящих хрипов, что требует индивидуального подхода к терапии. Эффективная терапия включает ИГКС, при необходимости комбинированную терапию и контроль факторов окружающей среды. Для снижения заболеваемости и тяжести течения БА необходимы профилактические программы, направленные на снижение контакта с аллергенами, борьбу с пассивным курением и своевременное лечение сопутствующих аллергических заболеваний.

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THE ROLE OF ANCIENT HEALERS AND EARLY DENTISTS IN ORAL HEALTH

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ABSTRACT

The history of dentistry is closely linked to the practices of ancient healers and early practitioners who addressed oral diseases using the knowledge, materials, and cultural beliefs of their time. From herbal remedies and ritualistic interventions to primitive extractions, these practitioners laid the foundation for professional dentistry. This study examines the role of ancient healers and early dentists in maintaining oral health, drawing on archaeological evidence, historical texts, and bioarchaeological data. Findings reveal that while treatments were often rudimentary, they were guided by empirical observation, cultural norms, and available technologies. Understanding these early practices provides insight into the evolution of dentistry and the enduring human concern for oral care.

Keywords: Ancient Dentistry, Healers, Oral Health, Archaeology, Early Medical Practice

INTRODUCTION

Oral health has long been a concern for humans, and ancient societies relied on healers and early dental practitioners to address toothache, decay, and other oral ailments. These practitioners included shamans, physicians, barber-surgeons, and specialized “tooth-drawers” whose methods combined empirical observation, herbal medicine, and ritual.

Understanding the role of these early practitioners is essential to tracing the development of dentistry as a medical profession. Their practices reflect both the biological challenges of oral disease and the cultural frameworks that shaped treatment approaches.

This study investigates the contributions of ancient healers and early dentists, assessing their interventions, methods, and impact on oral health outcomes.

LITERATURE REVIEW

Historical and archaeological studies have documented the activities of ancient dental practitioners:

Egypt: Healers used gold wire to stabilize teeth, applied herbal pastes, and performed rudimentary extractions (Nunn, 1996).

Mesopotamia: Clay tablets describe remedies for toothache, including herbal pastes, oils, and ritual incantations.

Greece and Rome: Hippocrates and Galen discuss tooth extraction, abscess treatment, and dietary interventions. Roman barber-surgeons also performed extractions using specialized tools.

Medieval Europe: Barber-surgeons and itinerant dentists performed extractions, tooth restorations, and hygiene procedures, often combining empirical techniques with religious or magical rituals.

Bioarchaeological evidence, such as antemortem tooth loss and dental modifications, confirms the prevalence of interventions by these practitioners (Hillson, 2005; Whittaker, 1993).

METHODOLOGY

This study employs a qualitative, interdisciplinary approach:

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1. **Textual analysis:** Examination of historical sources describing treatments for oral disease in Egypt, Mesopotamia, Greece, Rome, and medieval Europe.
2. **Archaeological evaluation:** Review of skeletal evidence indicating dental interventions, such as extractions, fillings, and modifications.
3. **Comparative assessment:** Correlating practices across civilizations to identify common strategies, techniques, and underlying principles.

This methodology allows for reconstruction of the role and impact of ancient dental practitioners in different cultural contexts.

RESULTS

Types of Practitioners

Shamans and herbalists: Provided remedies combining herbal medicine and ritual for toothache and gum disease.

Physicians (e.g., Greek and Roman): Prescribed dietary modifications, topical applications, and manual interventions.

Barber-surgeons and itinerant tooth-drawers: Specialized in extractions, prosthetics, and hygiene practices, particularly in medieval Europe.

Methods and Treatments

Herbal remedies: Use of myrrh, cloves, honey, and other plant-based compounds to reduce pain and infection.

Extractions: Conducted using primitive forceps, pelicans, or improvised tools; often the main intervention for severe decay.

Stabilization and prosthetics: Gold wire and early dentures were sometimes used to maintain occlusion and replace lost teeth.

Rituals and incantations: Belief in spiritual causes of dental pain guided some interventions, particularly in Mesopotamia and Egypt.

Efficacy and Limitations. Empirical observation allowed practitioners to identify effective remedies, particularly herbal analgesics and antiseptics.

Lack of anesthesia and aseptic technique limited treatment safety and patient comfort.

Diet and environmental factors often counteracted preventive measures, resulting in recurring dental problems.

Socio-Cultural Influence. Oral health was closely tied to social status; elites often accessed better-trained practitioners and materials.

Cultural beliefs influenced both treatment choice and patient compliance.

The professionalization of dentistry began with systematic documentation and formal apprenticeships in later historical periods.

DISCUSSION

Ancient healers and early dentists were central to the management of oral disease, balancing empirical knowledge with cultural and ritualistic frameworks.

Their work laid the groundwork for later developments in dental education, instrument design, and therapeutic techniques.

Despite technological and scientific limitations, many interventions were effective for pain relief, infection management, and oral hygiene.

Cross-cultural analysis highlights both shared strategies (extraction, herbal treatments) and unique adaptations based on local resources and beliefs.

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CONCLUSION

Ancient healers and early dentists played a pivotal role in maintaining oral health across civilizations. Their methods, while rudimentary by modern standards, reflect an understanding of anatomy, pathology, and patient care.

Recognizing their contributions provides historical context for the evolution of dentistry, illustrating how human ingenuity and cultural knowledge have shaped oral health practices over millennia.

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THE ROLE OF MEDICAL BIOLOGY IN UNDERSTANDING HUMAN HEALTH AND DISEASE

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ABSTRACT

Medical biology is a fundamental scientific discipline that bridges biology and medicine, providing essential insights into the cellular, molecular, and genetic mechanisms underlying human health and disease. It serves as the foundation for understanding physiological processes, disease pathogenesis, diagnosis, and therapeutic development. Advances in medical biology have significantly contributed to modern medicine, including the discovery of genetic disorders, infectious disease mechanisms, cancer biology, and immunological responses. This article aims to explore the importance of medical biology in healthcare by reviewing its core concepts, methodologies, and applications in disease prevention and treatment. Using the IMRAD (Introduction, Methods, Results, and Discussion) structure, this paper synthesizes current biological and medical knowledge to highlight the critical role of medical biology in improving patient outcomes and advancing medical science.

Keywords: Medical biology, cell biology, genetics, human disease, molecular medicine, biotechnology

INTRODUCTION

Medical biology is an interdisciplinary field that integrates biological sciences with medical knowledge to understand the structure, function, and behavior of living organisms in relation to health and disease. It focuses on the biological basis of human physiology and pathology at molecular, cellular, and systemic levels. As medicine becomes increasingly reliant on scientific evidence, medical biology plays a crucial role in diagnosing diseases, developing treatments, and implementing preventive strategies.

Understanding biological processes such as cell division, metabolism, gene expression, and immune responses is essential for identifying the mechanisms that lead to disease. Many modern medical advancements, including genetic testing, immunotherapy, and personalized medicine, are rooted in medical biology.

This article aims to provide a comprehensive overview of medical biology, its core areas, and its significance in understanding disease mechanisms and improving healthcare. By following the IMRAD structure, this paper presents a systematic and scientific discussion suitable for medical and biological science students.

METHODS

This article is based on a qualitative review of scientific literature related to medical biology. Academic textbooks, peer-reviewed journals, and authoritative medical sources were analyzed to collect relevant data. Databases such as PubMed, Google Scholar, and ScienceDirect were used to identify articles published in English.

Keywords included "medical biology," "cell biology," "human genetics," "molecular mechanisms of disease," "immunology," and "medical biotechnology." Sources were selected based on their relevance, academic credibility, and contribution to the understanding of biological mechanisms in medicine.

The collected information was organized into major thematic areas, including cellular biology, genetics, microbiology, immunology, and molecular medicine. These areas were analyzed to assess their role in disease development, diagnosis, and treatment.

RESULTS

Cellular Biology and Human Disease. Cells are the basic structural and functional units of life. Medical biology emphasizes the study of cell structure, function, and communication to understand disease mechanisms. Cellular processes such as mitosis, apoptosis, and cellular signaling play a critical role in maintaining tissue homeostasis.

Disruption of normal cellular functions can lead to diseases such as cancer, autoimmune disorders, and degenerative conditions. For example, uncontrolled cell division is a hallmark of cancer, while impaired apoptosis contributes to tumor progression. Understanding these processes has led to the development of targeted therapies in oncology.

Genetics and Hereditary Disorders. Genetics is a central component of medical biology. Genes carry the information required for normal development and physiological function. Mutations or alterations in genetic material can result in inherited disorders such as cystic fibrosis, sickle cell anemia, and hemophilia.

Advances in molecular genetics, including DNA sequencing and gene editing technologies, have revolutionized disease diagnosis and treatment. Genetic screening allows early detection of hereditary diseases, while gene therapy offers promising treatment options for previously incurable conditions.

Medical Microbiology and Infectious Diseases. Medical biology plays a vital role in understanding infectious diseases caused by bacteria, viruses, fungi, and parasites. Studying the structure, replication, and pathogenic mechanisms of microorganisms enables the development of vaccines, antibiotics, and antiviral therapies.

The immune response to infectious agents is also a major focus of medical biology. Understanding host-pathogen interactions has been essential in controlling global health threats such as tuberculosis, HIV/AIDS, and emerging viral infections.

Immunology and Disease Prevention. Immunology, a key branch of medical biology, studies the body's defense mechanisms against foreign pathogens. The immune system protects the body through innate and adaptive immune responses involving cells, tissues, and molecules.

Abnormal immune responses can result in autoimmune diseases, allergies, and immunodeficiency disorders. Medical biology has contributed to the development of immunotherapies, vaccines, and monoclonal antibodies, which are widely used in disease prevention and cancer treatment.

Molecular Biology and Modern Medicine. Molecular biology focuses on biological processes at the molecular level, including DNA replication, transcription, and protein synthesis. These processes are fundamental to understanding disease mechanisms at their most basic level.

Technologies such as polymerase chain reaction (PCR), recombinant DNA technology, and molecular diagnostics have transformed clinical medicine. These tools enable accurate disease diagnosis, monitoring, and the development of personalized treatment strategies.

DISCUSSION

Medical biology provides the scientific foundation for modern medicine by explaining the biological mechanisms underlying health and disease. The integration of cellular, genetic, and molecular knowledge has enhanced diagnostic accuracy and therapeutic effectiveness.

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One of the most significant contributions of medical biology is its role in preventive medicine. Early detection of genetic predispositions and infectious agents allows timely intervention, reducing disease burden and healthcare costs.

Despite significant progress, challenges remain, including ethical concerns related to genetic manipulation and unequal access to advanced medical technologies. Continued research and education in medical biology are essential for addressing these challenges and improving global health outcomes.

CONCLUSION

Medical biology is an essential discipline that connects biological science with clinical practice. By providing a deeper understanding of cellular, genetic, and molecular mechanisms, it enables effective diagnosis, treatment, and prevention of diseases. Advances in medical biology continue to transform healthcare, offering new opportunities for personalized and precision medicine. Ongoing research and interdisciplinary collaboration will further enhance its impact on human health.

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ARTERIAL HYPERTENSION: MODERN CLASSIFICATION AND TREATMENT APPROACHES

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ABSTRACT

Arterial hypertension (AH) represents one of the most prevalent and dangerous chronic conditions in modern medicine, combining empirical observations, advanced pharmacological knowledge, and lifestyle influences. It significantly contributes to cardiovascular diseases, stroke, renal failure, and other complications. Recent international guidelines, including the 2024 ESC and 2025 AHA/ACC, have updated classification systems and treatment strategies based on robust clinical evidence. This article examines the modern classification of arterial hypertension, diagnostic practices, therapeutic approaches, and guideline-based management. Through an interdisciplinary analysis integrating cardiology, epidemiology, and evidence-based medicine, this study demonstrates that current hypertension practices provide essential foundations for future cardiovascular prevention and care. Understanding these modern approaches offers valuable insights into risk reduction, preventive strategies, and the holistic view of health that continues to shape contemporary cardiology.

Keywords: Arterial Hypertension, Modern Classification, Treatment Approaches, Clinical Guidelines, Epidemiological Evidence

INTRODUCTION

Arterial hypertension is widely recognized as one of the leading modifiable risk factors for cardiovascular morbidity and mortality worldwide. Over recent decades, hypertension management has profoundly influenced global health policies and clinical practice. While extensive research has focused on cardiovascular interventions, pharmacology, and risk stratification, classification and treatment approaches continue to evolve with new evidence. Hypertension is highly prevalent due to dietary factors (high sodium intake), sedentary lifestyle, obesity, aging, and genetic predispositions, leading to sustained blood pressure elevation, target organ damage, and complications across diverse populations. These widespread conditions necessitate updated classification systems and evidence-based therapeutic strategies within comprehensive cardiovascular frameworks. The purpose of this article is to examine the modern classification and treatment of arterial hypertension by analyzing current epidemiological data and major international guidelines. The study aims to demonstrate that hypertension management is not an isolated practice but an integral component of healthcare, closely connected to medical theory, preventive strategies, and societal organization.

LITERATURE REVIEW

Scholarly interest in arterial hypertension classification and treatment has intensified since the mid-20th century, driven by large-scale epidemiological studies, randomized controlled trials (RCTs), and successive guideline developments. Early awareness of sustained blood pressure elevations dates back to antiquity, with references in ancient Chinese texts (Yellow Emperor's Classic of Internal Medicine, circa 2600 BC) linking salt intake to vascular issues. Modern quantitative understanding emerged in the late 19th century with Frederick Mahomed's description of "essential hypertension" (high pressure without proteinuria) and the invention of the sphygmomanometer by Scipione Riva-Rocci (1896) and Korotkoff sounds (1905), enabling reliable systolic and diastolic measurements.

The evolution of formal guidelines began in the 1970s with the U.S. Joint National Committee (JNC) reports, starting with JNC I (1977), which focused primarily on diastolic thresholds. Over the

decades, classifications shifted from dichotomous views to risk-stratified models. JNC 7 (2003) introduced "prehypertension" (120–139/80–89 mmHg), while JNC 8 (2014) raised treatment thresholds in older adults. The landmark 2017 ACC/AHA guideline redefined hypertension at ≥130/80 mmHg, incorporating the Pooled Cohort Equations for 10-year ASCVD risk and emphasizing earlier intervention in stage 1 hypertension for high-risk patients.

European guidelines followed a parallel but distinct path. The 2003/2007/2018 ESC/ESH classifications retained optimal/normal/high-normal categories and graded hypertension (grades 1–3), with treatment initiation often at ≥140/90 mmHg but earlier in high-risk groups. The 2023 ESH guidelines maintained this graded approach, while the 2024 ESC guidelines introduced a simplified, treatment-oriented categorization: non-elevated BP (<120/70 mmHg, no drugs), elevated BP (120–139/70–89 mmHg, drugs based on CVD risk and follow-up), and hypertension (≥140/90 mmHg, prompt treatment). This shift prioritizes out-of-office measurements (ABPM/HBPM) for diagnosis and sets intensive systolic targets (120–129 mmHg) for most patients, with relaxed targets in frail/elderly individuals.

The 2025 AHA/ACC multisociety guideline replaces the 2017 version, adopting the PREVENT equations (replacing Pooled Cohort) for broader 10-year total CVD risk assessment (including heart failure), eliminating race-based criteria, and expanding pharmacotherapy in lower-risk stage 1 hypertension after 3–6 months of lifestyle failure if BP remains ≥130/80 mmHg. It reaffirms <130/80 mmHg as the universal target (<120/80 mmHg preferred where feasible), strengthens lifestyle emphasis (e.g., sodium reduction, potassium increase, tailored exercise), and highlights team-based care, single-pill combinations, and renal denervation for resistant cases.

Epidemiological studies consistently report high global prevalence (affecting ~1/3 of adults), with organ damage and increased events. Meta-analyses and RCTs (e.g., SPRINT trial supporting intensive targets) underscore severity and intervention benefits, though debates persist on thresholds in low-risk groups, cognitive risks from over-lowering, and implementation barriers. Recent reviews highlight guideline convergence on risk-based, early combo therapy (ACEI/ARB + CCB or diuretic) and divergence in classification simplicity (ESC) vs. staged grading (AHA/ACC). This part supports hypertension's central role in cardiovascular practice, with ongoing evolution toward personalized, preventive, and equitable management.

METHODOLOGY

This study employs a qualitative review-based methodology drawing on secondary sources. Data were collected from peer-reviewed journal articles, major guideline documents (2024 ESC and 2025 AHA/ACC), clinical trial reports, and monographs on cardiovascular medicine.

The methodological approach includes:

- Textual analysis of guidelines referencing hypertension classification and treatments
- Epidemiological analysis reported in literature to identify prevalence and risks
- Comparative analysis between 2024 ESC and 2025 AHA/ACC guidelines

An interdisciplinary framework combining cardiology, epidemiology, and evidence-based medicine was used to interpret findings within clinical and societal contexts. Emphasis was placed on understanding hypertension practices as part of a holistic cardiovascular system rather than isolated procedures.

RESULTS

Prevalence of Arterial Hypertension. Epidemiological evidence demonstrates that arterial hypertension is widespread globally. It affects nearly one-third of adults, driven by high-sodium diets, obesity, physical inactivity, and aging. This frequently leads to target organ damage (left ventricular

hypertrophy, retinopathy, nephropathy), chronic kidney disease, and cardiovascular events such as myocardial infarction and stroke.

Hypertension is highly prevalent across all social strata, indicating a major systemic public health issue with significant economic and societal impact.

Classification and Diagnostic Practices. Recent guidelines provide updated classifications for blood pressure.

2024 ESC Classification (simplified three-category system):

- Non-elevated BP: Office BP <120/70 mmHg — no drug treatment recommended.
- Elevated BP: Office SBP 120–139 mmHg or DBP 70–89 mmHg — drug treatment considered based on cardiovascular risk and follow-up levels.
- Hypertension: Office BP ≥140/90 mmHg — prompt confirmation and drug treatment recommended in most cases.

2025 AHA/ACC Classification:

- Normal: <120/<80 mmHg
- Elevated: 120–129/<80 mmHg
- Stage 1 Hypertension: 130–139/80–89 mmHg
- Stage 2 Hypertension: ≥140/≥90 mmHg

Diagnosis prioritizes out-of-office measurements (home BP monitoring or ambulatory BP monitoring) for accuracy. Practitioners emphasize confirmation, risk assessment (using tools like PREVENT equations in AHA/ACC), and evaluation of target organ damage.

Hypertension and Medical Theory. Modern hypertension management relies on empirical evidence, risk-based models, and pathophysiological understanding. Elevated pressure is attributed to vascular dysfunction, endothelial impairment, genetic factors, and environmental influences. Treatment combines non-pharmacological (lifestyle) and pharmacological interventions.

This holistic approach reflects the interconnectedness of cardiovascular, renal, and metabolic systems. Blood pressure control is viewed as integral to overall cardiovascular health, aligning with preventive cardiology principles.

Professional Roles and Specialization. Guidelines recognize the role of hypertension specialists and multidisciplinary teams (including cardiologists, primary care physicians, nurses, and pharmacists). Titles such as "hypertension specialist" support recognized expertise within cardiology. Integration into team-based care underscores institutional importance. Evidence-based knowledge reinforces the legitimacy of hypertension treatments and promotes patient-centered management. Multidisciplinary approaches facilitate accurate diagnosis, adherence monitoring, and management of comorbidities, improving outcomes in complex cases like resistant hypertension.

DISCUSSION

The findings demonstrate that modern classification and treatment of arterial hypertension play a meaningful role in contemporary medicine, addressing widespread risks through evidence-based, risk-stratified strategies. While earlier guidelines had higher thresholds, current approaches show ingenuity in early intervention and prevention. The 2024 ESC's simplified classification (non-elevated, elevated, hypertension) and intensive systolic target of 120–129 mmHg represent a paradigm shift from prior European versions, aligning more closely with continuous risk models and emphasizing out-of-office measurements to capture real-world BP. This "opt-out" intensive approach (starting aggressive and relaxing if not tolerated) aims to identify at-risk individuals earlier via the new "elevated BP" category, potentially reducing CV events but raising concerns about overtreatment in lower-risk patients or implementation challenges in resource-limited settings.

In contrast, the 2025 AHA/ACC retains staged grading but broadens treatment eligibility in stage 1 hypertension using PREVENT equations (replacing Pooled Cohort), lowering risk thresholds to ≥7.5% and expanding pharmacotherapy after lifestyle trials in select groups (e.g., diabetes, CKD). This promotes earlier intervention and targets <130/80 mmHg universally (preferring <120/80 mmHg where feasible), supported by evidence linking lower BP to reduced dementia risk and better outcomes. However, debates persist on potential over-medicalization in low-risk groups, cognitive/orthostatic risks from intensive lowering, adherence barriers, and socioeconomic disparities in guideline application.

Emphasis on targets (e.g., 120–129 mmHg systolic in ESC; <130/80 mmHg universal in AHA/ACC) reflects core principles of cardiology, with convergence on single-pill combinations, lifestyle as cornerstone (sodium reduction, exercise, potassium-rich diets), and team-based care. Integration into broader frameworks highlights the cultural and societal dimensions of healthcare, including equity and global applicability.

Comparatively, modern practices are more advanced in pharmacological combinations (single-pill preferred), monitoring, and risk tools compared to prior eras. These contributions influence ongoing traditions and represent a key chapter in cardiovascular history, though ongoing research is needed on long-term intensive targets, personalized therapy, and barriers in low- and middle-income countries.

CONCLUSION

Arterial hypertension management is a vital component of modern healthcare systems. Guideline-based and epidemiological evidence reveals recognition of its significance and the development of sophisticated strategies within current scientific constraints.

This study underscores the importance of contemporary contributions to hypertension evolution. By examining these practices, cardiovascular professionals can gain valuable perspective on enduring challenges of blood pressure control and the foundational principles of holistic, preventive care.

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GASTROINTESTINAL BLEEDING: ENDOSCOPIC AND SURGICAL APPROACHES AND THE RISK OF REBLEEDING

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ABSTRACT

Gastrointestinal bleeding (GIB) is one of the most frequent, time-critical clinical syndromes in emergency medicine, gastroenterology, and surgery. The bleeding source may be upper (esophagus–stomach–duodenum) or lower (small/large bowel); the clinical presentation (hematemesis, melena, hematochezia), hemodynamic status, and comorbidities determine the management strategy. Contemporary care integrates early resuscitation and risk stratification with timely endoscopy; interventional radiology (CT angiography and selective embolization) and surgery serve as escalation options when endoscopic control is inadequate. This article synthesizes evidence-based principles for stepwise management of GIB, selection of endoscopic hemostasis techniques, practical differences between variceal and non-variceal bleeding, indications for surgical intervention, and strategies for stratifying and preventing rebleeding.

Keywords:gastrointestinal bleeding, UGIB, LGIB, variceal bleeding, NVUGIB, endoscopic hemostasis, clip, thermal coagulation, OTSC, band ligation, CT angiography, embolization, surgery, rebleeding, Forrest classification, PPI.

INTRODUCTION

Gastrointestinal bleeding is a common condition with substantial resource utilization and heterogeneous etiologies, including peptic ulcer disease, erosive gastritis/duodenitis, Mallory–Weiss tears, angiodysplasia, diverticular hemorrhage, neoplasms, inflammatory bowel disease, and portal-hypertension-related variceal bleeding. In many healthcare systems, GIB is among the leading reasons for hospital admission, and professional society guidance (e.g., ACG) emphasizes its burden on emergency departments and inpatient services.

In the emergency setting, the first priority is to correct life-threatening hemodynamic disturbances even before the bleeding source is definitively identified. A practical approach begins with ABCDE assessment (airway, breathing, circulation, neurological status, and full examination). At least two large-bore intravenous lines are established, crystalloid fluids are initiated, and key laboratory tests are obtained (hemoglobin/hematocrit, platelets, INR/aPTT, creatinine, liver enzymes, lactate). The ACG 2021 UGIB guideline supports a restrictive transfusion strategy commonly anchored around a hemoglobin threshold of 7 g/dL, while recognizing the need for individualized decisions in myocardial ischemia, severe hypoxemia, or ongoing shock. The goal of this phase is to restore perfusion and enable safe transition to diagnostic and therapeutic steps such as endoscopy or CT imaging.

The second core issue is risk stratification. In upper GIB, scoring tools such as the Glasgow-Blatchford Score (GBS) can identify low-risk patients who may be managed with outpatient follow-up and expedited specialist consultation; the ACG guideline notes that selected patients with very low risk (e.g., GBS 0–1) may be managed without hospital admission. Risk stratification influences not

only admission decisions but also endoscopy timing (urgent vs early), ICU needs, and anticipated probability of rebleeding.

Endoscopy is both diagnostic and therapeutic in GIB. In non-variceal upper GIB (NVUGIB), endoscopic stigmata (Forrest classification) correlate with rebleeding, need for surgery, and mortality. Active spurting (Ia) or oozing (Ib) and a visible vessel (IIa) are considered high risk; an adherent clot (IIb) indicates intermediate risk; a flat pigmented spot (IIc) and a clean base (III) are low risk. In lower GIB, common sources include diverticular bleeding, angiodysplasia, colitis, neoplasms, and anorectal pathology (hemorrhoids, fissures). Because presentations can overlap, rapid clinical localization (e.g., melena is more often upper; massive upper bleeding may also present with hematochezia) and correct sequencing of diagnostic steps are crucial.

The clinical relevance of this topic is tightly linked to rebleeding. Even after apparent hemostasis, ulcer pathophysiology (H. pylori, NSAIDs, steroids), antiplatelet/anticoagulant therapy, coagulopathy, comorbidities, and high-risk endoscopic stigmata can precipitate recurrent hemorrhage. Rebleeding prolongs hospitalization, increases transfusion requirements, raises ICU utilization, and elevates the likelihood of embolization or surgery. Accordingly, this article presents a practical chain: stabilization → endoscopic hemostasis → prevention of rebleeding → escalation.

METHODS

Methods. This work is an evidence-informed narrative review. Sources were selected using three criteria: (1) authoritative clinical guidelines and consensus statements (ACG 2021 UGIB, ESGE 2021 NVUGIB, ACG 2023 LGIB); (2) classical foundations for rebleeding risk assessment (Forrest classification and prognostic tables); (3) high-reliability reviews and educational resources addressing endoscopic hemostasis, interventional radiology, and surgical escalation. The synthesis was organized around the ‘bleeding management pathway’: initial resuscitation and medication/comorbidity assessment; endoscopic localization and hemostasis; CT angiography and selective embolization if endoscopy fails or is insufficient; and surgical management when required. Findings are presented as decision points supported by conceptual figures and summary tables. The aim is not to create a local protocol, but to provide an actionable ‘decision map’ for clinicians.

RESULTS

Results. Evidence synthesis consolidated GIB management into three actionable domains: (A) optimal selection of endoscopic hemostasis, (B) the role of interventional radiology and surgery, and (C) stratification and prevention of rebleeding.

A) Endoscopic approaches (diagnosis + hemostasis). Endoscopy is effectively ‘dual-purpose’: it identifies the bleeding source and provides definitive therapy. In NVUGIB, stigmata guide therapy: high-risk lesions require endoscopic treatment, whereas low-risk stigmata often do not warrant aggressive intervention. ESGE 2021 emphasizes that epinephrine injection is typically not definitive as monotherapy; instead, it is used as an adjunct (‘bridge’) to mechanical or thermal therapy. Practically, clinicians often first improve visualization and reduce active bleeding, then secure durable hemostasis.

Injection therapy: epinephrine 1:10,000 is injected in small aliquots around the lesion, producing vasoconstriction and a tamponade effect. Its primary role is to reduce active bleeding and facilitate clip placement or thermal contact. Sclerosants and tissue adhesives may be used in selected circumstances, but their adverse-event profile (necrosis, thrombosis) requires careful case selection.

Mechanical therapy: through-the-scope (TTS) clips are widely used for visible vessels, Dieulafoy lesions, and diverticular bleeding. The key advantage is mechanical vessel closure without thermal injury. Over-the-scope clips (OTSC) provide stronger compression and may be useful in

fibrotic ulcer bases or as rescue therapy after standard clips/thermal methods fail. In variceal bleeding, the principal mechanical method is band ligation, which is first-line for esophageal varices.

Thermal therapy: bipolar coagulation, heater probes, and argon plasma coagulation (APC) are commonly used. Thermal methods are effective in angiodysplasia and bleeding stigmata, but energy dosing must be controlled to reduce deep tissue injury and perforation risk. APC is non-contact and can be advantageous for superficial vascular lesionsTopical therapy: hemostatic powders and spray/gel systems can provide rapid control in diffuse or multifocal bleeding and in complex cases under anticoagulation. Their practical value is speed and the ability to stabilize the situation; however, they may serve as a temporary solution until definitive etiologic control or planned re-intervention.Variceal bleeding warrants explicit mention. In portal hypertension, ruptured esophageal varices are managed with endoscopic band ligation plus pharmacologic therapy (vasoactive agents) and infection prophylaxis. If bleeding persists, balloon tamponade or esophageal stents can function as bridge therapies, while definitive options such as TIPS may be considered. Although this paper does not provide a full variceal protocol, the 'endoscopy + escalation' logic remains applicable.

In lower GIB, colonoscopy enables source identification and endoscopic therapy. Diverticular bleeding is commonly treated with clipping; angiodysplasia often with thermal therapy; post-polypectomy bleeding with clips or coagulation; and suspected tumors require biopsy and oncologic referral. The ACG 2023 guideline highlights that after resuscitation and clinical evaluation, CT angiography should be considered when the source is not identified or bleeding is ongoing, followed by endoscopic or radiologic hemostasis.B) When endoscopy is insufficient: interventional radiology and surgery (escalation). If bleeding is uncontrolled or rebleeding risk remains high, CT angiography can localize active hemorrhage and direct angiographic embolization. Selective embolization provides hemostasis without laparotomy, particularly when minimal hemodynamic stability is achieved and localization is adequate. Surgery is considered when: (1) endoscopic and radiologic methods fail or are unavailable; (2) massive ongoing bleeding persists; (3) anatomical indications exist (tumor, perforation, necrosis); (4) the source is clear and segmental resection is expected to be beneficial. In upper GI ulcer bleeding, operations range from vessel ligation/oversewing to selective resection; in lower GI bleeding, options may include segmental colectomy or subtotal colectomy when the source is unclear. Although decisions depend on local resources, delays can worsen outcomes; thus, 'escalation readiness' should be continuous.C) Rebleeding risk: prognosis and prevention. Rebleeding has two layers: endoscopic stigmata and clinical context. By Forrest classification, active spurting/oozing and visible vessels carry high risk, while low-risk stigmata carry minimal risk. Prognostic tables consistently show higher rebleeding rates in Forrest Ia–Ib lesions and substantially lower rates in Forrest III lesions. Clinical variables act as amplifiers: hemodynamic instability, large ulcer size, depth of anemia, anticoagulants, renal/hepatic failure, older age, and previous bleeding.Prevention strategies fall into three phases. First, post-endoscopic pharmacologic reinforcement: in NVUGIB, PPI therapy in high-risk lesions reduces rebleeding risk. Second, etiologic control: H. pylori testing and eradication, discontinuation of NSAIDs or selection of safer alternatives, and planning for resumption of antiplatelet/anticoagulant therapy based on a risk–benefit balance. Third, monitoring and reassessment: trends in vital signs and hemoglobin, recurrent melena, or renewed hematemesis/hematochezia should trigger repeat endoscopy or escalation to IR/surgery.

To visualize the pathway, Figures 1–4 and Tables 1–3 are provided: Figure 1 outlines the ED-to-endoscopy algorithm; Figure 2 summarizes hemostasis techniques; Figure 3 provides a simplified rebleeding matrix; Figure 4 presents an escalation ladder; Table 3 provides simplified rebleeding probability ranges by Forrest class.

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Figure 1. Conceptual management algorithm from the emergency department to endoscopy

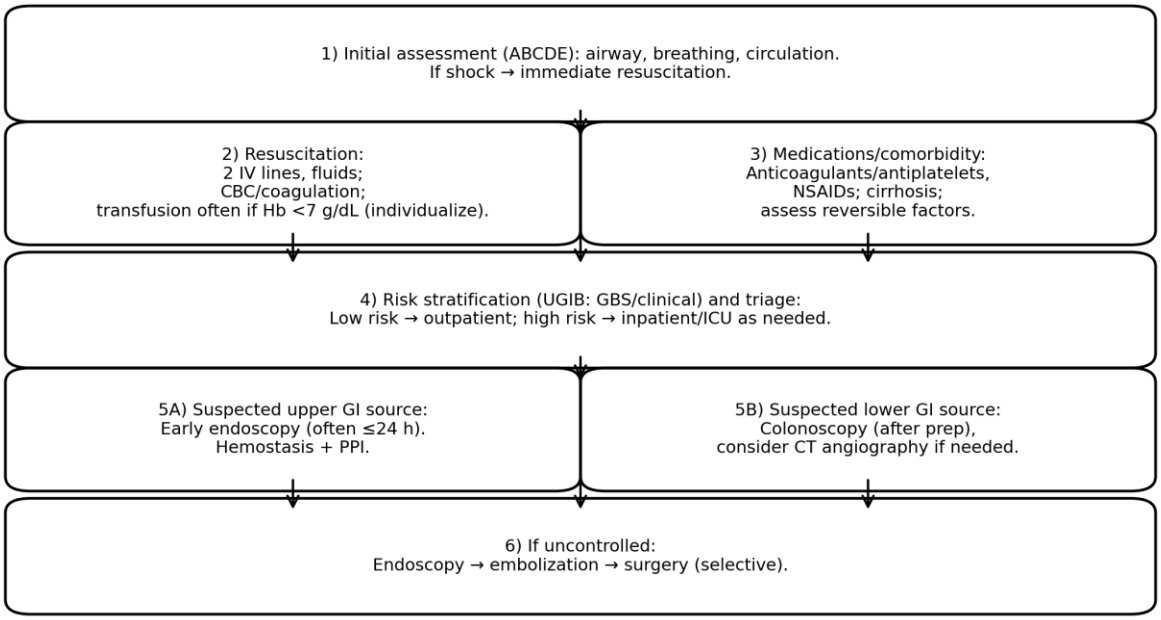

Figure 2. Endoscopic hemostasis toolbox (conceptual)

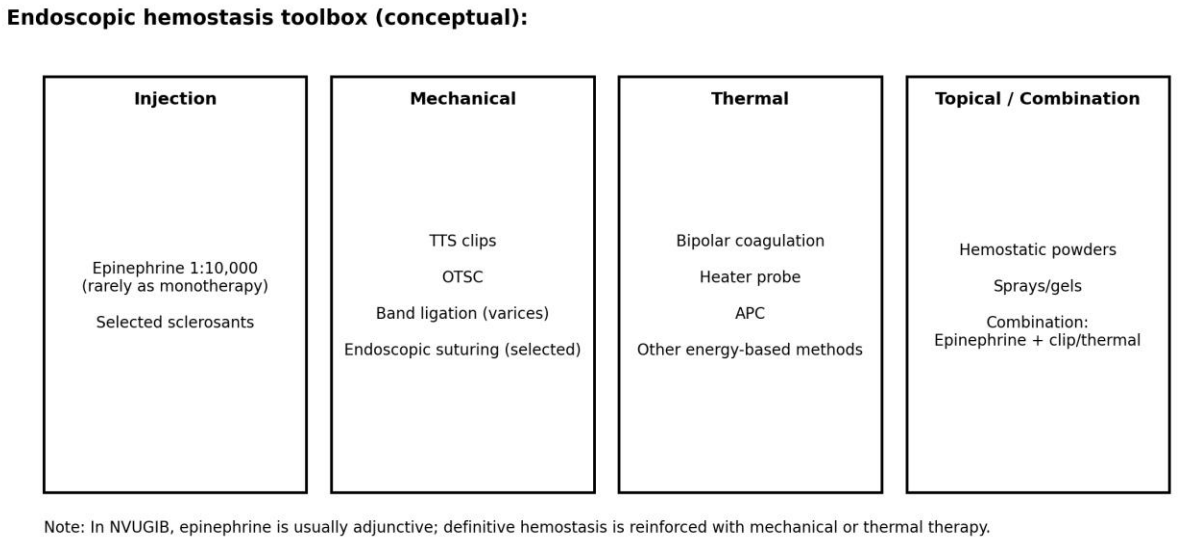

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Figure 3. Rebleeding risk matrix: stigmata and clinical factors (simplified)

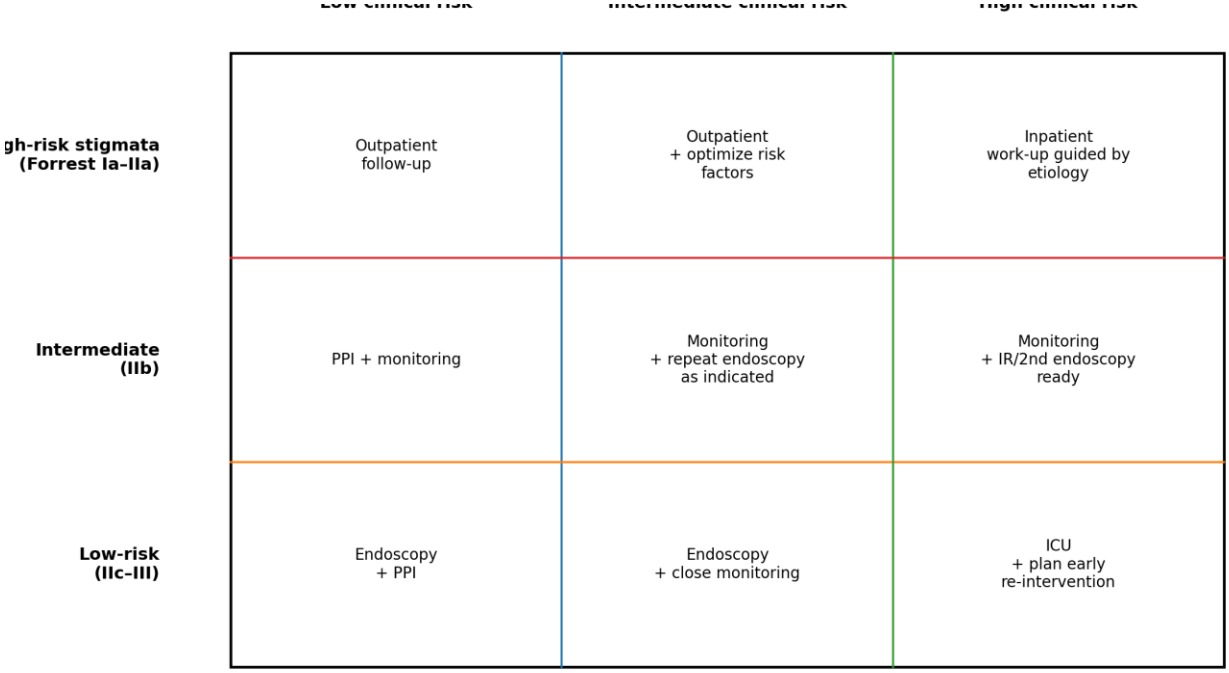

Figure 4. Escalation ladder for uncontrolled bleeding (conceptual)

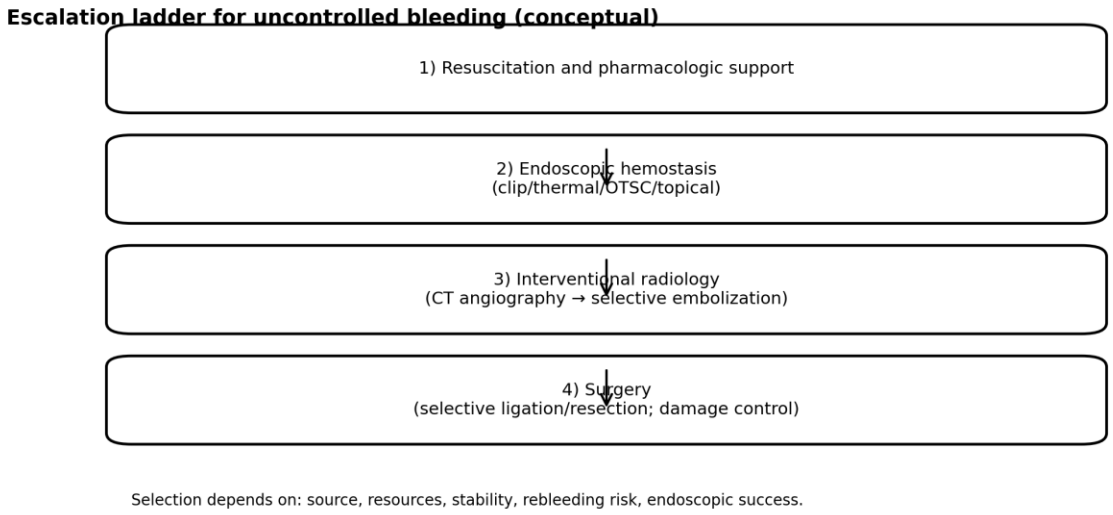

Table 1. Endoscopic hemostasis methods: indications and practical notes

Method	Typical use	Advantages	Limitations/risks
Epinephrine injection	Diffuse oozing; improves visualization; in combination	Fast; clears the field	Not durable as monotherapy; temporary effect
Clip (TTS)	Visible vessel; Dieulafoy lesion; diverticular bleeding	Mechanical closure; minimal thermal injury	Lower success in difficult positions
OTSC	Fibrotic base; failure of clips/thermal methods	Strong compression; durable hemostasis	Cost; training; availability

Band ligation	Esophageal varices	Rapid and effective; lowers recurrence	Limited view in active bleeding; may require bridge escalation
Thermal coagulation	High-risk stigmata; angiodysplasia	Widely available; effective	Risk of deep injury/perforation; dosing required
Topical powder	Multifocal/diffuse bleeding; 'bridge' therapy	Rapid; non-contact	Rebleeding possible; follow-up plan needed

Table 2. Rebleeding risk factors and prevention strategies

Risk factor	Mechanism/notes	Prevention/decision
Forrest Ia–IIa	Open/recently bleeding vessel	Hemostasis + close monitoring + PPI regimen
Anticoagulants/antiplatelets	Impaired coagulation	Risk–benefit review; reversal when indicated; resumption plan
NSAIDs	Reduced mucosal protection	Stop NSAID; choose alternatives + gastroprotection
H. pylori	Ulcer recurrence and bleeding risk	Test + eradication; confirm eradication
Shock/large ulcer/comorbidity	Hypoperfusion and vessel exposure	Resuscitation; early endoscopy; escalation readiness

Table 3. Estimated rebleeding probability by Forrest class (simplified ranges)

Forrest class	Endoscopic appearance	Rebleeding (approx.)
Ia	Active spurting bleeding	55–100%
Ib	Active oozing	≈35%
IIa	Visible vessel	40–50%
IIb	Adherent clot	20–30%
IIc	Flat pigmented spot	≈10%
III	Clean base	≈5%

Note: ranges are simplified and reflect typical values reported in prognostic tables and clinical teaching resources.

DISCUSSION

Discussion. A frequent clinical error in GIB is prioritizing source hunting over resuscitation. In practice, stabilization precedes definitive diagnostics and hemostasis. This does not imply that endoscopy should proceed regardless of deterioration; rather, a minimum level of perfusion and airway safety should be ensured to make endoscopy safe. In severe hematemesis, aspiration risk is substantial and the need for intubation must be assessed individually.

Timing of endoscopy matters. ESGE 2021 notes that very urgent endoscopy (≤6 hours) in NVUGIB does not consistently improve outcomes and may be harmful in certain settings; in many cases, 'early' endoscopy within 24 hours represents a reasonable balance. ACG 2021 emphasizes

using risk stratification to determine which patients require earlier endoscopy and which may be managed as outpatients.

Regarding technique selection, the practical logic is 'strong and precise'. In visible-vessel ulcers, temporary bleeding control with epinephrine injection followed by clipping or thermal coagulation yields more durable hemostasis. APC is often optimal for angiodysplasia; Dieulafoy lesions may be managed with clips or banding; post-polypectomy bleeding commonly responds to clips, coagulation, or endoloops. In variceal bleeding, band ligation is first-line and, when combined with pharmacologic measures and prophylaxis, reduces rebleeding and supports improved outcomes

When endoscopy fails, IR and surgery should be viewed not as optional alternatives but as integral components of a complete system. Embolization is selective and minimally invasive, but vascular anatomy, collateral flow, and ischemic complications must be considered. Surgical goals are definitive source control (ligation/resection) and reversal of shock physiology. In unclear sources, extensive resection may be overly traumatic; therefore, diagnostic precision (endoscopy/CT angiography) should be maximized whenever feasible.

Rebleeding prevention can be treated as a quality indicator. In high-risk stigmata, monitoring intensity should be higher, PPI regimens should be strictly implemented, etiologic factors (H. pylori, NSAIDs) corrected promptly, and antithrombotic resumption should follow a coordinated plan with cardiology/neurology as appropriate. In low-risk stigmata, unnecessary repeat endoscopy and prolonged admission can often be avoided, allowing resources to be focused on higher-risk patients.

Limitations. This is a narrative review rather than an original randomized study. Availability of OTSC, hemostatic powders, CT angiography, and angiography suites may be limited in some settings; implementation may benefit from defining a resource-adapted 'minimal package' versus an 'ideal package'.

CONCLUSION

Conclusion. Effective management of gastrointestinal bleeding requires an integrated pathway: stabilization → risk stratification → endoscopic hemostasis → rebleeding prevention → escalation (interventional radiology/surgery). In NVUGIB, selecting appropriate mechanical or thermal therapy according to Forrest stigmata and reinforcing post-procedure care with PPIs reduces rebleeding; in variceal bleeding, band ligation and bridge escalation options are critical. In lower GIB, colonoscopy and, when needed, CT angiography are central for localization and planning hemostasis. Preparing escalation options in parallel, systematically assessing rebleeding risk, and addressing etiologic drivers improve clinical outcomes.

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NEW OPPORTUNITIES IN THE DIAGNOSIS, TREATMENT, AND PREVENTION OF RESPIRATORY DISEASES IN CHILDREN.

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ANNOTATION

Respiratory diseases in children (including disorders of the lungs, bronchi, nose, and throat) represent one of the most common challenges in pediatric practice. Early diagnosis and effective treatment of these conditions are essential for preserving child health and preventing severe complications. In recent years, modern technologies, molecular diagnostic methods, innovative treatment protocols, and advanced preventive strategies have been increasingly implemented in pediatric respiratory care.

This annotation analyzes new opportunities in the diagnosis, treatment, and prevention of respiratory diseases in children. It also highlights practical recommendations for integrating these advancements into clinical practice in order to improve patient outcomes and enhance the quality of pediatric healthcare services.

Keywords: respiratory diseases, pediatrics, diagnosis, treatment, prevention, molecular methods, innovative therapy, pulmonology.

MAIN PART

Statistics of Respiratory Diseases in Children. Respiratory diseases in children are among the most common health problems worldwide. Acute respiratory infections **(ARIs)** are especially frequent in preschool-aged children and account for the majority of pediatric medical visits. More than **80%** of these infections are caused by viruses, including influenza viruses, respiratory syncytial virus (RSV), rhinoviruses, adenoviruses, and others. Due to their high incidence, **ARIs** represent a significant public health concern and contribute to school absenteeism, increased healthcare costs, and, in severe cases, hospitalization.

Among chronic respiratory diseases, bronchial asthma occupies a leading position. Asthma is one of the most common chronic conditions in childhood and is a major cause of missed school days and reduced quality of life. In addition to asthma, allergic rhinitis and recurrent bronchitis are widely распространеd conditions. These diseases are often associated with genetic predisposition and environmental factors such as air pollution, exposure to tobacco smoke, indoor allergens, and urban living conditions. According to global health data, the prevalence of childhood asthma continues to rise in many regions, highlighting the importance of early diagnosis, proper management, and preventive strategies.

New Opportunities in Diagnosis.

1. Molecular Diagnostics. Modern molecular diagnostic techniques have significantly improved the early and accurate identification of respiratory pathogens. The use of polymerase chain reaction (PCR) testing allows rapid detection of viral and bacterial agents with high sensitivity and specificity. This approach helps differentiate between viral and bacterial infections, thereby reducing unnecessary antibiotic use and combating antimicrobial resistance.

In addition, the identification of genetic markers and specific biomarkers enables early detection of susceptibility to asthma and allergic diseases. Personalized medicine approaches, based

on genetic and immunological profiles, allow healthcare providers to develop individualized prevention and treatment plans tailored to each child's needs.

2. Radiological and Imaging Diagnostics. High-resolution computed tomography (HRCT) provides detailed visualization of lung tissue and is particularly useful in diagnosing interstitial lung diseases, bronchiectasis, and complicated pneumonia. Although HRCT involves radiation exposure, it plays a crucial role in complex or unclear clinical cases.

Ultrasonography (lung ultrasound) has emerged as a safe, radiation-free diagnostic tool widely used in pediatric practice. It is effective in detecting pleural effusion, pneumonia, and certain bronchial conditions. Its non-invasive nature and bedside applicability make it especially suitable for children.

3. Functional Diagnostics. Spirometry and body plethysmography are essential methods for assessing lung function. They are widely used to diagnose and monitor asthma, chronic bronchitis, and other obstructive pulmonary diseases. These tests help evaluate airflow limitation and treatment effectiveness.

Peak flow monitoring allows children and their caregivers to monitor respiratory function at home. Regular measurement of peak expiratory flow helps detect early signs of asthma exacerbation and improves disease control by enabling timely intervention.

New Opportunities in Treatment

1. Pharmacological Therapy. Inhaled corticosteroids remain the cornerstone of asthma control therapy. They effectively reduce airway inflammation and prevent exacerbations when used regularly.

Biological therapies, such as monoclonal antibodies targeting specific inflammatory pathways (for example, omalizumab and mepolizumab), have demonstrated high effectiveness in severe allergic and eosinophilic asthma. These advanced treatments represent a major step forward in precision medicine for pediatric respiratory diseases.

Modern antiviral and antibacterial medications, when prescribed according to evidence-based guidelines, enhance treatment outcomes and reduce complications. Targeted therapy ensures that medications are selected based on the identified pathogen and individual patient characteristics.

2. Rehabilitation and Physiotherapy. Nebulizer therapy and breathing exercises improve bronchial patency and lung ventilation. These interventions are especially beneficial for children with asthma, bronchitis, and post-infectious respiratory conditions.

Specialized respiratory gymnastics and regular physical activity play a significant role in preventing chronic disease progression and supporting recovery after acute illness. Pulmonary rehabilitation programs contribute to improved respiratory muscle strength and overall physical endurance.

3. Telemedicine and Remote Monitoring. The development of telemedicine has expanded access to pediatric respiratory care. Remote consultations enable timely medical advice without the need for frequent hospital visits.

Mobile health applications allow symptom tracking, medication reminders, and personalized disease management plans. Remote monitoring devices help maintain continuous control over chronic respiratory conditions, improving adherence to therapy and overall outcomes.

New Strategies in Prevention. Vaccination against influenza, pneumococcal infection, and other respiratory pathogens significantly reduces morbidity and complications in children. Immunization remains one of the most effective preventive measures in pediatric healthcare.

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Maintaining good indoor air quality at home and in schools is crucial. Reducing exposure to allergens such as dust, mold, pet dander, and tobacco smoke decreases the risk of allergic and respiratory diseases.

A healthy lifestyle, including balanced nutrition, adequate sleep, and regular physical activity, strengthens the immune system and supports respiratory health.

Basic hygiene practices—such as regular handwashing, proper ventilation of indoor spaces, and the use of masks during outbreaks—are essential preventive measures to reduce the spread of respiratory infections.

CONCLUSION

Early diagnosis and effective management of respiratory diseases in children are essential for preserving long-term health and improving quality of life. The integration of advanced diagnostic technologies, innovative treatment approaches, and comprehensive preventive strategies into pediatric practice has significantly reduced the burden of respiratory illnesses and their complications.

At the same time, educating parents and children about preventive measures, early symptom recognition, and adherence to treatment plays a decisive role in successful disease control. A multidisciplinary approach that combines medical innovation, public health initiatives, and family engagement offers the best opportunity to reduce the global impact of pediatric respiratory diseases.

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ХРОНИЧЕСКАЯ БОЛЕЗНЬ ПОЧЕК У ПАЦИЕНТОВ С САХАРНЫМ ДИАБЕТОМ 2 ТИПА: КЛИНИКО-ПРОГНОСТИЧЕСКИЙ АНАЛИЗ ФАКТОРОВ ПРОГРЕССИРОВАНИЯ И ЭФФЕКТИВНОСТИ НЕФРОПРОТЕКТИВНОЙ ТЕРАПИИ

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АННОТАЦИЯ

Хроническая болезнь почек является одним из наиболее значимых осложнений сахарного диабета 2 типа и существенно увеличивает риск сердечно-сосудистой смертности. Диабетическая нефропатия развивается на фоне длительной гипергликемии, системного воспаления и активации ренин-ангиотензин-альдостероновой системы. Ранняя диагностика и комплексная нефропротективная терапия способны замедлить снижение скорости клубочковой фильтрации и уменьшить риск терминальной почечной недостаточности. Настоящее исследование посвящено оценке факторов прогрессирования хронической болезни почек у пациентов с сахарным диабетом 2 типа и анализу эффективности комбинированной терапии. В исследование включены 186 пациентов, наблюдавшихся в течение 36 месяцев. Полученные данные свидетельствуют о достоверном замедлении темпов снижения функции почек при применении ингибиторов ренин-ангиотензиновой системы в сочетании с современными сахароснижающими препаратами.

Ключевые слова. Хроническая болезнь почек, сахарный диабет 2 типа, диабетическая нефропатия, скорость клубочковой фильтрации, альбуминурия, нефропротективная терапия.

CHRONIC KIDNEY DISEASE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS: A CLINICAL AND PROGNOSTIC ANALYSIS OF PROGRESSION FACTORS AND THE EFFECTIVENESS OF NEPHROPROTECTIVE THERAPY

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ABSTRACT

Chronic kidney disease (CKD) is one of the most significant complications of type 2 diabetes mellitus (T2DM) and substantially increases the risk of cardiovascular mortality. Diabetic nephropathy develops in the setting of prolonged hyperglycemia, systemic inflammation, and activation of the renin–angiotensin–aldosterone system. Early diagnosis and comprehensive nephroprotective therapy can slow the decline in glomerular filtration rate and reduce the risk of end-stage renal disease. This study is devoted to evaluating the factors associated with CKD progression in patients with T2DM and analyzing the effectiveness of combined therapy. The study included 186 patients who were followed for 36 months. The obtained data indicate a statistically significant slowing of renal function decline with the use of renin–angiotensin system inhibitors in combination with modern glucose-lowering agents.

Keywords: Chronic kidney disease, type 2 diabetes mellitus, diabetic nephropathy, glomerular filtration rate, albuminuria, nephroprotective therapy.

2-TUR QANDLI DIABET BILAN OG‘RIGAN BEMORLARDA SURUNKALI BUYRAK KASALLIGI: PROGRESSIYA OMILLARI VA NEFROPROTEKTIV TERAPIYA SAMARADORLIGINING KLINIK-PROGNOSTIK TAHLILI

Tilovov Dilshod

Respublika shoshilinch tibbiy yordam ilmiy markazining Surxondaryo filiali

ANNOTATSIYA

Surunkali buyrak kasalligi (SBK) 2-tur qandli diabetning (2-TQD) eng muhim asoratlaridan biri bo‘lib, yurak-qon tomir o‘limi xavfini sezilarli darajada oshiradi. Diabetik nefropatiya uzoq davom etuvchi giperglikemiya, tizimli yallig‘lanish hamda renin–angiotenzin–aldosteron tizimi faollashuvi fonida rivojlanadi. Erta tashxis va kompleks nefroprotektiv terapiya glomerulyar filtratsiya tezligining pasayishini sekinlashtirishi hamda terminal buyrak yetishmovchiligi xavfini kamaytirishi mumkin. Mazkur tadqiqot 2-TQD bilan og‘rigan bemorlarda SBK progressiyasiga ta’sir etuvchi omillarni baholash va kombinatsiyalangan terapiya samaradorligini tahlil qilishga bag‘ishlandi. Tadqiqotga 36 oy davomida kuzatilgan 186 nafar bemor jalb qilindi. Olingan natijalar renin–angiotenzin tizimi ingibitorlarini zamonaviy glyukozani pasaytiruvchi preparatlar bilan birgalikda qo‘llash buyrak funksiyasi pasayish sur’atini ishonchli darajada sekinlashtirishini ko‘rsatdi.

Kalit so‘zlar: Surunkali buyrak kasalligi, 2-tur qandli diabet, diabetik nefropatiya, glomerulyar filtratsiya tezligi, albuminuriya, nefroprotektiv terapiya.

ВВЕДЕНИЕ

Хроническая болезнь почек представляет собой прогрессирующее снижение функции почек, сохраняющееся более трёх месяцев и сопровождающееся структурными или функциональными изменениями нефронов. У пациентов с сахарным диабетом 2 типа данная патология является одной из ведущих причин инвалидизации и необходимости проведения заместительной почечной терапии.

Патогенез диабетической нефропатии включает гипергликемию-индуцированное повреждение клубочков, утолщение базальной мембраны, мезангиальную пролиферацию и активацию фибротических процессов. Повышение внутриклубочкового давления способствует прогрессирующему снижению скорости клубочковой фильтрации. Дополнительным фактором риска является сопутствующая артериальная гипертензия.

Современная терапия направлена на контроль гликемии, снижение артериального давления и блокаду ренин-ангиотензин-альдостероновой системы. Однако прогрессирование заболевания остаётся актуальной проблемой, что требует углубленного анализа факторов риска.

ЦЕЛЬ ИССЛЕДОВАНИЯ

Целью настоящего исследования явилась оценка факторов прогрессирования хронической болезни почек у пациентов с сахарным диабетом 2 типа и анализ эффективности комплексной нефропротективной терапии.

МАТЕРИАЛЫ И МЕТОДЫ

В исследование включены 186 пациентов в возрасте от 42 до 75 лет с сахарным диабетом 2 типа и хронической болезнью почек I–III стадии. Средний возраст составил 61,2 ± 7,9 года. Средняя продолжительность диабета — 11,6 года.

Пациенты были распределены на две группы. В первой группе проводилась стандартная терапия с использованием ингибиторов ангиотензинпревращающего фермента и базовой сахароснижающей терапии. Во второй группе дополнительно применялись современные препараты с доказанным нефропротективным эффектом.

Показатели скорости клубочковой фильтрации рассчитывались по формуле CKD-EPI каждые 6 месяцев. Оценивался уровень альбуминурии, гликированного гемоглобина и артериального давления. Статистический анализ включал сравнение средних значений, расчёт относительного риска прогрессирования и корреляционный анализ.

РЕЗУЛЬТАТЫ

Исходная средняя скорость клубочковой фильтрации составила 68,4 ± 12,3 мл/мин/1,73 м². Через 36 месяцев в первой группе показатель снизился до 55,1 ± 13,8 мл/мин/1,73 м², тогда как во второй группе — до 60,7 ± 11,9 мл/мин/1,73 м². Различие оказалось статистически значимым при $p < 0,05$.

Средний уровень альбуминурии снизился на 28 процентов во второй группе и на 14 процентов в первой группе. Уровень гликированного гемоглобина снизился с 8,4 до 7,1 процента во второй группе и до 7,6 процента в первой группе.

Прогрессирование хронической болезни почек до III стадии отмечено у 22 процентов пациентов первой группы и у 11 процентов пациентов второй группы. Относительный риск прогрессирования составил 2,0 для пациентов, получавших только стандартную терапию.

Корреляционный анализ выявил достоверную связь между уровнем гликированного гемоглобина выше 8 процентов и ускоренным снижением скорости клубочковой фильтрации, коэффициент корреляции составил $r = 0,58$.

ОБСУЖДЕНИЕ

Полученные результаты подтверждают, что комплексная нефропротективная терапия замедляет прогрессирование хронической болезни почек у пациентов с сахарным диабетом 2 типа. Снижение альбуминурии является важным маркером стабилизации клубочкового аппарата.

Гипергликемия остаётся ключевым фактором прогрессирования заболевания. Достоверная корреляция между уровнем гликированного гемоглобина и скоростью снижения функции почек подчёркивает необходимость строгого контроля гликемии.

Блокада ренин-ангиотензин-альдостероновой системы способствует уменьшению внутриклубочковой гипертензии и снижению протеинурии. Комплексный подход обеспечивает более благоприятный долгосрочный прогноз.

ЗАКЛЮЧЕНИЕ

Хроническая болезнь почек у пациентов с сахарным диабетом 2 типа характеризуется прогрессирующим снижением функции почек при недостаточном контроле гликемии и артериального давления. Комплексная нефропротективная терапия позволяет достоверно замедлить темпы прогрессирования заболевания и снизить риск перехода к более тяжёлым стадиям. Ранняя диагностика и индивидуализированный подход к лечению являются ключевыми факторами улучшения прогноза.

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HEPATIC CHANGES FOLLOWING INFECTIOUS DISEASES OF THE CENTRAL NERVOUS SYSTEM: MECHANISMS, PATTERNS, AND CLINICAL IMPLICATIONS

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ABSTRACT

Infectious diseases of the central nervous system (CNS)—including bacterial meningitis, viral encephalitis, tuberculous meningitis, and neuroinvasive systemic infections—do not remain confined to the brain and meninges. They frequently trigger systemic inflammation, neuroendocrine stress responses, hemodynamic instability, and therapeutic exposures that collectively reshape hepatic physiology. The liver, as an immune-metabolic “gatekeeper,” responds to CNS infection through acute-phase signaling, altered bile acid transport, microcirculatory changes, mitochondrial stress, and immune-cell trafficking. Clinically, these processes can manifest as transient transaminase elevation, sepsis-associated cholestasis, mixed hepatocellular–cholestatic patterns, steatosis during prolonged critical illness, and drug-induced liver injury (notably during anti-tuberculous therapy). This article synthesizes current mechanistic evidence for the brain–liver axis, describes the most typical biochemical and morphological patterns of hepatic change after CNS infections, and proposes a practical IMRAD-style approach to evaluation and monitoring. The key message is that post-CNS-infection hepatic abnormalities are often multifactorial: inflammation-driven bile transporter dysfunction, hypoxic–ischemic stress, immune-mediated injury, and medication toxicity may co-occur. Recognizing these patterns can prevent unnecessary invasive procedures, improve antimicrobial/adjunctive therapy safety, and support early detection of clinically significant liver dysfunction.

Keywords: Central nervous system infection; meningitis; encephalitis; sepsis-associated cholestasis; liver injury; brain–liver axis; cytokines; drug-induced liver injury; tuberculous meningitis; bile acid transport.

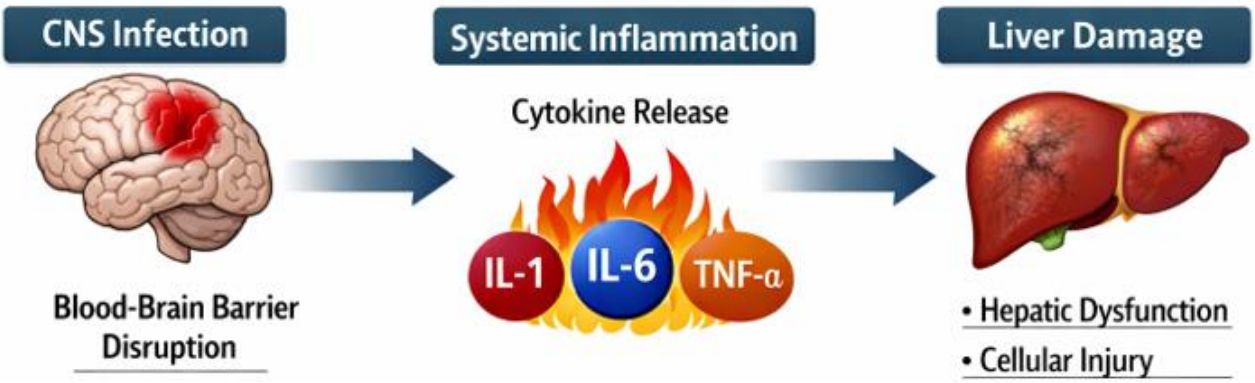

Figure 1. Conceptual pathway linking CNS infection to systemic inflammation and downstream liver injury (cytokine-driven hepatocellular dysfunction and cellular damage).

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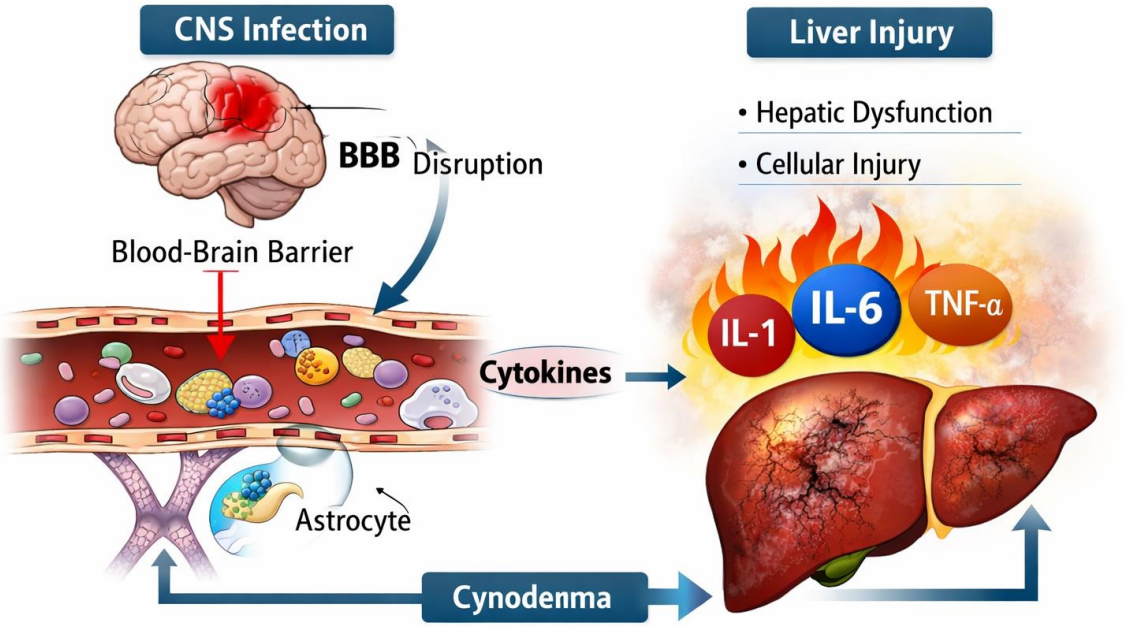
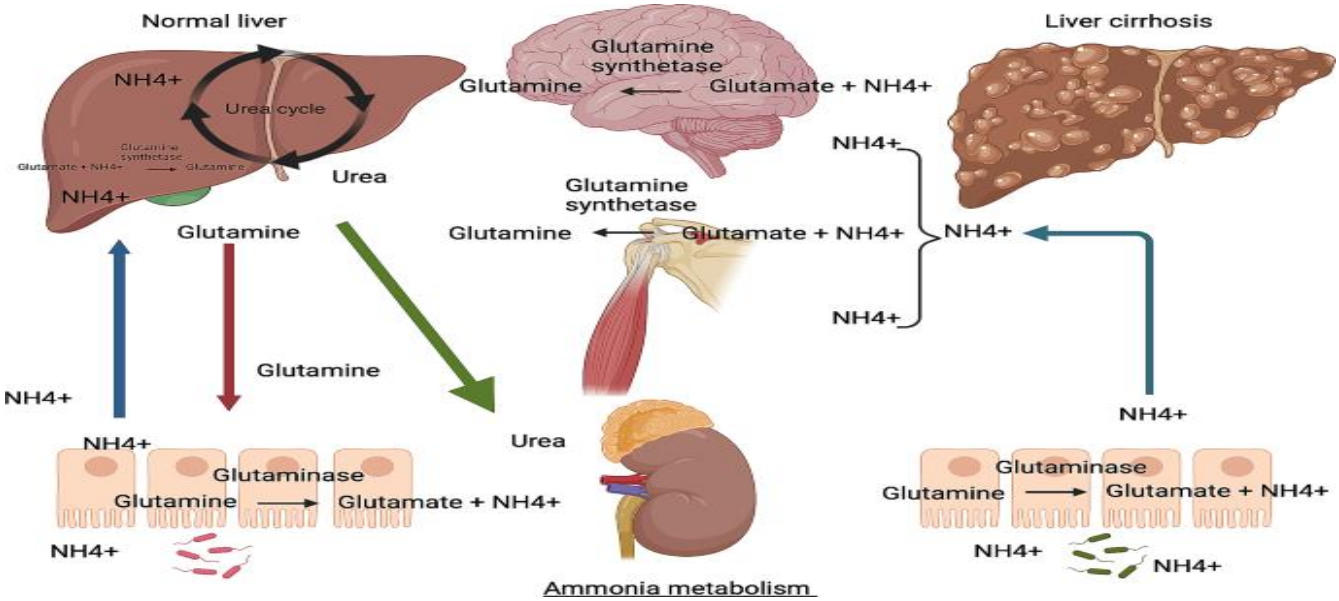


Figure 2. CNS infection → BBB disruption → cytokine signaling → liver injury (schematic illustration of the inflammatory cascade).



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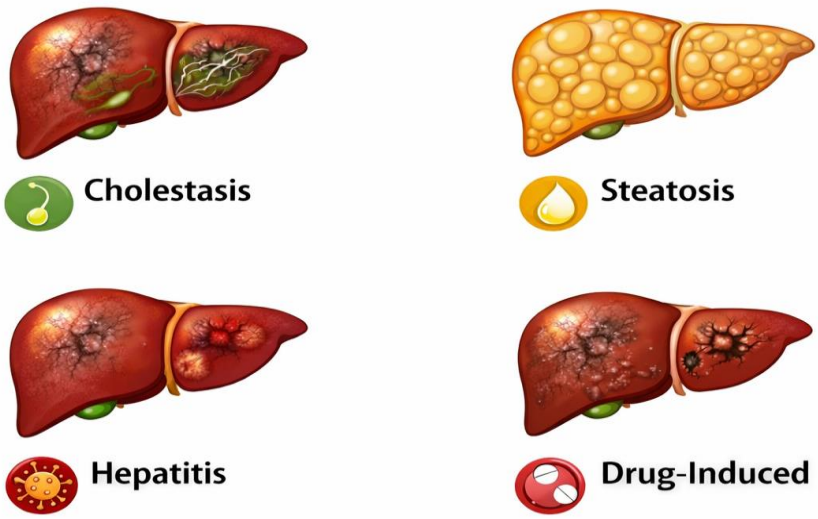

Figure 3. Common post-infectious liver patterns encountered after CNS infections: cholestasis, steatosis, hepatitis-like injury, and drug-induced liver injury (DILI).

INTRODUCTION

CNS infections remain a major cause of acute morbidity worldwide, ranging from rapidly progressive bacterial meningitis to viral encephalitis and chronic infections such as tuberculous meningitis. While the clinical focus naturally centers on neurologic complications—raised intracranial pressure, seizures, cerebral edema, focal deficits, and long-term cognitive outcomes—the systemic "echo" of a CNS infection is increasingly recognized as a determinant of prognosis and therapeutic tolerance. The liver is a primary target of this systemic response because it integrates innate immunity, metabolism, detoxification, bile production, and regulation of circulating inflammatory mediators. Several observations motivate a dedicated discussion of hepatic changes after CNS infections. First, abnormal liver function tests (LFTs) are common during systemic infections and inflammatory states; the liver is frequently involved even when the primary infection is outside the hepatobiliary tract. Second, sepsis and severe inflammation can cause cholestasis through cytokine-mediated impairment of bile formation and transporter function, often producing prominent hyperbilirubinemia with modest transaminase rise. Third, modern concepts of inter-organ communication highlight a brain–gut–liver (and broader brain–liver) axis, where acute brain injury and neuroinflammation can reshape hepatic immune signaling and metabolic outputs, potentially amplifying systemic inflammation and influencing recovery. Fourth, treatment itself—especially prolonged antimicrobial regimens and adjunctive therapies—can contribute to hepatotoxicity. This is particularly relevant in tuberculous meningitis, where first-line anti-tuberculous drugs are hepatically metabolized and may induce clinically meaningful liver injury. The purpose of this article is to present an

METHODS

Design and approach. This article is a narrative, mechanism-to-clinic synthesis structured in IMRAD format. Evidence was integrated from peer-reviewed reviews and guideline resources addressing (a) liver involvement in systemic infection, (b) sepsis-associated cholestasis and transporter-level mechanisms, (c) inter-organ axes connecting brain inflammation to hepatic signaling, and (d) hepatotoxicity considerations in CNS infection therapies, particularly tuberculous meningitis. Search strategy (conceptual). Sources were identified by targeted searches combining

terms for CNS infections (meningitis, encephalitis, tuberculous meningitis) with hepatic outcomes (cholestasis, transaminases, liver injury, bile transporters, hepatotoxicity). Priority was given to authoritative reviews on sepsis-induced cholestasis and infection-related liver involvement, guideline and knowledge platforms for hepatotoxicity management in tuberculosis therapy, and recent reviews describing the brain–liver or brain–gut–liver axis and metabolic crosstalk. Outcome framework. The analysis was organized around four clinically recognizable hepatic outcomes after CNS infection: (1) inflammation-driven cholestasis, (2) hepatocellular injury and sterile inflammatory amplification, (3) metabolic/critical-illness–associated steatosis and dysfunction, and (4) drug-induced liver injury.

RESULTS

Mechanistic pathways from CNS infection to hepatic dysfunction.Systemic inflammatory signaling and the acute-phase response. CNS infections frequently induce a systemic inflammatory response through cytokine release (e.g., IL-1, IL-6, TNF-α), activation of innate immune pathways, and neuroendocrine stress signaling. The liver is central to the acute-phase response, synthesizing proteins that modulate inflammation and coagulation while simultaneously adapting metabolic pathways to stress. Inflammatory mediators can shift hepatocyte function away from bile formation and xenobiotic processing toward acute-phase protein production, raising susceptibility to cholestasis and metabolic imbalance. Sepsis-associated cholestasis and bile transporter dysfunction. One of the most characteristic hepatic patterns during severe infection is cholestasis that arises from impaired bile formation and bile acid transport rather than mechanical obstruction. Cytokines and endotoxin-driven pathways can downregulate nuclear receptors and transporters involved in bile acid homeostasis, shifting bile acid traffic and promoting intrahepatic bile acid accumulation. Microcirculatory and hypoxic–ischemic stress. Severe CNS infection can be accompanied by shock, vasopressor requirement, hypoxemia, and microvascular dysfunction, all of which can impair hepatic perfusion. Reduced oxygen delivery to hepatocytes promotes mitochondrial stress and hepatocellular injury, potentially increasing AST/ALT. Immune cell trafficking and axis effects. Beyond generalized sepsis biology, inter-organ axis literature suggests that acute brain inflammation can modulate hepatic chemokine production and immune cell recruitment, with potential bidirectional effects: hepatic inflammation can amplify systemic immune responses and may influence immune cell migration relevant to CNS injury. 2) Typical patterns of liver abnormalities after CNS infection Pattern A: Predominant cholestasis (hyperbilirubinemia ± modest ALP/GGT). Patients may show rising total and direct bilirubin with relatively mild aminotransferase elevation. Pattern B: Hepatocellular injury (AST/ALT elevation). This may reflect hypoxic stress, direct inflammatory injury, metabolic dysregulation, or concomitant systemic infection affecting the liver. Pattern C: Mixed cholestatic–hepatocellular changes. Mixed patterns are common because cholestasis and hepatocellular injury mechanisms often overlap during severe illness. Pattern D: Drug-induced liver injury (DILI). Tuberculous meningitis is a high-yield example because standard regimens include hepatically metabolized drugs with known hepatotoxic risk, requiring careful monitoring and structured reintroduction strategies when hepatotoxicity occurs.

3) Morphological correlates (conceptual pathology) Although liver biopsy is rarely indicated solely for transient LFT abnormalities in acute CNS infection, morphological correlates can be inferred: canalicular cholestasis in inflammation-associated cholestasis; necroinflammatory foci in hepatocellular injury; steatosis in prolonged critical illness; and variable necrosis or cholestasis in DILI. 4) Practical evaluation and monitoring Baseline assessment should include ALT, AST, ALP, GGT, total/direct bilirubin, INR, albumin, and medication history. Trend-based interpretation is crucial: rapid bilirubin rise with modest ALT/AST in severe infection supports inflammation-mediated cholestasis, while disproportionate ALT/AST elevations with rising INR heighten concern

for significant hepatocellular injury or DILI. When anti-tuberculous therapy is used, guideline-informed hepatotoxicity management and stepwise reintroduction are recommended.

DISCUSSION

Hepatic changes after CNS infections are rarely attributable to a single cause. The liver integrates immune sensing, bile acid signaling, and metabolic adaptation; therefore neuroinfection-driven systemic inflammation can produce cholestasis through transporter downregulation while simultaneously exposing hepatocytes to hypoperfusion, oxidative stress, and immune-cell–mediated injury. Inter-organ axis concepts add another layer, suggesting that neuroinflammation may reshape hepatic immune signaling and create feedback loops that worsen organ dysfunction. Clinically, LFT abnormalities should be interpreted as potentially expected but still actionable findings. Recognizing sepsis-associated cholestasis can prevent unnecessary biliary interventions when imaging does not support obstruction. Vigilance for DILI is essential in regimens known for hepatotoxicity, particularly in tuberculous meningitis, where structured reintroduction strategies help balance infection control with hepatic safety. Even after neurologic stabilization, hepatic changes can influence rehabilitation and medication tolerance. Persistent cholestasis may impair nutrition, and unresolved hepatocellular injury may constrain drug options. Future prospective studies focused on meningitis and encephalitis should quantify the prevalence of distinct LFT patterns, link them to severity and therapies, and explore biomarkers connecting neuroinflammation to hepatic transporter dysfunction.

CONCLUSION

Hepatic changes following infectious diseases of the central nervous system are common, clinically meaningful, and typically multifactorial. Dominant drivers include systemic inflammation with cytokine-mediated bile transporter dysfunction, microcirculatory and hypoxic stress causing hepatocellular injury, inter-organ axis signaling, and drug-induced liver injury—especially during prolonged anti-infective regimens such as those used for tuberculous meningitis. Recognizing characteristic laboratory patterns and interpreting them in context enables safer pharmacotherapy, reduces unnecessary procedures, and supports integrated, organ-protective management.

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V.F. SHATALOV'S TEACHING METHODS AND THE POSSIBILITIES OF THEIR APPLICATION IN MEDICAL DISCIPLINES

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ANNOTATION

This article is dedicated to the teaching methods of V.F. Shatalov and the possibilities of its application in medical disciplines

Key words: principles of Collaborative Pedagogy, organizational and methodological system, verbal-logical, associative, mnemonic, innovative teacher, modular learning, brevity.

When we speak of "Shatalov's methodology," we mean a universal psychological, pedagogical, organizational, and methodological system applicable to the study of any subject (mathematics, physics, biology, history, geography, native and foreign languages). Each subject in Shatalov's methodology has its own specific teaching methods. But in general, the entire organizational and methodological system has the following structure.

Subsystems of the organizational and methodological system:

1) Perspective. Advancement. A qualitatively new approach to the prospective and advanced structuring and planning of programmatic educational material.

2) Reference signals. Large-scale introduction of programmatic topics using reference signals as the basis for intensifying the educational process.

3) Knowledge Inspection and Control. Continuous monitoring and correction of students' academic achievements based on continuous feedback and the principle of open perspectives.

4) Co-Management. Organizing co-management of the educational process based on the principles of Collaborative Pedagogy. Parental participation in monitoring and correcting students' academic achievements.

5) Repetition. Continuous, variable repetition of the studied material at the reproductive, productive, and creative levels.

6) Free Homework.

7) Creating a Psychologically Comfortable Learning Environment.

Now let's examine some of the subsystems in more detail: 1) The entire organizational and methodological system of V.F. Shatalov is a system for intensifying the educational process. This innovative teacher and his followers, relying on modern psychological and pedagogical research and their own extensive experimental experience, have proven that teaching according to Shatalov's system allows for a shorter period of schooling. V.F. Shatalov repeatedly emphasizes that, according to modern research, brain cell development in children generally ends by age 11. Consequently, modern curricula, with their focus on age-specific learning, undersaturate schoolchildren!

2) According to V.F. Shatalov, the minimal unit of support is the reference signal – an "associative symbol replacing a certain semantic meaning; it is capable of instantly recalling previously known and understood information." One of the most important functions of reference signals is to facilitate the comprehension of new information and to consolidate it through the close interaction of various types of memory: visual, figurative, verbal-logical, associative, mnemonic, and

motor. When working with reference notes, both hemispheres (left and right) work simultaneously, meaning that the mechanisms of abstract and concrete figurative thinking operate synchronously.

3) The system of working with reference signals allows for solving knowledge assessment problems. In V.F. Shatalov's method, each student is fully questioned on each topic, and, crucially, with a minimum of time spent during the lesson. The reference note is always reproduced in written and oral form during the same lesson. Grades for written and oral retrieval of key notes are recorded in a special Academic Achievement Record. This Record provides a subject-specific record of academic achievement. The teacher keeps the summary Record; each student receives a copy with their name on it, where they record their grades. Let's pay attention to a crucial detail: the secrecy of the class register is eliminated. Students know the essential rules for recording academic achievement: to receive a final thematic grade, they must receive grades for all types of work on the topic reflected in the Record; a grade of "2" does not exist in our system. If a student fails a particular type of work, a blank cell remains in the Record. A blank cell also remains if the student was absent from class for one reason or another. Such a "blank" is a signal that there is a gap in the student's knowledge. Missing classes is not a reason to avoid completing all types of work on the topic. It is the Committee's job to help students close these gaps. All grades below "5" (i.e. "4" and "3") in the Statement are entered in pencil, and each pencil grade can be corrected to a higher one by re-submitting this type of work in the co-management system.

The essence of the inspection and control subsystem boils down to simple truths: students aren't graded for a particular type of work; rather, they receive a grade and decide whether to accept the grade they received or improve upon it.

6) Our methodology doesn't use the term "homework." It does use the term "homework." The amount of homework (number of exercises) is determined for the year and presented to students at the beginning of the school year in the form of thematic worksheets. A worksheet is a set of homework exercises on a specific topic. To test a student's independence in homework, after the student has completed all the assignments, a so-called relay work session is conducted. Selected, diverse, and multi-level tasks are selected from among the homework exercises. Another specific assessment method in Russian language teaching is error correction. When checking homework, errors are not corrected; only appropriate notes are made in the margins. All errors in the notebook are corrected by the student themselves, and then they immediately work on the correction. It is for this work that a special assessment is entered into the Statement.

7) The methodological system created by the innovative teacher is highly humanistic, and at its center are the teacher and student as equal subjects in the educational process.

Viktor Fedorovich Shatalov's method is an intensive learning system based on the use of "reference cues" (compressed outlines), block-based delivery of material, multiple repetitions, and the absence of cues for "strong" and "weak" areas. It effectively visualizes the complexities of interconnectedness, which are important in medicine.

Key principles of the Shatalov Method:

• Reference cues (notes): Visual models that replace long texts with diagrams, symbols, pictures, and graphs that facilitate memorization.

• Block-based delivery of material: Theoretical material is presented in blocks, from the general to the specific.

• Systems: Multiple (sheet-by-sheet) repetition of the material received, ensuring reliable memorization.

• Open knowledge management: Assessment of each student's knowledge using flowcharts.

• Psychological comfort: no fear of answering, the right to make mistakes, and the opportunity to correct them.

Application in medical disciplines:

The Shatalov Method is ideal for disciplines with a large volume of information that require systematic attention:

1. Anatomy and histology: Creation of reference cues for memorizing disorders of organs, systems, nerve pathways, and blood vessels. 2. Pathophysiology and Biochemistry: Constructing flowcharts of disease pathogenesis that describe cause-and-effect relationships (e.g., development mechanisms, the blood coagulation cascade).

3. Pharmacology: Schemes for classifying drugs, their principles of action, and mechanisms of action.

4. Clinical Disciplines: Creating reference signals for diagnostic and treatment algorithms, helping students make quick decisions.

Benefits for medical education:

• Rapid processing of large volumes of information.

• Developing systemic clinical thinking.

• Eliminating "fluff" and focusing on core, vital knowledge.

• Improving long-term memory through the use of visual associations.

The Shatalov method transforms medical education from rote memorization to logical understanding, which is fundamentally important for future medical practice.

The relevance of V.F. Shatalov's developments in the field of modular learning is undeniable and is confirmed by the effective results of their application. Educational models based on traditional approaches don't always take into account students' individual abilities and don't allow for a reliable assessment of their knowledge. In turn, the modular learning method allows teachers to identify each student's potential and provide intensive instruction. This approach is particularly relevant in today's school education environment. The concept developed by V.F. Shatalov exhibits a certain cyclicality, characteristic of the evolution of scientific views. Nevertheless, classical principles reappear over time, and the concept of modular learning is no exception. It seems likely that this method will remain relevant for a long time to come.

A reference cue is a set of associative keywords, symbols, and other thought supports, arranged in a specific manner, replacing a specific semantic meaning. It is capable of instantly recalling previously known and understood information .

A reference cue is a visual construct consisting of reference cues that are structurally interconnected. These cues replace a system of meanings, concepts, and ideas, which are interconnected elements. An important requirement for a reference cue is a precise and understandable transcript

The image of a graphic symbol and its explanation in the context of a specific material allow for the automatic memorization of both the symbol and the material itself. For each fragment of theoretical material, an icon—a reference cue—is created, which explains and memorizes the material. The system for explaining theoretical material is formed by linking and designating reference cues in place of each other.

Next, it is necessary to explain the associations of the signals with the theory itself to ensure full assimilation of the material. The use of vivid, varied, and unusual reference cues creates an engaging and playful learning environment. They stimulate active learning and ensure a holistic, systematic, and meaningful understanding of the basic patterns and concepts of their interrelations.

The main requirements that reference cues must meet are:

Conciseness. A reference cue should contain only a few words. The fewer printed characters, the more attractive the reference cues are to the learner, the less time they spend on self-study, the faster written assignments on signal recall are completed, the higher the grades students receive for these assignments, and the more willing they are to correct their undesirable grades.

Structured. The signal uses links and logical blocks connected by arrows, lines, boundaries, etc. Learning with reference signals develops systemic thinking, distinguishes between the general and the important, and identifies cause-and-effect relationships.

Presence of semantic accents. The most important elements of the reference signal are highlighted with frames, color, unique symbol arrangement, etc. Autonomy. Each of the four or five blocks should be independent, understandable independently of the other blocks of the reference signal.

Associativity and imagery. Clear associations with the reference signal and its elements should emerge and be remembered. The meanings of the developed graphic representations of reference signs should be easily recognizable.

Ease of manual reproduction. Students will be required to reproduce the reference signals discussed in class from memory for assessment.

Color visualization. Memorization of the material is facilitated by engaging visual memory. Some signals can be brightly colored.

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EXPERIMENTAL STUDIES OF THE EFFECT OF METABOLIC SYNDROME ON HEMODYNAMIC PARAMETERS IN RATS AND THE EFFECTIVENESS OF A MODIFIED KETOGENIC DIET

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ABSTRACT

Metabolic syndrome (MS) is a complex metabolic disorder associated with obesity, hypertension, hyperglycemia, and dyslipidemia, which leads to systemic pathological changes in internal organs and hemodynamic disturbances. The present experimental study investigates the effect of metabolic syndrome on hemodynamic parameters and morphological changes in rats, as well as evaluates the therapeutic effectiveness of a modified ketogenic diet. Metabolic syndrome was modeled in Wistar rats through a high-fat diet combined with a 10% fructose solution. The animals were divided into six experimental groups including healthy controls, rats receiving traditional and modified ketogenic diets, and rats with metabolic syndrome with or without dietary intervention. Hemodynamic parameters such as systolic and diastolic blood pressure and heart rate were measured using the tail-cuff method, while morphological changes in internal organs were assessed through histological analysis. The results demonstrated that metabolic syndrome significantly increased blood pressure and heart rate and caused pathological changes in the lungs, heart, and liver, including fibrosis, inflammation, and hypoxia. Dietary intervention with ketogenic diets showed a corrective effect on these disturbances. The modified ketogenic diet, enriched with fish, wheat bran, olive oil, and medium-chain triglycerides, proved to be more effective in normalizing hemodynamic parameters and reducing morphological damage compared to the traditional ketogenic diet. These findings suggest that modified ketogenic dietary strategies may have potential therapeutic value in mitigating metabolic syndrome–related complications and improving cardiovascular and respiratory function.

Keywords: metabolic syndrome, hemodynamic parameters, ketogenic diet, modified ketogenic diet, Wistar rats, pulmonary fibrosis, inflammation, biomarkers, cardiovascular function, experimental study.

INTRODUCTION

Metabolic syndrome (MS) is a multifactorial condition characterized by obesity, hypertension, hyperglycemia, and dyslipidemia , which contributes to the development of systemic abnormalities, including changes in the morphology of internal organs such as the lungs, heart, and liver. In clinical practice, MS is associated with an increased risk of pulmonary fibrosis, respiratory dysfunction, and cardiovascular complications. Biomarkers such as surfactant protein D (SP - D) and chitinase-3-like protein 1 (CHI 3 L 1) are used to assess pulmonary injury. The present study models MS in rats to examine its effects on hemodynamics and organ morphology and evaluates the therapeutic potential of traditional and modified ketogenic diets.

MATERIALS AND METHODS

Experimental animals and design

Wistar white rats weighing 180–200 g and aged 1–3 months. The animals were divided into six groups (20 animals each):

1. Intact (healthy) rats (control group).
2. Healthy rats on a traditional ketogenic diet.
3. Healthy rats on a modified ketogenic diet.

4. Rats with MS model without correction.
5. Rats with MS on a traditional ketogenic diet (30 days).
6. Rats with MS on a modified ketogenic diet (30 days).

All procedures complied with the principles of the Convention for the Protection of Vertebrate Animals (Strasbourg, 1986). The total duration of the experiment was 120 days: the first 90 days were the MS modeling phase, followed by the 30 days of the treatment phase, with diets administered to the respective groups.

Modeling metabolic syndrome

In the experimental group, before feeding, rendered mutton mesenteric fat (at a temperature of 38–40°C) was administered intragastrically via a metal tube at a rate of 1 g per 100 g of animal weight (equivalent to 10 g/kg or 2 g for a 200 g rat). After 1 hour, the animals were fed a standard diet. Instead of drinking water, this group was given a 10% fructose solution.

Description of diets

The traditional ketogenic diet included a standard high-fat, low-carbohydrate diet. The modified ketogenic diet consisted of fish, wheat bran, olive oil, and medium-chain triglycerides (MCTs) in a 50/50 ratio, aiming to optimize metabolic effects and reduce inflammation.

Methods for assessing hemodynamic parameters

Before recording parameters (systolic and diastolic blood pressure, as well as pulse) using the tail-cuff method, the rats were habituated to the experimental conditions to minimize stress. Awake, the rat was placed in a special chamber with a tail cuff attached. The rat spent approximately 15 minutes in this condition each day for a week.

Hemodynamic parameters (systolic and diastolic blood pressure, heart rate) were measured at baseline, after 3 and 4 months.

Methods of morphological analysis

Rats were decapitated in the fasting state under brief ether anesthesia on days 60 and 90 of the experiment. Internal organs (lungs, heart, liver, etc.) were removed and fixed in 12% formalin solution for morphological examination. Morphological examination included histological analysis of the fixed organs to detect fibrosis, inflammation, and hypoxia.

Statistical data processing

Data are presented as mean ± standard deviation (SD), with percentage changes from baseline or previous measurement indicated. Statistical significance was assessed using Student's t -test ($p < 0.05$ was considered significant).

RESULTS

Hemodynamic changes

Table 1. Dynamics of systolic blood pressure, diastolic blood pressure and heart rate (mean ± SD , % change; * $p < 0.05$; ** $p < 0.01$).

Group	Systolic blood pressure (outgoing)	Diastolic blood pressure (outgoing)	Heart rate (outgoing)	Systolic blood pressure (3 months)	Diastolic blood pressure (3 months)	Heart rate (3 months)	Systolic blood pressure (4 months)	Diastolic blood pressure (4 months)	Heart rate (4 months)
Intact	114.5 ± 4.1 (100%)	82.2 ± 2.6 (100%)	257.0 ± 2.9 (100%)	117.5 ± 1.9 (+2.6%)	83.7 ± 2.2 (+1.8%)	262.3 ± 4.1 (+2.1%)	119.1 ± 2.9 (+4.0%)	87.5 ± 3.4 (+6.5%)	259.5 ± 10.1 (+1.0%)

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Group	Systolic blood pressure (outgoing)	Diastolic blood pressure (outgoing)	Heart rate (outgoing)	Systolic blood pressure (3 months)	Diastolic blood pressure (3 months)	Heart rate (3 months)	Systolic blood pressure (4 months)	Diastolic blood pressure (4 months)	Heart rate (4 months)
MS + lab . pit .	120.8 ± 6.1 (100%)	83.7 ± 5.3 (100%)	264.5 ± 9.4 (100%)	166.8 ± 6.5 (+38.1%**)	128.3 ± 3.9 (+53.3%**)	479.3 ± 16.9 (+81.2%**)	150.2 ± 10.6 (+24.3%*)	124.3 ± 11.1 (+48.5%*)	422.8 ± 23.8 (+59.8%*)
MS + trad . diet	125.6 ± 3.2 (100%)	88.8 ± 4.8 (100%)	249.5 ± 10.1 (100%)	159.2 ± 7.7 (+26.7%**)	131.8 ± 6.6 (+48.4%**)	488.1 ± 27.1 (+95.6%**)	137.8 ± 4.0 (+9.7%*)	119.5 ± 7.5 (+34.5%*)	340.5 ± 21.7 (+36.5%*)
MS + mod . diet	119.5 ± 3.8 (100%)	87.2 ± 5.8 (100%)	252.3 ± 24.8 (100%)	167.7 ± 9.6 (+40.3%**)	133.0 ± 9.2 (+52.5%**)	466.5 ± 31.8 (+84.9%**)	128.0 ± 13.4 (+7.1%)	99.7 ± 12.4 (+14.3%)	305.7 ± 29.8 (+21.1%*)

In the MS groups, a significant increase in blood pressure and heart rate was observed after 3 months, with a partial reduction by month 4. The modified diet provided the best normalization.

Morphological changes

On days 60 and 90, signs of pulmonary fibrosis, inflammation, and hypoxia in the fixed organs were detected in the MS groups. The modified diet reduced these changes more effectively than the traditional diet, normalizing tissue structure.

DISCUSSION

The obtained results confirm that metabolic syndrome provokes systemic disturbances through mechanisms of chronic inflammation, oxidative stress, and hypoxia, leading to significant changes in hemodynamics and the morphology of internal organs. In particular, the sharp increase in blood pressure and tachycardia in the groups with metabolic syndrome after 3 months of the experiment correlate with literature data, where metabolic syndrome is associated with accelerated pulmonary aging and fibrosis [2, 8]. Biomarkers SP - D and CHI 3 L 1, as shown in studies [5, 6, 7, 11, 13, 14], play a key role in the pathogenesis of these changes: SP - D reflects damage to the alveolar epithelium, and CHI 3 L 1 promotes the accumulation of visceral fat and Th 2 inflammation, aggravating respiratory disorders.

A comparison of traditional and modified ketogenic diets revealed the superiority of the latter in the correction of hemodynamic and morphological disorders. The modified diet, which included fish (a source of omega-3 fatty acids), wheat bran (fiber to improve microbiota), olive oil (monounsaturated fats with antioxidant properties), and MCT oils (a quick source of energy that stimulates ketogenesis), in a 50/50 ratio for oils, likely enhances anti-inflammatory effects by reducing the level of proinflammatory cytokines and improving glucose metabolism. This is consistent with data on the positive effects of ketogenic diets on pulmonary function in patients with obesity and diabetes [3, 4, 9, 10]. Unlike the traditional diet, which partially reduces hypertension but leaves significant deviations, the modified version normalizes parameters closer to control levels,

which may be due to the synergistic effect of components such as omega-3 and MCT on endothelial function and oxidative balance.

However, despite its effectiveness, the rat model of MS has limitations: induction with a high-fat, fructose-containing diet mimics human MS but does not fully replicate the genetic and environmental factors. Morphological changes observed at days 60 and 90 (fibrosis, inflammation) highlight disease progression, but a full assessment requires molecular analysis, including the expression of fibrosis-related genes (e.g., TGF - β). Furthermore, the short-term treatment phase (30 days) demonstrates the potential of the diets, but long-term effects, including possible rebound after withdrawal, require further study.

In the context of clinical practice, these data highlight the importance of biomarker integration . SP - D and CHI 3 L 1 in the diagnosis of pulmonary complications of MS, as recommended in [1, 15]. Dietary interventions, especially modified ketogenic diets, can serve as adjuvant therapy for the prevention of respiratory disorders, but require adaptation to the individual, taking into account individual factors such as age and comorbidities . Future research should focus on the mechanisms of action of modified diets, including the effects on the gut microbiome and epigenetic changes, to optimize therapeutic strategies.

CONCLUSION

MS leads to hemodynamic and morphological disturbances that are corrected by ketogenic diets. The use of biomarkers and spirometry for monitoring, as well as dietary interventions for prevention, are recommended.

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