REVIEW ARTICLE

BARODONTALGIA AND OTHER DENTAL PROBLEMS DURING MILITARY SERVICE: A LITERATURE REVIEW

Barodontalgia i inne stomatologiczne problemy żołnierzy: przegląd literatury

Oskar Dominik Tokarczuk[1], Michał Siwek[2], Piotr Suski[1], Weronika Miazek[1], Bartłomiej Ziomko[1], Beata Tokarczuk[3], Emanuela Bis[1], Leszek Szalewski[4]

1. *Student Scientific Society at the Digital Dentistry Lab, Medical University of Lublin, Poland*
2. *Faculty of Medicine, Medical University of Lublin, Poland*
3. *Orthodontic Surgery, Polish Society for Orthodontic Technology, Poland*
4. *Digital Dentistry Lab, Medical University of Lublin, Poland*

Oskar Dominik Tokarczuk – 0000-0003-3020-3266
Michał Siwek – 0000-0002-0930-9333
Piotr Suski – 0009-0003-6339-9143
Weronika Miazek – 0000-0003-3054-7747
Bartłomiej Ziomko – 0000-0002-0506-1449
Beata Tokarczuk – 0000-0003-3712-6531
Emanuela Bis – 0000-0003-0043-0011
Leszek Szalewski – 0000-0003-1688-4982

Abstract

Introduction: Military service carries health risks that extend beyond the hazards associated with direct combat. Insights into the history of military medicine reveal the evolution of medical practices and surgery, particularly in the field of maxillofacial surgery. This specialty owes its advancement to pioneers such as Harold Gillies and Johannes Esser, whose innovations reached their peak during periods of armed conflicts. **Objective:** The review aims to raise awareness of the specific dental health needs of military personnel, with a particular focus on barodontalgia, dental pain caused by changes in ambient pressure, common among military pilots and divers. **Methods:** The literature on dental challenges among military personnel was analysed, considering the impact of working conditions on oral health (searched phrases: health problems in the military, military dentistry, barodontalgia). Common issues such as dental caries, periodontal diseases, and barodontalgia were identified, suggesting the need for better dental care and further research. **Conclusions:** Complex health challenges in military communities, from post-traumatic stress disorder to dental problems were identified. There is a need for continuous development of military medicine, a holistic approach to the health of soldiers, including oral health, to improve their quality of life and operational readiness. Research findings indicate the need to develop dedicated diagnostic and therapeutic protocols, adapted to the unique conditions of military service.

Streszczenie

Wstęp: Służba wojskowa niesie za sobą zagrożenia zdrowotne wykraczające poza ryzyko związane z bezpośrednim udziałem w działaniach bojowych. Wgląd w historię medycyny wojskowej pozwala zrozumieć rozwój praktyk medycznych oraz chirurgii, w szczególności w dziedzinie chirurgii szczękowo-twarzowej. Przełom w tej specjalizacji zawdzięczamy pionierom, takim jak Harold Gillies i Johannes Esser, których innowacje osiągnęły szczyt w okresie konfliktów zbrojnych. **Cel:** Przegląd ma na celu podniesienie świadomości na temat specyficznych potrzeb zdrowotnych personelu wojskowego w obszarze stomatologii, ze szczególnym skupieniem na barodontalgii, czyli bólu zębów wywołanym przez zmiany ciśnienia, występującym często u wojskowych pilotów i nurków. **Metody:** Przeanalizowano literaturę dotyczącą stomatologicznych wyzwań dla personelu wojskowego, uwzględniając wpływ warunków pracy na zdrowie jamy ustnej (wyszukiwane frazy: zdrowotne problemy w wojsku, stomatologia wojskowa, barodontalgia). Wskazano na powszechne problemy, takie jak próchnica, choroby przyzębia i barodontalgia, sugerujące potrzebę zapewnienia lepszej opieki stomatologicznej oraz prowadzenia dalszych badań. **Wnioski:** Zidentyfikowano złożoność wyzwań zdrowotnych w służbie wojskowej, od zespołu stresu pourazowego po problemy stomatologiczne. Podkreślono potrzebę ciągłego rozwoju medycyny wojskowej, holistycznego podejścia do zdrowia żołnierzy, w tym zdrowia jamy ustnej, aby poprawić ich jakość życia i gotowość operacyjną. Wyniki badań wskazują na konieczność opracowania specjalnych protokołów diagnostycznych i terapeutycznych, dostosowanych do specyficznych warunków służby.

Keywords: military dentistry, barodontalgia, pressure changes, health problems in the military

Słowa kluczowe: stomatologia w wojsku, barodontalgia, zmiany ciśnienia, problemy zdrowotne w wojsku

DOI 10.53301/lw/188302

Received: 08.04.2024

Accepted: 06.05.2024

Corresponding author:
Oskar Dominik Tokarczuk
Student Scientific Society at the Digital Dentistry Lab, Medical University of Lublin, Lublin
e-mail: tokarczukoskar@gmail.com

Introduction

Military service carries health risks that extend beyond injuries associated with direct combat. Knowledge of the history of military medicine helps understand the specific health problems that armed force personnel may face. The words of General Władysław Sikorski: 'From the beginning of human existence and from the moment human history is known, war has been regarded as one of the principles of human development' also pertain directly to medicine [1]. The First World War was a turning point that changed the approach to health and hygiene, especially with regard to disinfection and the prevention of infectious diseases [2]. The importance of military medicine increases during times of armed conflicts, as evidenced by its considerable development during these periods. Armed conflicts, World War I and World War II in particular, had a significant impact on the development of surgery, especially in the field of maxillofacial surgery. Pioneers such as Harold Gillies and Johannes Esser contributed to many innovations in reconstructive surgery. Their revolutionary facial reconstruction techniques not only saved the lives of many soldiers, but also shaped modern maxillofacial surgery [3]. In more recent times, it has been noted that approximately 8% of veterans from missions in Iraq and Afghanistan developed symptoms of post-traumatic stress disorder (PTSD) and other mental health problems, highlighting the impact of wartime experiences on mental health [4]. Soldiers also struggle with a variety of oral problems both during peacetime and war.

It is worth mentioning that military personnel in Poland receive special dental care. The regulation of the Minister of National Defence specifies additional dental benefits for professional soldiers, including check-ups, hygiene procedures, as well as conservative and surgical treatment. These benefits are provided in military units or in cooperation with other medical entities. Soldiers holding specific functions, including pilots, divers and special forces, are entitled to an extended package of benefits. The regulation emphasises the importance of healthcare in the context of the specific nature of military service [5].

This paper presents a review of available literature on dental problems among military personnel, with particular emphasis on barodontalgia, i.e. dental pain caused by changes in ambient pressure, which is often seen in pilots and divers, and which has aroused interest among dental professionals.

Aim

The aim of this paper is to raise awareness about the specific oral health needs among soldiers and the need to adapt dental practices to the specific conditions of their work [6].

Dental problems among soldiers

Military personnel, including pilots and divers, are exposed to a variety of oral health problems during their career that require special attention. Armstrong and Dermont [7], as well as Khanna et al. [8] highlighted the importance of prevention, emphasising that specific working conditions, such as exposure to noise, vibration and variable pressure, can adversely affect the health of naval personnel. However, extensive data on the dental health of soldiers is missing in the literature. Research has indicated common dental problems, high rates of dental caries, periodontal disease and barodontalgia, suggesting the need for further research and improved dental care in the military.

In his study among 348 soldiers of the Armed Forces of Ukraine, Lavrin [9] assessed the efficacy of caries prevention under specific operational conditions. The study group consisted of military personnel from Ternopil who underwent a detailed dental examination using the DMF index [the sum of an individual's decayed (D), missing (M), and filled (F) permanent teeth or surfaces] to assess the intensity of caries, and the test of enamel resistance (TER) to determine enamel resistance to acid dissolution. After an initial diagnosis, the participants received comprehensive dental care, including both standard hygiene interventions and, depending on individual needs, fissure sealing and fluoride varnish application. All treatments were tailored to frontline requirements. The analysis of results showed alarmingly high caries rates, ranging from 83.08% among 20–25 year olds to 100% among 36–45 year olds. There was also a noticeable increase in the intensity of caries in each age group, although follow-up after 12 months showed a considerable reduction and an improved enamel resistance to acid.

Soldiers are also at risk of dental injuries. A case study of a 39-year-old military diver showed dental problems arising from the use of an inadequate diving mouthpiece. Its change led to the fracture of previously treated tooth with a large amalgam filling. The advanced periodontal disease discovered during a check-up highlighted the importance of regular dental screening in soldiers. The use of an appropriate mouthpiece, which reduced the risk of tooth overload, proved to be a solution. The need to extract the tooth and place an implant, followed by mouthpiece customisation, highlights the importance of adequate dental care to ensure the health and effectiveness of soldiers during their military service [10].

The difficulties of providing adequate dental care in combat settings become apparent in the course of modern military conflicts, such as the Russian-Ukrainian war. Shortcomings in routine preventive screening and

prophylactic interventions may contribute to dental problems becoming apparent during mobilisations and combat missions [11]. Research shows that regular oral hygiene and professional restorative treatment are key to maintaining the oral health and combat readiness of soldiers [12].

Barodontalgia

Barodontalgia, also referred to as aerodontalgia or tooth squeeze, is a specific dental pain caused by a change in ambient pressure. The pain may involve teeth that are typically asymptomatic, but when exposed to certain conditions, such as flying at an altitude of 600–1,500 m or diving at depths of 10–25 m, pre-existing conditions that did not previously produce dental symptoms become apparent. Sharp or throbbing pain often occurs as a result of an increase in the difference between the intracavitary pressure and the external pressure, which can be caused by the expansion of gases within closed dental spaces [13].

The mechanism of barodontalgia was described in detail by Strohaver [14] in 1972. He identified two forms of the disorder, i.e. direct and indirect, depending on the different causes of pain. Direct barodontalgia is due to the direct effect of pressure changes on the tooth, leading to pain, especially during take-off. The indirect form, on the other hand, can be caused by irritation of the alveolar nerves as a result of sinusitis, which manifests in dull pain, most often during landing.

Barodontalgia has been divided into four classes, depending on the condition of the pulp/periapical tissues and symptomatology. This classification allows accurate diagnosis and selection of appropriate treatment [15]. Early observations of this phenomenon mainly focused on pilots flying at altitudes > 3,000 m and divers descending to depths > 10 m. The upper lateral teeth, as well as teeth with multiple and extensive fillings, are most susceptible to barodontalgia. Despite various theories explaining the mechanism of pain, there is consensus on the role of sudden pressure changes and pulpal pathologies[16, 17].

Diagnosis of barodontalgia

The diagnosis of barodontalgia involves several stages of dental examination, particularly important among aircrew members who may experience long intervals between dental check-ups. Damaged fillings (e.g. cracked or broken), fillings with insufficient retention and secondary caries are key areas of such examinations. Vitality tests and/or radiographs covering the periapical tissue are recommended in the case of teeth with extensive fillings to exclude asymptomatic pulp necrosis. Orthopantomographic images can help detect dental problems that are not evident on clinical examination, as well as serve as dental records. If this imaging modality is not available, dental radiographs of the upper and lower teeth may deliver valuable data [18]. Stoetzer et al. [19] described a case of a 26-year-old patient reporting acute pain in the left mandible, which appeared during flight and increased as the aircraft ascended, reaching a VAS score of 8 (0–10). Lowering the altitude of the flight was associated with slight pain reduction, but without its complete resolution. A check-up examination revealed a filling in tooth 36, a negative pulp vitality test and a positive percussion test, in the absence of clinical periodontal disease. An X-ray was performed and showed a periapical lesion. Endodontic treatment of tooth 36 with cofferdam was initiated under local anaesthesia. No purulent exudate was found during the treatment, but significant bleeding was observed from both mesial canal orifices. Gangrenous necrosis of pulp was detected particularly in the distal root canals. After preparation of the canals, a temporary dressing was applied. The presence or absence of cracks was assessed optically using magnifying glasses and a blue-light lamp; no cracks were detected. Filling of the root canals was performed.

Prevention and treatment of barodontalgia

Maintenance of good oral health in individuals who work under fluctuating pressure conditions, which requires regular dental check-ups, recommended at least once a year, is essential for the effective prevention of barodontalgia. During check-ups, particular attention should be paid to the early detection of caries and damaged fillings, dentin exposure and other factors that can lead to the development of barodontalgia.

Prompt and accurate diagnosis, including radiography and pulp vitality tests, is of key importance if symptoms develop. In cases of reversible pulpitis, zinc oxide and eugenol (ZOE) may provide relief and prevent further pain. In more advanced cases in individuals exposed to significant pressure changes, endodontic treatment is preferred over procedures such as pulpectomy or direct pulp capping to effectively minimise the risk of future barodontalgia. Additionally, patients who have recently undergone dental procedures requiring anaesthesia should avoid aeroplane flights for 24 hours, while those undergoing surgery should avoid aeroplane flights for seven days to minimise the risk of barodontalgia. Taking care of their oral health and following professional dental advice can significantly contribute to reducing the risk of this painful disorder [17].

Barodontalgia in a military setting

Barodontalgia poses unique challenges for the military, including divers and submarine crews. A study on dental health among German sailors, which analysed 50,000 medical records, assessed the impact of the work of divers and submarine crews on their dentition. An evaluation of the results of 13,618 examinations in 2,580 patients provided a comprehensive picture of the dental health of navy personnel exposed to variable atmospheric pressures. It was found that divers, who regularly experience pressure fluctuations, had better oral health status than submarine crews operating under more stable pressure conditions. However, long-term follow-up revealed a gradual deterioration of oral health among divers and scuba divers, highlighting the occupational risks and the importance of regular dental care to maintain oral health among mariners working in a variety of pressure conditions [20].

Pilots, who may develop specific health complications due to changes in ambient pressure, especially during

high-altitude flights, are another group of soldiers affected by barodontalgia. The phenomenon of odontocrexis, also known as barometric tooth explosion, observed among aircrews, is an example of a specific form of dental trauma associated with barometric pressure changes, which often affects teeth with extensive fillings [21]. This highlights the complex relationship between ambient pressure and bodily responses, as well as the importance of using high quality preventive and therapeutic materials to minimise the risk of pressure-induced dental damage.

A case was described of a fighter pilot who experienced a tooth fracture in December 2009 while flying at an altitude of 3,600 metres, which manifested while descending to an altitude of approximately 900 metres [22]. Despite acute pain, the mission was not jeopardised due to short symptom duration. An intraoral examination revealed a V-shaped fracture in the right lower first molar. Various tests confirmed that the tooth was vital and had no previous pathology or treatment, which was also confirmed by X-rays. This case highlights the potential risks of working in extreme conditions and shows that even healthy teeth can be damaged as a result of pressure changes.

Gunepin et al. [23] conducted a study involving 60.6% of French military divers (1,317 fully completed questionnaires), and showed that 5.3% of divers developed barotrauma, which disrupted diving in 34.3% of cases. While the majority of divers were aware of the importance of oral health, as informed by military medical personnel, only some of them received specific dental advice and consultations related to diving or were warned against diving after certain oral procedures [23, 24]. These findings indicate the need to raise awareness about barodontalgia and to provide better dental care for individuals working in military environments. Since both military pilots and divers are at particular risk of barodontalgia and other oral health problems associated with pressure changes, military doctors and dentists should follow specific prevention and treatment protocols.

These issues demonstrate the importance of thorough dental surveillance to ensure the health and safety of military personnel. Regular screening and close collaboration between aviation and diving medicine and dentistry can help minimise the risk of barodontalgia and other complications arising from working in extreme conditions.

Laval-Meunier et al. [25] assessed the frequency of barodontalgia in French military and civilian aircrew in 2010. Using 1,184 detailed anonymous questionnaires from 15 medical centres for aircrew, the researchers collected data on barodontalgia. They found that 6.6% of respondents had experienced an in-flight barodontalgia at least once in their lifetime. The median pain intensity was rated at 5.5 out of 10, and the discomfort appeared most commonly during descent below 8,000 metres. Some pilots have expressed concerns about the impact of barodontalgia on in-flight safety. This research demonstrated the challenges associated with barodontalgia in pilots, despite advances in dentistry and technology. The authors recommended the use of preventive measures to reduce the prevalence of barodontalgia among flight crews, emphasising the importance of understanding and addressing underlying dental conditions that may exacerbate in-flight barodontalgia.

González-Santiago et al. [26] investigated the oral health and the prevalence of barodontalgia in 506 male military pilots between 1995 and 2000. Using specialised dental instruments and an X-ray machine, a detailed clinical examination was conducted and data on dental status were collected. Flight conditions were simulated in a hyperbaric chamber to assess the physiological effects of sudden pressure changes on the teeth. The analysis showed that barodontalgia was relatively rare (13 cases; 2.63%) and occurred more frequently during actual flights than during hyperbaric training. Most of these cases were associated with previously treated teeth, indicating a potential link between the quality of dental treatment and the risk of barodontalgia. The study highlighted the important role of oral health care and prophylaxis among flight crews to maintain flight safety.

Almadi and Al-Hajri [27] assessed the frequency of dental pain among military pilots and divers in Saudi Arabia and Kuwait. The study used 350 questionnaires, obtaining responses from 72.8% of pilots and 80% of divers, respectively. It was found that approximately 34% of respondents had experienced barodontalgia, with a significantly higher rate among pilots (49.6%) compared to divers (17.3%). Pain occurred at different heights and depths, depending on the type of activity. Recurrence of tooth pain after treatment was reported in 16.4% of pilots and 25% of divers, highlighting the problem of pain recurrence despite therapeutic interventions.

Zanotta et al. [28] focused on the general oral health problems of divers exposed to pressure changes in their study. The study group comprised 520 patients, of whom 15% reported dental problems and further 10.2% experienced dental pain. Dental injuries were reported in 6.3% of the study participants. Additionally, temporomandibular joint (TMJ) problems or mucosal irritation by a mouthpiece were reported by 11.3% of the subjects.

The results on the frequency of barodontalgia among soldiers are summarised in figures 1 and 2.

The results indicate the need for comprehensive oral examinations and avoidance of dental materials prone to air or fluid retention to reduce the risk of barodontalgia.

Discussion

The analysis of the cited articles allows to formulate a thesis that dental symptoms among military personnel, while not a primary concern, are still an important component of comfort during service. The cited studies indicate that PTSD and other mental disorders [4] may affect the stomatognathic system, leading to masticatory dysfunction and reduced salivary flow, which significantly contributes to the development of carious lesions, rampant caries in particular, and periodontitis, which may be linked to a compromised immune system.

Referring to the words by General Sikorski [1] and considering the current political situation in Eastern Europe,

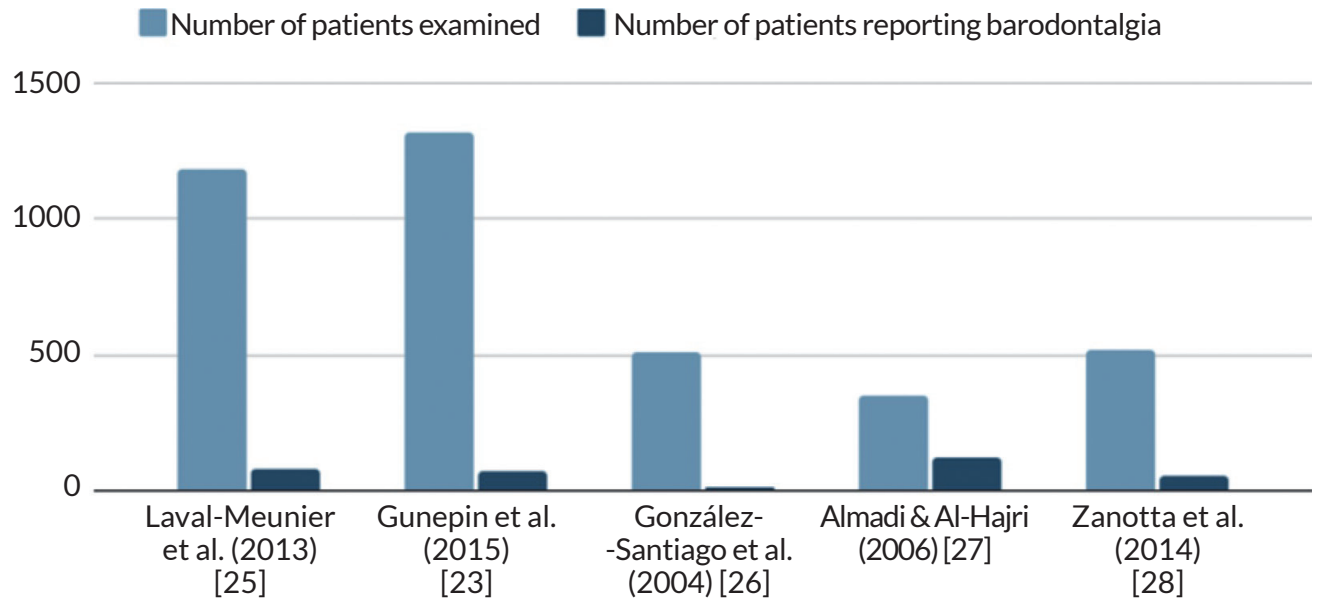

Figure 1. Overview of studies on the prevalence of barodontalgia among military personnel

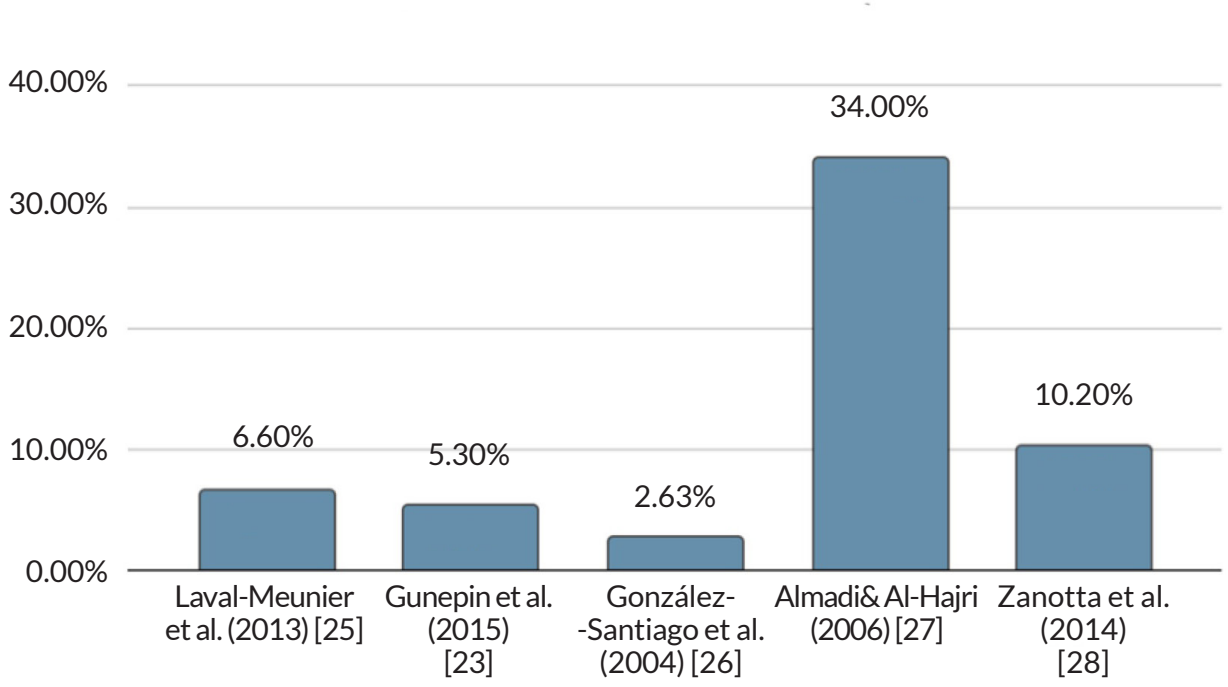

Figure 2. Percentage of soldiers reporting barodontalgia

it could be suggested that investigating dental problems among Ukrainian soldiers will deliver new data on barodontalgia. Lavrin et al. [11] suggested in their study that adopting NATO dental care standards and improving the existing care system could significantly enhance oral health and, consequently, the combat readiness of Ukrainian soldiers. Mobile dental clinics and improved oral hygiene practices, in line with NATO guidelines,

could be a solution to these common problems. Furthermore, the development of dental care in the military by incorporating comprehensive prevention and treatment models is of key importance in reducing caries intensity and ensuring effective oral health management among soldiers [11].

When considering the topic of dental problems in the military environment, many papers can be found highlighting the issue of barodontalgia, which is linked to a group of military personnel working in variable pressure conditions [20]. Since a certain proportion of those affected by barotrauma report a significant impact on their professional work, prevention and treatment of barodontalgia in these groups become a key direction for future research [25].

Conclusions

Research shows that health problems ranging from PTSD to dental conditions, such as caries, periodontal disease and barodontalgia, significantly affect the effectiveness and combat readiness of military personnel, indicating the need for further research in military medicine and dentistry [4, 7–9]. The need for a holistic approach to soldiers' health, encompassing physical, mental and dental aspects, to improve their operational readiness and quality of life has been emphasised.

Dental challenges such as barodontalgia require regular check-ups and the use of specific treatment approaches and customised accessories (e.g. mouthpieces) for divers and pilots to minimise the risk of injury [10, 13, 15, 17, 20, 27]. Furthermore, there is a clear need for military-specific diagnostic and treatment protocols to improve dental care and reduce dental problems among soldiers, recognising oral health as an important component of combat readiness [23, 24, 26].

References

1. Sikorski W. Przyszła wojna. Warszawa, Wydawnictwo MON, 1984.
2. Pennington H. The impact of infectious disease in war time: a look back at WW1. Future Microbiol, 2019; 14: 165–168. doi: 10.2217/fmb-2018-0323
3. Stathopoulos P. Maxillofacial surgery: the impact of the Great War on both sides of the trenches. Oral Maxillofac Surg, 2018; 22: 21–24. doi: 10.1007/s10006-017-0659-5
4. Richardson LK, Frueh BC, Acierno R. Prevalence estimates of combat-related post-traumatic stress disorder: critical review. Aust N Z J Psychiatry, 2010; 44: 4–19. doi: 10.3109/00048670903393597
5. Rozporządzenie Ministra Obrony Narodowej z dnia 27 czerwca 2023 r. w sprawie dodatkowych świadczeń zdrowotnych lekarza dentysty i materiałów stomatologicznych przysługujących żołnierzom zawodowym (Dz.U. 2023 poz. 1334)
6. Pasquier P, de Rudnicki S, Donat N, et al. Type et épidémiologie des blessures de guerre, à propos de deux conflits actuels: Irak et Afghanistan. Ann Fr Anesth Reanim, 2011; 30: 819–827. doi: 10.1016/j.annfar.2011.05.018
7. Armstrong S, Dermont M. Defence dentistry: an occupationally focused health service with worldwide deployable capability. Br Dent J, 2021; 230: 417–423. doi: 10.1038/s41415-021-2834-1
8. Khanna P, Chatterjee K, Goyal S, et al. Psychological stress in the navy and a model for early detection. J Mar Med Soc, 2019; 21: 116–120. doi: 10.4103/jmms.jmms_84_18
9. Lavrin O. Assessment of the prevention measures effectiveness for the development of carious dental lesions in military personnel of the armed forces of Ukraine. East Ukr Med J, 2023; 11: 483–491. doi: 10.21272/eumj.2023;11(4):483-491
10. Gunepin M, Zadik Y, Derache F, Dychter L. Non-barotraumatic tooth fracture during scuba diving. Aviat Space Environ Med, 2013; 84: 630–632. doi: 10.3357/ASEM.3592.2013
11. Lavrin OY, Avdeev OV, Romanjuk NYe, Bedenyuk OA. Dental assistance to military personnel of the armed forces of Ukraine. Int J Med Med Res, 2022; 7: 51–57. doi: 10.11603/ijmmr.2413-6077.2021.2.12488
12. Lavrin OY. Analysis of the prevalence of major dental diseases and the structure of dental care provision to the military personnel of the Armed Forces of Ukraine. Actual Dentistry, 2022; 4, 20–29. doi: 10.11603/2311-9624.2021.4.12665
13. Nagaraj T, Nigam H, Gogula S, et al. Aeronautic dentistry. J Adv Clin Res Insights, 2018; 5: 75–77. doi: 10.15713/ins.jcri.216
14. Strohaver RA. Aerodontalgia: dental pain during flight. Med Serv Dig, 1972; 23: 35–41
15. Ferjentsik E, Aker F. Barodontalgia: a system of classification. Mil Med, 1982; 147: 299–304. doi: 10.1093/milmed/147.4.299
16. Brandt MT. Oral and maxillofacial aspects of diving medicine. Mil Med, 2004; 169: 137–141. doi: 10.7205/MILMED.169.2.137
17. Robichaud R, McNally ME. Barodontalgia as a differential diagnosis: symptoms and findings. J Can Dent Assoc, 2005; 71: 39–42.
18. Zadik Y. Aviation dentistry: current concepts and practice. Br Dent J, 2009; 206: 11–16. doi: 10.1038/sj.bdj.2008.1121
19. Stoetzer M, Kuehlhorn C, Ruecker M, et al. Pathophysiology of barodontalgia: a case report and review of the literature. Case Rep Dent, 2012; 2012: 453415. doi: 10.1155/2012/453415
20. Goethe WHG, Bäter H, Laban Ch. Barodontalgia and barotrauma in the human teeth: findings in navy divers, frogmen, and submariners of the Federal Republic of Germany. Mil Med, 1989; 154: 491–495. doi: 10.1093/milmed/154.10.491
21. Calder IM, Ramsey JD. Ondontecrexis – the effects of rapid decompression on restored teeth. J Dent, 1983; 11: 318–323. doi: 10.1016/0300-5712(83)90116-1
22. Gunepin M, Derache F, Audoual T. Fracture of a sound tooth in a pilot under hypobaric conditions. Aviat Space Environ Med. 2010; 81: 691–693. doi: 10.3357/ASEM.2754.2010
23. Gunepin M, Derache F, Dychter L, et al. Dental barotrauma in French military divers: results of the POP study. Aerosp Med Hum Perform, 2015; 86: 652–655. doi: 10.3357/AMHP.4197.2015
24. 24. Gunepin M, Derache F, Blatteau JE, et al. Incidence and features of barodontalgia among military divers. Aerosp Med Hum Perform, 2016; 87: 137–140. doi: 10.3357/AMHP.4424.2016
25. Laval-Meunier F, Bertran PE, Arrivé E, et al. Frequency of barodontalgia among military or civilian pilots and aircrew members. Aviat Space Environ Med. 2013; 84: 1055–1060. doi: 10.3357/ASEM.3584.2013
26. González-Santiago MM, Martinez-Sahuquillo-Marquez A, Bullón Fernández P. Prevalencia de las barodontalgias y su

relación con el estado bucodental en el personal con responsabilidad en vuelo militar. Med Oral, 2004; 9: 92–105
27. Almadi E, Al-Hajri W. Prevalence of barodontalgia among pilots and divers in Saudi Arabia and Kuwait. Saudi Dental Journal, 2006; 18: 134–140
28. Zanotta C, Dagassan-Berndt D, Nussberger P, et al. Barodontalgias, dental and orofacial barotraumas: a survey in Swiss divers and caisson workers. Swiss Dent J, 2014; 124: 510–519