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Assessment of dental anodontia among Ferdinand I Military Technical Academy students in Romania

Procena bezubosti kod studenata Vojno-tehničke Akademije Ferdinand I u Rumuniji

Ancuța Dumitrița Dan*†, Doina Lucia Ghergic*

***Titu Maiorescu University, Doctoral School – Dental Medicine, Bucharest, Romania;**
†Ferdinand I Military Technical Academy, Bucharest, Romania

Abstract

Background/Aim. Data regarding tooth absence among Romanian military personnel are lacking. The aim of this study was to determine the prevalence of dental anomalies among military students at the Military Technical Academy in Bucharest, Romania. **Methods.** A cohort of 318 military students was enrolled in the study. Each participant underwent an extensive evaluation of their oro-dental health status based on guidelines of the European Global Oral Health Indicators Development II Project (EGOHID II). **Results.** Anodontia was discovered in 6 participants (prevalence rate was 1.9%), namely 4 women (prevalence among women was 4.6%) and 2 men (prevalence among men was 0.87%). Five of the six patients had never been previously diagnosed with anodontia. The most commonly affected teeth were second premolars (n = 8), followed by first premolars (n = 4) and second permanent molars (n = 2). Premolar anodontia was equally common in the maxilla and the mandible; both instances of molar anodontia were in the mandible. None of the participants with anodontia had remaining temporary teeth. A brief overview and two cases of diagnosed patients, who presented with inferior bilateral second molar anodontia and quadruple canine inclusion and a quadruple second premolar anodontia, are given. **Conclusion.** Military students in Romania would benefit from systematic dental evaluation and long-term monitoring prior to enrollment in the Military Academy.

Key words:
anodontia; military personnel; prevalence; romania; students.

Apstrakt

Uvod/Cilj. Podaci o nedostatku zuba kod rumunskog vojnog osoblja ne postoje. S obzirom na to, cilj rada bio je da se ispita prevalenca anomalije zuba među studentima Vojno-tehničke akademije u Bukureštu, Rumunija. **Metode.** Studijom je bilo obuhvaćeno ukupno 318 vojnih studenata. Svaki učesnik bio je podvrgnut sveobuhvatnoj proceni orodentalnog zdravstvenog stanja, na osnovu smernica *European Global Oral Health Indicators Development II* (EGOHID II) projekta. **Rezultati.** Anodoncija je otkrivena kod 6 učesnika u studiji (stepen prevalence iznosio je 1,9%) i to kod 4 žene (prevalenca među ženama iznosila je 4,6%) i dva muškarca (prevalenca među muškarcima iznosila je 0,87%). Kod pet od 6 ispitanika, anodoncija nikad ranije nije bila dijagnostikovana. Najčešće zahvaćeni zubi bili su sekundarni premolari (n = 8), zatim prvi premolari (n = 4) i sekundarni stalni premolari (n = 2). Premolarna anodoncija bila je jednako zastupljena i u maksili i u mandibuli, a oba slučaja molarne anodoncije bila su u mandibuli. Nijedan od učesnika u ispitivanju sa anodoncijom nije imao preostale privremene zube. Dat je kratak prikaz i dva slučaja dijagnostikovanih pacijenata koji su imali bilateralno nedostatak donjeg drugog kutnjaka i četvorostruku inkluziju očnjaka i četvorostruku anodonciju sekundarnog prednjeg kutnjaka. **Zaključak.** Pre upisa na Vojnu akademiju, vojni studenti u Rumuniji bi mogli imati koristi od sistemske stomatološke procene i dugotrajnog praćenja.

Ključne reči:
bezubost; kadar, vojni; prevalenca; rumunija; studenti.

Introduction

Romania, being a strategic partner of the North Atlantic Treaty Organization (NATO), is an active participant in peacekeeping operations which requires Romanian military troops to remain combat-ready. Military readiness depends on physical training, mental training, and health, including oro-dental health [1–3]. Specialized dental emergency care can

Correspondence to: Ancuța Dumitrița Dan, Aleea Ciceu, Bucharest, 041787, Romania. E-mail: aniela_ana1982@yahoo.com

not be administered to personnel located in isolated areas for combat missions or combat exercises. Moreover, the medical evacuation of a soldier in the event of such an emergency requires substantial logistical and human resources. Hence, it is important to monitor the oro-dental health status of troops. To this end, NATO has published military oral health standards for NATO member states with a dental fitness classification system [4].

Data regarding tooth loss among Romanian military personnel are lacking. Teeth can be missing for a variety of reasons, including extraction due to caries, trauma, or anodontia [5, 6]. Incomplete dentition can disrupt patients' quality of life due to several functional impacts, including impaired masticatory and phonetic function, as well as psychosocial impacts, due to discomfort, pain, or shame related to poor aesthetics [7]. It is important that oro-dental disease be timely diagnosed to enable the provision of appropriate interdisciplinary treatments that can correct functional and aesthetic deficiencies.

Individuals may have anodontia of both temporary and permanent teeth [8–10], or may, more commonly, have anodontia of a permanent tooth despite having had complete temporary dentition [11–15]. Ideally, anodontia should be recognized early in children's radiographs. However, many young adults joining the Romanian military may not have received regular dental care during childhood. Thus, it is likely that there are military academy students with undiagnosed congenital anodontia or with missing teeth due to trauma or tooth decay. The aim of the study was to assess the oral health status of Romanian military students, with particular attention to the identification of missing teeth due to anodontia.

Methods

Participants

Appropriate enrolment to achieve a representative sample was estimated to be 261 participants in Open-Epi, version 2.3 [16], under the following settings: population size of 805; hypothesized proportion for outcome factor in the population $p = 0.5$, with a maximum variance $\sigma(p) = p(1\text{-}p)$; margin of error $\Delta(p) = \pm 5$ percentage points; and an assumed type I error rate of 0.05 with a 95% confidence level. Year 1 (n = 327), year 2 (n = 259), and year 3 (n = 219) students enrolled in military-technical programs at the Ferdinand I Military Technical Academy, a polytechnic university in Bucharest, Romania, was invited to participate in this study. Because participation in the study was voluntary, following random selection, the sample should be considered a sample of convenience. The inclusion criteria in this study were: being a student in the 1st, 2nd, or 3rd year at the Academy and completing the informed consent form to participate in the study. Before being asked for consent, prospective participants were informed of the purpose and stages of the study, potential study benefits for participants and for medical research, and the implications of providing informed consent to participate in the study.

Clinical evaluation

Participating students were subjected to an examination at the Academy's dental office between March and May 2019. Prior to clinical evaluation, the following information was recorded for each participant: age, gender, time since last dental examination, time it takes to get to the dentist, use of fluoride toothpaste, typical number of snacks between main meals, tobacco and alcohol consumption, type of high school graduated (military or civilian), and environment of origin (urban or rural).

All examinations were performed by a single experienced examiner, according to the recommendations of the European Global Oral Health Indicators Development (EGOHID) II Project, after the examiner was informed about the aspects of examination that would be important for the study, including affirming informed consent, the need for good-quality materials, and adherence to the 2008 EGOHID II Full Standard Clinical Survey Form v22a. The clinical examination and registration of the collected data were performed in accordance with the recommendations of the EGOHID II Project Guide.

For each clinical examination, a dental mirror, dental probe, dental tweezer, light, air spray, cotton rolls, cotton balls, toothbrushes, and possibly dental floss were used. Before their examinations, subjects were asked to remove any removable braces or dentures. The examiner made sure that the teeth to be examined were clean, intervening where necessary by cleaning teeth with a dry toothbrush. Floss was used to remove interdental bacterial plaque. To perform a thorough examination, the teeth were dried for 5 seconds with air spray or a cotton ball, and the teeth were illuminated with a light source from the dental unit.

The examiner searched for signs of oro-dental disease and dental anomalies, according to the EGOHID II Dental Disease Assessment form, similar to the sample form shown in the EGOHID Project Report [17]. Causes of missing teeth were coded following EGOHID II guidelines outlined in the aforementioned report as follows: CODE 97, extracted due to caries; CODE 98, missing for any other reason; and CODE 99, unerupted (visible in an X-ray). Additionally, missing teeth that had been rehabilitated with an implant were noted with CODE P. Dental sites of anodontia were identified according to mouth quadrant (1-4, upper right and left, lower right and left, respectively) and dental site within the quadrant (numbered from central incisor backward). When anamnesis indicated that a missing tooth was never present in the arch, a radiological evaluation was performed or presented by the patient to confirm or rule out anodontia. Third molars were not considered in this study. The clinical examinations took, on average, 12 min *per* patient (range, 10~15 min).

Results

Participants

Out of the 805 students invited to participate, 318 students gave informed consent and enrolled in this study (39.5% enrolment rate), including 133 first-year (41.8% enrolment rate), 88 second-year (30.5% enrolment rate),

and 97 third-year (27.7% enrolment rate) students. This cohort could be considered statistically representative according to our OpenEpi analysis, which suggested the need for at least 261 subjects. Reasons given for choosing not to participate were the following: a busy daily schedule, fear of going to the dentist (despite knowing no therapeutic maneuvers would be performed at the examination), lack of interest in participating in biomedical research, and lack of interest in becoming more informed about one's own oral health status.

Demographically, the majority of respondents were men [231 males (72.6%); 87 females (27.4%)], and the cohort had a mean age of 20.2 years, with ages ranging from 18 [n = 8 (2.2%)] to 24 years [n = 1 (0.28%)]. The highest percentage of subjects was 21 years old [n = 123 (33.9%)]. A third of the cohort derived from rural origins [rural, n = 106 (33.3%); urban, n = 212, (66.7%)], and about a third graduated from military high school [military school graduates, n = 108 (34.0%); civilian school graduates, n = 210 (66.0%)].

Dental findings

Cohort

Anodontia was observed in 6 (1.88%) of the 318 participants, including 4 women (prevalence among women was 4.6%) and 2 men (prevalence among men was 0.87%). The most affected teeth were the second premolars (n = 8), followed by the first premolars (n = 4) and permanent molars (n = 2). There were six absent premolars from the maxilla and six absent premolars from the mandible. The sites of both anodontia-affected permanent molars were located in the mandible. None of the participants had a temporary molar corresponding to the premolar(s) affected by anodontia. The dental sites affected by anodontia are shown in Table 1.

Notably, five of the six participants in whom anodontia was discovered received their diagnosis of anodontia for the first time in the course of this study. Only one of them had been receiving ongoing dental monitoring, and the rest had not heard of this type of abnormality.

Treated case

Teeth surrounding sites affected by anodontia often exhibited interdental tremas and dental rotations that would be expected to disrupt optimal dento-maxillary functioning. For instance, in the case of a female patient (Figure 1) who had anodontia of the permanent lower second molars (sites 3.7 and 4.7), impaction of her bilateral and bimaxillary permanent canines was observed. The patient's lower canines (sites 3.3 and 4.3) were surgically-orthodontic straightened, and the same treatment was recommended for her upper canines (sites 1.3 and 2.3). This patient's radiological examination revealed additional anodontia of the wisdom teeth in all four quadrants.

Fig. 1 – Images of a 19-year-old female patient with anodontia presenting with impaction, *tremas*, and maxillary diastema: A) Clinical appearance of the mandibular arch with bilateral anodontia of the permanent second molars, at sites 3.7 and 4.7; B) Clinical appearance of the maxillary arch of the same patient, with bilateral inclusion of permanent canines, at sites 1.3 and 2.3; C) Radiograph demonstrating anodontia of dentition at sites 3.7 and 4.7.

The coexistence of anodontia together with dental inclusions can affect the positioning of patients' teeth in both arches. Notably, this patient presented with excessive *tremas* in both arches, together with a midline maxillary *diastema*, which was corrected by orthodontic treatment. No skin, hair, nails, eyes, or bone abnormalities were observed during her clinical examinations, indicating that her anodontia was non-syndromic. Because the patient was adopted and not in contact with her biological family, it could not be determined whether she may have inherited the observed dental abnormalities.

Table 1

Summary of anodontia cases identified

Patient sex/age (years)	Anodontia site(s)[a]										No. sites
	1.4	1.5	2.4	2.5	3.5	3.4	3.7	4.4	4.5	4.7	
F/19						×					1
F/19		×		×	×				×		4
F/19					×				×		2
F/19							×			×	2
M/20		×		×				×			3
M/20	×		×								2

[a]Sites are identified as "quadrant locus": quadrants 1, 2, 3, and 4 are upper right, upper left, lower right, and lower left, respectively; teeth in each quadrant are numbered from the central incisor to molars, such that .4 and .5 indicate first and second premolars, respectively, and .7 indicates a second molar.

Untreated case

Another example is a 19-year-old female participant that had anodontia at the level of all four second premolars (Figure 2). In this case, the radiograph was performed four years before the clinical examination but showed the absence of premolars. Furthermore, in this case, there was a non-syndromic anodontia. This patient did not benefit from orthodontic treatment.

Fig. 2 – Images of a 19-year-old female patient with non-syndromic quadruple second premolar anodontia without any other dental abnormalities: A) Clinical appearance of her mandibular arch with bilateral anodontia of the permanent second premolars, at sites 3.5 and 4.5; B) Clinical appearance of her maxillary arch with bilateral anodontia of the permanent second premolars, at sites 1.5 and 2.5; C) The radiograph shows the absence of premolars.

Discussion

The prevalence of anodontia observed in the present study cohort (1.88%) was within the range of previously reported anodontia incidence rates (0.15–13.4%) [8, 10, 18–23], while being slightly lower than that reported in a prior study conducted in Romania from 2008 to 2015 (3%) [24]. Although women constituted only 27.4% of our cohort, they accounted for two-thirds of the anodontia cases observed, consistent with prior studies reporting a higher risk of anodontia in females than males [8, 10, 12].

The predominance of second premolars being affected by anodontia in our study is consistent with prior studies reporting that second premolars and upper lateral incisors were the teeth most often affected by anodontia [25, 26] with the most often affected teeth within a series of like-type teeth being the distal tooth in each series (i.e., lateral incisor, second premolar, and third molar) [8, 27, 28]. We observed bilateral, rather than unilateral, anodontia of the second premolars more frequently than reported in previous studies [10, 29].

In general population, anodontia of the second molars is quite rare, with reported prevalence rates ranging from 0% to 3.4% [19, 21, 22, 30, 31]; in our study, we observed a 0.31% (n = 1) prevalence. Previously, anodontia of the second permanent molars has been reported to be accompanied by other dental anomalies [10]. In the case observed here, the patient presenting with anodontia of the permanent lower second molars had comorbid inclusion of all four permanent canines.

Only one of the six patients diagnosed in our study had received a prior diagnosis of anodontia. Of the six patients in whom anodontia was identified, only one was selected to proceed with orthodontic treatment. That patient (presented in Figure 1) had anodontia of the second permanent molars of the lower arch. None of the patients in whom anodontia of the premolars was discovered accepted to receive specialized therapy to correct associated dento-maxillary dysfunctions.

Anodontia was found more frequently in women than men, with an overall prevalence of almost 1 in 50. Second premolars were the most common teeth affected, followed by first premolars and second permanent molars. Both arches and both sides were affected at similar rates.

The lack of early treatment for dental anomalies that impair dento-maxillary function, such as anodontia, can result in worsening of oro-dental status over time, and thus costlier corrective treatment [32].

Limitations of the study

There are two major limitations of this study. First, the study focused on a single military academy with young adult students in Romania; thus, the findings may not reflect the general population. Second, the sample of anodontia cases discovered was small. Given that data regarding the oral health status of Romanian military students and personnel are lacking, a similar analysis should be conducted for the Romanian armed forces at large. Furthermore, a longitudinal study conducted with periodic evaluations would be warranted to reveal how the treatment needs of military personnel change over time and thus provide information regarding the logistical and human resources that should be involved.

Conclusion

The participants' lack of prior knowledge of their diagnoses indicates that the dental needs of members of the Romanian military academy are not yet being well met. Timely therapeutic intervention may be facilitated by widespread early dental evaluations.

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