

volume 9 may 2023 number 1 ISSN 2303-8616

HEALTH BULLETIN



Faculty of Health Studies

University of Mostar

HEALTH BULLETIN

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EDITORIAL

Dear Readers,

Before You is the seventeenth issues of the electronic journal the Health Bulletin and for the first time it is published entirely in English. Until now, the work in our journal was published both in Croatian and English. But, considering that our desire and intention is progress and access to more widespread internet databases, from this issues on, we will publish only in English. Our continuous goal is our aspiration and struggle to raise the level of our journal and seriously "attack" the online databases Scopus, WoS and many more.

This issue publishes ten works (5 scientific articles, four professional and one case report) written by our present and former students and teachers, and in addition, two of our authors/co-authors are from the Republic of Croatia.

I hope that by reading the Health Bulletin, you will expand and complement your knowledge which will also help your practical work and give additional motive to publish work in our journal. I would like to thank everyone who contributed to this issue and also invite all those interested to send their work for future issues, but from now on exclusively in English.

Dragan Babić

Mostar, May 2023.

THE HEALTH BULLETIN – SCIENTIFIC EXCELLENCE

Dragan Babić, Josip Šimić, Darjan Franjić, Roberta Perković

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Received on 01.02.2023.

Reviewed on 12.02.2023.

Accepted on 22.02.2023.

The last few decades have reported significant changes in the field of health sciences, including: nursing, radiological technology, physiotherapy, sanitary engineering, midwifery, etc. (1). The Faculty of Health Studies (FZS) of the University of Mostar has recorded growth and progress in its twenty-three years of existence. From its beginnings as a college, it became a respectable faculty of the University of Mostar, in Bosnia and Herzegovina and the region. Our faculty, with three education levels, provides students top-quality education and great learning and career opportunities. Hundreds of Masters of Healthcare, as well as several PhDs and associate professors, have been educated at our faculty.

With the desire for the widest possible spectrum of knowledge and the possibility of providing the highest possible quality of healthcare, and with the aim of educating students and teaching staff, there is an unquestionable need for science at the Faculty of Health Studies (2). The development of scientific activity and modern science is difficult to separate from the development of scientific communication, both in formal or informal networks used by scientists. The emergence of new discoveries in science also includes the process of scientific communication. Scientific

communication enables better cooperation among scientists, that is, it enables progress in all scientific fields (3). The Health Bulletin increases the ranking of our faculty and university in general. We publish the journal with the aim and hope that the innate and profession-oriented curiosity of our students will rekindle scientific thinking and scientific-research work in the field they have chosen as their career. The journal provides a space that teachers and associates will use to publish their scientific and scientific-research works, and at the same time encourage our students (4, 5).

The idea for the journal was born in 2014, and after detailed preparation, the first issue was published in May 2015. The journal is a semiannual publication, and in the past nine years, including this publication, 17 issues of the Health Bulletin have been published, including 170 works from over 350 authors and co-authors from nine countries (Bosnia and Herzegovina, Republic of Croatia, Serbia, Slovenia, Montenegro, Kosovo, Italy, Kazakhstan, and India). The majority of authors and co-authors are from the University of Mostar and the University Clinical Hospital Mostar, but there are authors from other universities in Bosnia and

Herzegovina (Sarajevo, Tuzla, Banja Luka, and others).

Our journal is indexed in four scientific databases (Cobiss, Google Scholar, Hrčak, and EBSCO), and we work towards indexation in Scopus and Web of Science citation databases. Until now, the largest number of published works were original scientific articles, but also review, professional, case reports, essays, and book reviews. So far, we have published works from biomedicine and healthcare, as well as from other related disciplines. Published papers in our journal are becoming increasingly cited in international databases. In the Google Scholar citation database, some of our works have between 20 and 30 citations (6-8), and others between 10 and 20 citations (3, 9-14).

Our plan for the future is to gradually increase the quality and raise the scientific and professional level of the journal. In the upcoming issues, we plan to increase the number of citations of authors and co-authors in our journal, as well as in other journals with higher ranking, which would increase the overall citation index of the Health Bulletin. This article, among other things, contributes to success on that front. Our long-term plan is to attract people to publish, and increase the number of readers with our professional and scientific quality and the variety and topicality of published work. We will strive to continue this progress, maintain a high level of teaching quality for the purpose of better education of our students who will help the sick in through careers, and some of them will also become teachers and educate new generations.

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THE FREQUENCY OF DUAL DIAGNOSIS AMONG THE USERS OF PSYCHOSOCIAL SERVICES IN THE THERAPEUTIC COMMUNITIES IN THE REPUBLIC OF CROATIA

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Received on 10.03.2023.

Reviewed on 27.03.2023.

Accepted on 01.04.2023

ABSTRACT

Introduction: Addiction is a mental state or physical condition that results from the continued use of a substance or performance of a particular activity. Dual diagnosis is the co-occurrence in the same individual of severe mental problems and addiction disease. **Objective:** To test the frequency of co-occurring disorders among the users of psychosocial services in the therapeutic communities in the Republic of Croatia. **Subjects and methods:** A cross-sectional study on a sample of 648 members of therapeutic communities was carried out. The data were collected by means of a modified international Pompidou Group's questionnaire consisting of general sociodemographic data and the data on treatment, risky behaviour and legal problems. **Results:** More than a half of the total number of subjects had dual diagnosis. The most frequent diagnoses co-occurring with addiction were disorders of adult personality and behaviour and schizophrenia, schizophrenia-like disorders and delusional disorders. Co-occurring disorders were more frequent in women than in men. In the Pope John XXIII Community, the main addiction substance among people of young age was amphetamine, and this change in trends of psychoactive substance abuse should be additionally explored. **Conclusion:** Somewhat more than a half of users of psychosocial services in the therapeutic communities in the Republic of Croatia had dual diagnosis.

Key words: addiction, dual diagnosis/co-occurring disorders, therapeutic communities, users of psychosocial services

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INTRODUCTION

Addiction is a mental state or physical condition that results from the continued use of a substance or performance of a particular activity and that triggers the urge to continue to use that substance or perform that particular activity despite the harm it causes (1). It usually involves addiction to a psychoactive substance, i.e. “a substance that interacts with the central nervous system by altering not only mental, but also physical functions“ (2). The use of opioid/psychoactive substances is related to altered states of consciousness, and it most frequently results in, for example, jeopardizing the safety of public transport and other negative effects in the immediate vicinity of a person using such substances (3). An increased number of experts believe that research on the causes of addiction should include more factors (4). A great number of research studies have shown that addiction as a phenomenon depends on the correlation between psychological and sociological factors which, when combined, lead to the predisposition for addiction. The most common mental illnesses that psychologists encounter in addicts include depression, anxiety, schizophrenia, and personality disorders. Some hereditary factors impact on addiction and encourage its development (5). Dual diagnosis means the co-occurrence of severe mental problems and addiction (to psychoactive substances or alcohol). The term “dual diagnosis” is used to describe a diagnosis in people suffering from the co-occurring opioid substance abuse/addiction and

psychotic, affective or severe personality disorders (6). Dual diagnosis is difficult to diagnose due to the abuse of psychoactive substances which themselves cause problems and because their use is often explained as an attempt of “self-treatment” (7). In practice, two efficient diagnostic criteria included in DSM-V and ICD-10 can be used. Based on diagnostic criteria in these systems, various tools have been developed, such as the Tool for the Assessment of Dual Diagnosis, the Psychiatric Diagnostic Screening Questionnaire and the Form for Mental Health Assessment (8). As far as co-occurring disorders are concerned, those related to addiction include alcoholism, schizophrenia, personality disorders and mood disorders. These disorders are analysed hereinafter. It should be emphasised that new behavioural addictions have developed over the last several years and they are also analysed.

Treatment and rehabilitation of patients with dual diagnosis is a very complex and lengthy process which requires life-long commitment. Hospitals carry out detoxification; alleviate addiction withdrawal symptoms; introduce, adjust or withdraw substitution therapies, and implement various sociotherapeutic methods. As hospital treatment is just the beginning of a lengthy processes, patients who decide to establish total abstinence are recommended rehabilitation-resocialisation treatment in a therapeutic community (9). A therapeutic community is one of the most famous sociotherapeutic methods where the pyramid of authority is significantly less strict, and which employs two-way communication on all levels in order to improve

the mental state of patients (10). The experts talk about the four basic characteristics of a therapeutic community: permissiveness, democratisation, reality confrontation and communalism (11).

The purpose of this research study was to establish the frequency of dual diagnosis among the users of psychosocial services in the therapeutic communities in the Republic of Croatia.

SUBJECTS AND METHODS

The cross-sectional study on a sample of 648 subjects, i.e. users of therapeutic community services, was carried out. The study was conducted between May and October 2022. The leaders of eight therapeutic communities in the Republic of Croatia, namely the Pope John XXIII Community Association, Comunità Mondo Nuovo, Therapeutic Community “Susret”, Therapeutic Community “Ne-ovisnost”, Therapeutic Community “Pet plus”, Therapeutic Community “Moji Dani”, Therapeutic Community “RetoCentar” and Therapeutic Community “Biram bolji život”, participated in the study and provided information on subjects with dual diagnosis who were the members of their therapeutic communities.

Telephone interviews with the leaders of therapeutic communities were carried out for the purposes of this research study. During the interviews, the purpose, methods and objectives of data collection were explained. After that, the leaders of therapeutic communities were emailed

a questionnaire. The method for completing the questionnaire and the relevant symbols were explained in detail. The data about the members of these therapeutic communities, i.e. about the addicts with dual diagnosis, were anonymous and could not be in any way traced back to them. The analysis was carried out on a group level. The leaders of therapeutic communities delivered the requested information on the basis of the modified international questionnaire of the Council of Europe Cooperation Group To Combat Drug Abuse and Illicit Trafficking in Drugs (The Pompidou Group), and the International Classification of Diseases, 10, codes F11 to F19 (12). The Pompidou Group’s questionnaire consists of general sociodemographic data and the data on treatment, risky behaviour and legal problems. The questionnaire used in this study was modified, i.e. shorter, and supplemented with the requested information on other diagnoses of community members that the leaders of therapeutic communities could provide on the basis of insight into their medical records.

Diagnoses were classified in five groups: schizophrenia and delusional disorders (F20-F29), mood (affective) disorders (F30-F39), neurotic, stress-related and somatoform disorders (F40-F48), disorders of adult personality and behaviour (F60-F69) and behavioural and emotional disorders with onset usually occurring in childhood and adolescence (F90-F98).

The identity of leaders and members of therapeutic communities has not been revealed. If the study results are published, data protection policies will be respected to the maximum extent.

Study results are given both on a group level and statistically, without any individual disclosure of cases. All results will be kept confidential. The study subjects have no individual benefit from the study, but there is a general benefit in terms of detection and assessment of the frequency of dual diagnosis among the users of psychosocial services in the therapeutic communities in the Republic of Croatia.

Statistical analysis

The statistical software SPSS (Statistical Package for Social Sciences) for Windows (version 20.0, SPSS Inc, Chicago, Illinois, USA) was used for statistical analysis. The obtained results were analysed using descriptive statistics. They are shown in tables and charts, where their absolute (n) and relative frequencies (%) are indicated.

RESULTS

Men were predominant (88.27 %) in a research population. The majority of subjects came from the Therapeutic Community “Susret” (22.8 %), and the smallest number of subjects from the Therapeutic Community “Biram Novi Život” (2.7 %). The majority of subjects were in the age range between 40 and 49 years (31.64 %), from the City of Zagreb (21.60 %), with high-school qualifications (71.91 %), single (71.72 %) and with no children (71.98 %).

The main abuse substance in the majority of members of therapeutic communities were opioids (40.43 %), and alcohol (18.98 %). The frequency of members with dual diagnosis and those without dual diagnosis was approximately equal in all therapeutic communities, with a somewhat higher ratio of those with dual diagnosis (52.01 %). The main addiction substance among young people in the Pope John XXIII Community was amphetamine, and this change in trends of psychoactive substance abuse should be additionally explored.

The most frequent diagnoses occurring with addiction were disorders of adult personality and behaviour (19.81 %) and schizophrenia, schizophrenia-like disorders and delusional disorders (19.66 %). The highest frequency of people with co-occurring disorders was recorded in the Therapeutic Community “Moji Dani” (Figure 1).

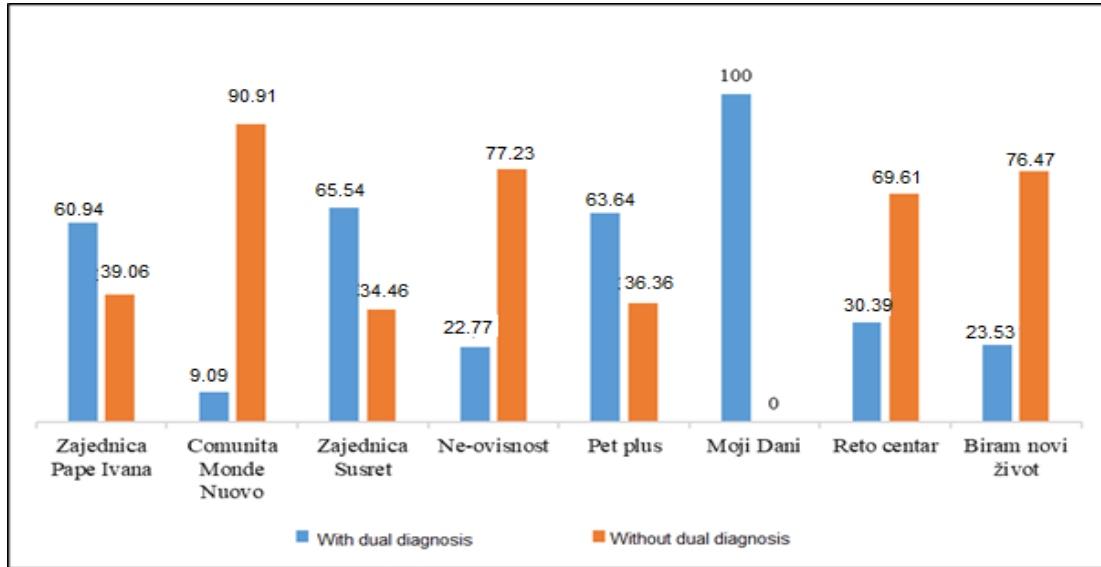


Figure 1. The presence of co-occurring disorders in members of therapeutic communities in the Republic of Croatia (in %).

The most frequent diagnoses in both men and women were disorders of adult personality and behaviour, followed by schizophrenia, schizophrenia-like disorders and delusional disorders (Figure 2).

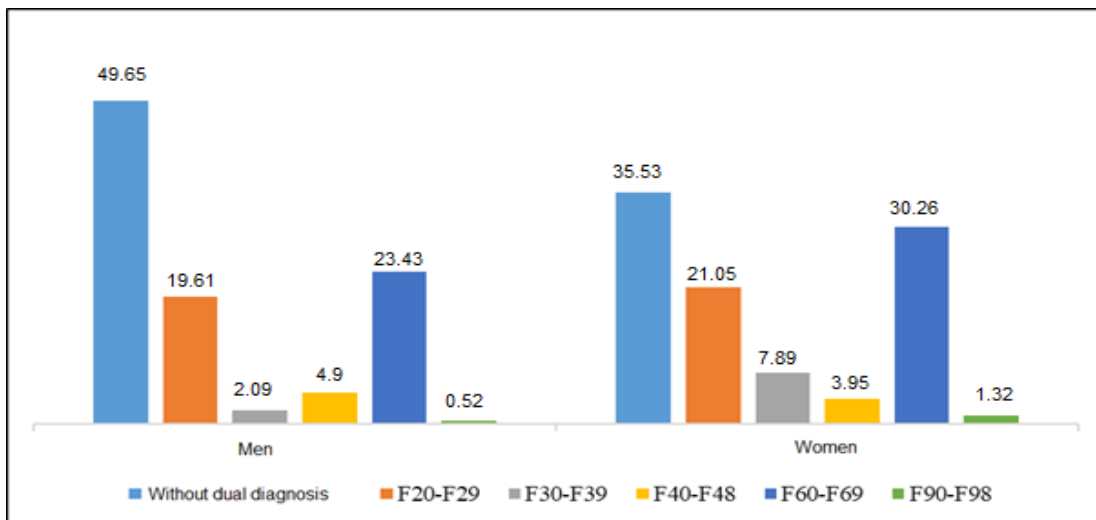


Figure 2. The frequency of various co-occurring disorders in men and women from all therapeutic communities in the Republic of Croatia (in %).

Co-occurring disorders were more frequent in women than in men in the therapeutic communities in the Republic of Croatia (Figure 3).

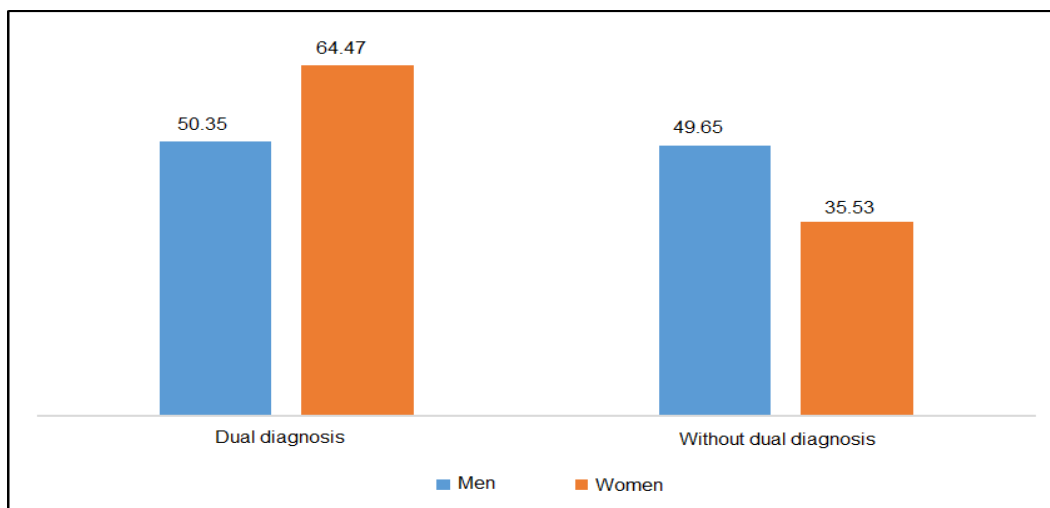


Figure 3. The presence of all co-occurring disorders in men and women in therapeutic communities (in %).

DISCUSSION

The results of this research study have shown that the patients undergoing psychosocial treatment in the therapeutic communities in the Republic of Croatia are mostly men, middle-aged with high-school qualifications, single and with no children. As far as co-occurring disorders are concerned, the research has shown that more than a half of the clients of therapeutic communities are those with co-occurring disorders. Furthermore, addiction in these clients is most often accompanied with disorders of adult personality and behaviour and schizophrenia, schizophrenia-like disorders and delusional disorders, while behavioural and emotional disorders with onset usually occurring in childhood and adolescence are the least frequent. Therefore, the research hypothesis that there is a large number of people with dual diagnosis among the users of psychosocial services in the therapeutic communities in the Republic of Croatia can be confirmed. These results are in line with the results of other similar research studies. It has

been already emphasised that many authors state that three quarters of individuals with dissocial personality disorders also suffer from addiction disease (13, 14). In individuals with borderline personality disorders, addiction occurs in 14.0 to 72.0 % of cases. The rates of prevalence of co-occurring disorders are the lowest if the current addiction disease is taken into account, and the highest if we take into account the fact that an individual with a borderline personality disorder was an addict in a certain period of their life (15). Some research studies have shown that 45.0 % of individuals with borderline personality disorders meet the diagnostic criteria for addiction disease (16). As far as psychoactive substances are concerned, experts believe that addiction should be analysed from two aspects – mental and physical (17). As concerns schizophrenia and addiction disease, some research studies emphasise that these individuals often rely on self-treatment by consuming alcohol or psychoactive substances, i.e. that people with schizophrenia also fight alcohol or psychoactive

substance addiction (18). As far as specific substances are concerned, certain authors state that alcohol addiction occurs in 60.0 to 90.0 % of people with schizophrenia (19, 20). Alcohol addiction in those people occurs at the prevalence from 21.0 to 86.0 %, cannabis addiction at the prevalence from 17.0 to 83.0 % and cocaine abuse with the prevalence from 15 to 50 % (20). Therefore, incidence rates of dual diagnosis in people with schizophrenia are three times higher than in the general population (20, 21).

Furthermore, the results of this research study have shown that co-occurring disorders are more frequent in women than in men who undergo psychosocial treatment in the therapeutic communities in the Republic of Croatia. When the information related to the frequency of individual diagnoses is analysed, it is evident that there are no significant differences among the people undergoing psychosocial treatment in the therapeutic communities in the Republic of Croatia. Therefore, the research hypothesis that there are significant differences in diagnosis among the people undergoing psychosocial treatment in therapeutic communities in the Republic of Croatia with regard to sex of subjects is rejected. These research results, however, cannot be compared with the results of other similar research studies due to the scarce literature information about women with dual diagnosis (22). Nevertheless, a number of studies state that therapeutic communities play an important role in the improvement and preservation of mental health (23-27).

The advantage of this research study is that it was conducted on a relatively large sample of subjects. Only two therapeutic communities from the Republic of Croatia did not participate in the research, one of them not being eligible as it does not receive patients with dual diagnosis. Not understanding the questions from the questionnaire or giving socially desirable answers were the factors that could influence the accuracy of answers given by subjects. Despite these limitations, this research study is specific and the first one of this kind conducted in the Republic of Croatia since co-occurring disorders are not given sufficient attention. The research on the frequency of dual diagnosis among the users of psychosocial services in the therapeutic communities in the Republic of Croatia would provide an insight into the real situation, i.e. in the on-the-spot situation, and could contribute to the creation of innovative strategies to combat various types of addiction and provide better quality care for the people with dual diagnosis. This research could help in integrating new interventions in psychosocial treatment provided to patients with dual diagnosis in therapeutic communities.

CONCLUSION

Somewhat more than a half of users of psychosocial services in the therapeutic communities of the Republic of Croatia have dual diagnosis, which indicates how important it is for experts to be persistent in providing maximum possible care to people with dual diagnosis. Other diagnoses present among those users occur at the

same incidence with regard to their sex. The ratio of users with dual diagnosis is higher in female than in male users of psychosocial services in the therapeutic communities in the Republic of Croatia.

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UČESTALOST DUALNIH POREMEĆAJA MEĐU KORISNICIMA PSIHOSOCIJALNOG TRETMANA U TERAPIJSKIM ZAJEDNICAMA REPUBLIKE HRVATSKE

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SAŽETAK

Uvod: Ovisnost je psihičko i fizičko stanje koje je posljedica višekratnog uzimanja određene tvari ili poduzimanja određenog djela. Pod dualnim poremećajem podrazumijeva se komorbiditet težih psihičkih problema te bolesti ovisnosti. Cilj: Ispitati učestalost dualnih poremećaja među korisnicima psihosocijalnog tretmana u terapijskim zajednicama u Republici Hrvatskoj. Ispitanici i metode: Provedena je presječna studija na uzorku od 648 korisnika terapijskih zajednica. Podatci su prikupljeni primjenom modificiranog međunarodnog Pompidou upitnika sastavljenog od općih sociodemografskih podataka te podataka o liječenju, rizičnom ponašanju i sudskim problemima.

Rezultati: Više od polovine ukupnog broja ispitanika imalo je dualni poremećaj. Najučestalije dijagnoze koje se javljaju uz dijagnozu ovisnosti bili su poremećaji ličnosti i poremećaji ponašanja odraslih te shizofrenije, poremećaji slični shizofreniji i sumanuta stanja. Dualni poremećaji bili su češći kod žena u odnosu na muškarce. U udruzi Zajednica Pape Ivana XXIII glavno sredstvo ovisnosti među osobama mlađe životne dobi bio je amfetamin, te bi ovu promjenu dosadašnjih trendova zlouporabe psihoaktivnih sredstava trebalo dodatno istražiti.

Zaključak: Među korisnicima psihosocijalnih tretmana u terapijskim zajednicama u Republici Hrvatskoj je nešto više od polovice korisnika s dualnim poremećajima.

Ključne riječi: Ovisnost, dualni poremećaji, terapijske zajednice, korisnici psihosocijalnog tretmana

Autor za korespondenciju: Gordana Cavicchi, mag. act. soc.

THE IMPORTANCE OF DETERMINING THE VITAMIN D3 CONCENTRATION IN PATIENTS WITH TYPE 1 DIABETES

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Received on 25.01.2023.

Reviewed on 10.02.2023.

Accepted on 25.02.2023.

ABSTRACT

Introduction: Many epidemiological studies have shown a connection between vitamin D deficiency and increased incidence of type 1 diabetes. **Objective:** The aim of this study is to determine the impact of vitamin D levels in children with newly diagnosed type 1 diabetes, taking into account the following parameters: gender, place of residence, positive/negative family history, comorbidities. **Respondents and methods:** The research was conducted through a retrospective analysis of the medical records of the Children's Disease Clinic of the University Clinical Hospital Mostar. The research included a sample of 30 children diagnosed with type 1 diabetes, treated at the Department of Endocrinology and Metabolic Diseases, Clinic for Children's Diseases, University Clinical Hospital Mostar. **Results:** The research consisted of 30 participants treated at the Department of Endocrinology and Metabolic Diseases, Clinic for Children's Disease. The sample consists of 40% (n=12) male respondents and 60% (n=18) female respondents. Slightly more than half of the respondents, 53.3% (n=16) lived in the city, while the remaining 46.7% (n=14) lived in the countryside. Statistical analysis of the patients with newly diagnosed type 1 diabetes, showed that there were significantly more patients (70%) with positive family history of diabetes mellitus than those with negative. In this study, 26.7% (n=8) patients with newly diagnosed type 1 diabetes had comorbidities, compared to 73.3% patients without comorbidities (n=22). Patients living in rural areas had significantly higher values of vitamin D3 concentration compared to those who lived in urban areas. **Conclusion:** 83.3% of subjects with newly diagnosed type 1 diabetes have a reduced level of vitamin D at the time of diagnosis. Numerous studies have shown a link between vitamin D deficiency and an increased risk of developing diabetes. Due to all of the above, supplementation and control of vitamin D is recommended, especially in children who have a risk in the form of positive family history and comorbidities such as Hashimoto's thyroiditis, and celiac disease from an early age for the purpose of prevention.

Keywords: Vitamin D, diabetes mellitus type 1, children

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INTRODUCTION

Numerous epidemiological studies have shown a connection between vitamin D deficiency and increased incidence of type 1 diabetes. According to some studies, the incidence of this disease is reduced by supplementing vitamin D in early childhood (1). Vitamin D is a prohormone with several active metabolites that act as hormones. It has two main forms: D2 (ergocalciferol) and D3 (cholecalciferol). Vitamin D3 is metabolized in the liver into 25(OH)D, which is then converted into 1,25(OH)2D (1,25-dihydroxycholecalciferol, calcitriol, or active vitamin D hormone) in the kidneys. The main circulating form, 25(OH)D, has some metabolic activity, but the most metabolically active is 1,25(OH)2D. The conversion to 1,25(OH)2D is controlled by its own concentration, parathyroid hormone (PTH) and serum Ca and phosphate concentrations (2,3). The effect of vitamin D on genes is mediated by the Vitamin D Receptor (VDR) (5). Vitamin D Receptor binds to DNA as VDR/VDR homodimers or VDR/RXR heterodimers in order to regulate gene expression. Dimers are subsequently recognized and bind to transcription factor IIB (TFIIB) (4,5). This complex then binds to the Vitamin D response element (VDRE), i.e. the promoter region of target genes on DNA and leads to transcriptional suppression or activation of genes regulated by vitamin D (6). Polymorphisms in the VDR gene are associated with health conditions that include diabetes mellitus (DM), low bone density, cardiovascular disease, cancer, autoimmune reactions, and

infections (7). The indicator of vitamin D status in the body is the concentration of 25-OH D. The half-life of 25-OH D in the bloodstream is 2 weeks (14). Although recommended blood concentrations are not fully agreed upon, it is considered that a concentration lower than 75 nmol/L (30 ng/L) indicates a deficiency or insufficiency (hypovitaminosis D). Concentrations lower than 50 nmol/L (20 ng/mL) indicate vitamin D deficiency or insufficiency. In general, experts agree that 25-OH D concentrations of 75 to 100 nmol/L are desirable in the population, and those lower than 50 nmol/L are insufficient for the health of the musculoskeletal system. Excess vitamin D (hypervitaminosis D) is considered when the concentration of 25-OH D is higher than 250 nmol/L and with hypercalcemia. Toxic effects are observed at concentrations of 25-OH D > 375 nmol/L in the blood (11,12). Diabetes mellitus is the most common metabolic disease of multiple etiology, characterized by chronic hyperglycemia with a disturbance in the metabolism of carbohydrates, fats, and proteins, which occurs when the pancreas completely or partially stops producing insulin (15,16). Type 1 diabetes is suspected if the following symptoms are expressed: increased thirst and urination, itching and recurrent bacterial or fungal infections on the skin, buccal mucosa, gingiva, urinary system or external genitalia, increased hunger, weight loss, fatigue and drowsiness, and in more severe conditions, weakness, disturbance of consciousness or coma (17,18). The World Health Organization classifies diabetes into type 1

(formerly "insulin-dependent"), type 2 (formerly "insulin-independent"), other specific types, and gestational diabetes (18).

Diabetes mellitus type 1 is caused by the autoimmune destruction of pancreatic beta cells, which leads to a complete lack of insulin, and insulin replacement is necessary (16,19). Type 1 diabetes is usually more often detected in childhood or adolescence (15). Diabetes mellitus type 2 is caused by tissue insensitivity (resistance) to insulin (16). Gestational diabetes is diabetes that is diagnosed during pregnancy (16,17). According to some studies, vitamin D has an effect on the prevalence of type 1 diabetes. Supplementation of vitamin D in the diet is associated with a reduced risk of type 1 diabetes. Providing adequate vitamin D supplementation to infants could help reverse the trend of increasing incidence of type 1 diabetes (19, 20).

The main goal of this research is to determine the concentration of vitamin D in children with newly diagnosed type 1 diabetes. The specific goal of this study was to examine the influence of vitamin D taking into account the following parameters: gender, place of residence, positive/negative family history, and vitamin D concentration at the time of disease detection.

RESPONDENTS AND METHODS

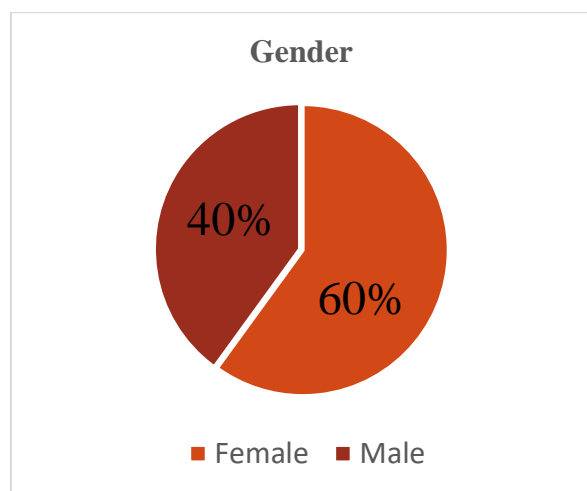
This retrospective study was conducted at the Department of Endocrinology and Metabolic Diseases of the Children's Clinic in the University Clinical Hospital Mostar. The participants were children aged 0-18 living in three counties of

Bosnia and Herzegovina (Herzegovina-Neretva County, West-Herzegovina County, and Hercegovina County) that were hospitalized at the Children's Clinic. Using medical history and other available medical documentation the following results were analyzed: gender, place of residence, family history, comorbidities, and vitamin D concentration at the time of diagnosis. The status of vitamin D in the body was determined by measuring the concentration of 25-hydroxy vitamin D (25-OH D) in the blood. Reference values are 75 nmol/L – 100 nmol/L. The serum levels lower than 50 nmol/L represents vitamin D deficiency, the levels between 50-75 nmol/L insufficiency, and levels greater than 100 nmol/L vitamin D sufficiency (11). Vitamin D values were determined by the electrochemiluminescence (ECLIA) method on the Roche's Cobas 601 analyzer in the University Clinical Hospital Mostar laboratory. Statistical processing of the collected data was done with the computer program SPSS 10.0 (SPSS for Windows, SPSS Inc. Chicago IL, USA). Data were processed using descriptive statistics methods, where categorical variables were presented as frequency and percentage and graphically, while continuous variables were presented through arithmetic mean and standard deviation. The comparison of frequencies for categorical variables was determined by the Chi-square test, while the differences in the values of continuous variables for independent samples were examined using the t-test. The Shapiro-Wilk test was used to test the normality of the distribution of a continuous variable. The level of

statistical significance in the paper is 5% with a confidence of 95%.

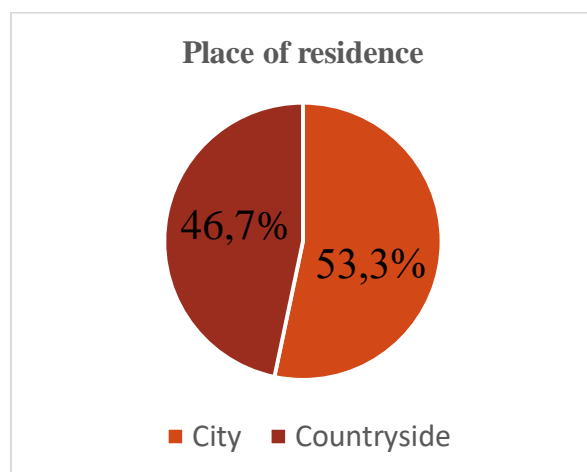
THE RESULTS

This study included 30 participants under the age of 18, of which 40% (n=12) were male and 60% (n=18) were female (Picture 1).



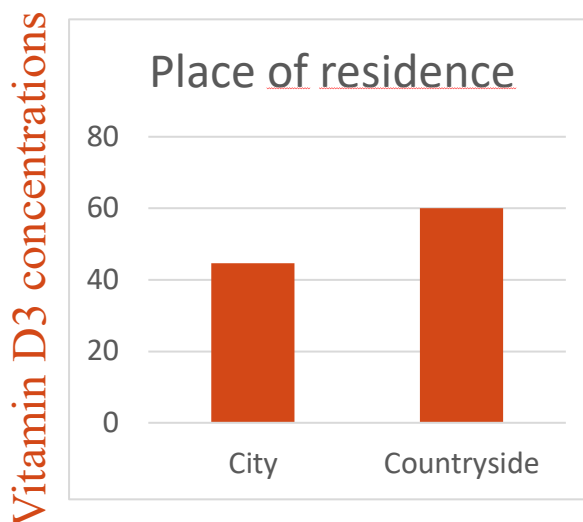
Picture 1. Graphic presentation of participants by gender (n=30).

Slightly more than half of participants, 53.3% (n=16) of them lived in the city, while the remaining 46.7% (n=14) lived in the countryside (Picture 2).



Picture 2. Graphic presentation of participants by the place of residence (n=30).

Using the Student t-test for independent samples, it was determined that there are statistically significant differences in vitamin D3 concentrations with regard to the place of residence, that is, whether the patient lives in the countryside or in the city. Patients living in rural areas had significantly higher values of vitamin D3 concentration (Picture 3).



Picture 3. Mean values of vitamin D3 concentration with regard to the patient's place of residence (n=30).

In this study there were statistically more patients without an associated disease compared to those with some comorbidity (Chi-square test, Table 1). 26.7% (n=8) patients with newly diagnosed type 1 diabetes had comorbidities, of which one had two and one had three comorbidities compared to 73.3% patients without comorbidities (n=22).

Table 1. Differences in the frequency of comorbidities in patients with newly diagnosed type 1 diabetes (n=30)

Comorbidities	N	X ²	df	p
Yes	8	6,533	1	<0,05
No	22			

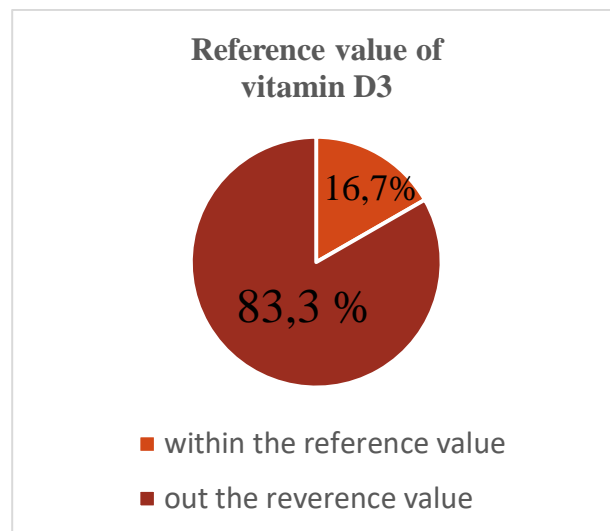
Table 2. Distribution of comorbidities in patients with newly diagnosed type 1 diabetes (n=8)

Comorbidities	f	%
Hashimoto's	5	45,4
Hypovitaminosis	2	18,2
Hypercholesterolemia	2	18,2
Hyperthyroidism	1	9,1
Hypothyroidism	1	9,1

The Shapiro-Wilk test determined that the distribution of vitamin D3 concentration results deviates statistically significantly from normal (S-W=0.922, df=12, p>0.05), which justifies the use of parametric methods of statistical data processing in further processing.

The minimum value of vitamin D3 concentration in patients from this study was 25.6 nmol/L. and the maximum was 94.6 nmol/L, while the average value was 51.84 (Sd=18.54).

The Picture 4 shows the distribution of patients with regard to whether their vitamin D3 concentration is within the reference values, and it was determined that the majority of patients, 83,3% (n=25) of them, have a vitamin D3 concentration value outside the reference values, while only 16,7% (n=5) of them have a normal vitamin D3 value, or from 75 to 100 nmol/L.



Picture 4. Distribution of patients with newly diagnosed type 1 diabetes with regard to the concentration of vitamin D3 (n=30).

DISCUSSION

Numerous previous studies shows that vitamin D deficiency is associated with a higher incidence of diabetes. This study analyzed the influence of vitamin D concentration in patients with newly diagnosed type 1 diabetes, taking into account the following parameters: gender, place of residence, positive or negative family history, comorbidities, and the concentration of vitamin D measured at the time of diagnosis.

In this study, 26.7% patients with newly diagnosed type 1 diabetes had comorbidities, 5% of them had Hashimoto's thyroiditis, so we can confirm the close connection between these two diseases. This result is in correlation with recent meta-analysis of all available data in 10,920 patients with DM revealed a mean incidence of thyroid disease of 11%. A large pediatric diabetes center in Germany that recruited 495 patients with

T1DM described an additional rapid increase in the prevalence of thyroid antibodies with age, rising from 3.5% in patients younger than 5 years to 25.3% in those between 15 years of age. and 20 years (22). Radetti and al. showed a close connection between these two autoimmune diseases. Thyroid disorders remain the most common autoimmune disorders associated with type 1 diabetes. This was shown in a cross-sectional study involving 1419 children with type 1 diabetes, where 3.5% had Hashimoto's thyroiditis (23). When we talk about family anamnesis, among patients with newly diagnosed type 1 diabetes, there are significantly more patients with a positive family anamnesis than patients with a negative anamnesis, even 70% of them.

The question arises whether vitamin D participates in the etiology and pathogenesis of the disease. The results of our study showed that 83.3% of subjects had a lower concentration of vitamin D at the time of disease detection. The study, which was conducted in Olu and Lapland, northern Finland, collected data in the first year of life on the frequency and dose of vitamin D supplementation in children born in 1996. Of the 10,366 children included in the analyses, 81 were diagnosed with diabetes during the study. Vitamin D supplementation was associated with a reduced incidence of type 1 diabetes. This study confirmed that supplementing with dietary vitamin D reduces the risk of type 1 diabetes. Providing adequate vitamin D supplementation to infants could help reverse the trend toward increased incidence of type 1 diabetes. (24).

Research carried out in Germany proved the association of vitamin D with diabetes mellitus type 1. The vitamin D system is associated with type 1 diabetes by epidemiological studies and studies of immune intervention as well as polymorphisms of the vitamin D binding gene (9). A study conducted by Tangjittipokin W et al, indicating the association between vitamin D and diabetes mellitus type 1, the study was conducted among 100 T1D children and 100 control groups. Relationships between T1D polymorphism and CYP2R1 and VDR haplotypes were found (25). Vitamin D-related gene variations are associated with vitamin D and circulating cytokine levels in children with T1D (25). A meta-analysis and reference lists of retrieved articles investigated the impact of vitamin D. The analysis included controlled trials and observational studies that evaluated the effect of vitamin D supplementation on the risk of developing type 2 diabetes. 1. Vitamin D supplementation in early childhood may provide protection against the development of type 1 diabetes studies (26). Research conducted by Hussein AG et al showed that the GG genotype of the CYP2R1 polymorphism and/or the CC genotype of the CYP27B1 polymorphism increases the risk of developing type 1 diabetes in Egyptian children (8). Research conducted by Nam HK et al has shown that polymorphisms in vitamin D metabolism may contribute to the susceptibility to type 1 diabetes in Korean children (10). According to American recommendations, infants and children should receive between 5 µg/day and 255 µg/day of additional vitamin D, especially if they have

limited sun exposure, live in northern areas, are exclusively breastfed, or have dark skin (27). Our research found that children who had vitamin D values within the reference values, 46.7% of them, live in the countryside. The question arises whether the place of residence, a different way of eating, and lifestyle have an influence in relation to rural and urban environments. However, no adequate evidence was found for this comparison.

CONCLUSION

The main goal of this research was to determine the influence of vitamin D concentration in children diagnosed with type 1 diabetes, taking into account the following parameters: gender, place of residence, negative or positive family history, comorbidities, and vitamin D concentration at the time of diagnosis. The research was conducted at the Department of Endocrinology and Metabolic Diseases of the Clinic for Children's Diseases, SKB Mostar. Since a lot of research supports the opinion that vitamin D can have a beneficial effect on the prevention of type 1 diabetes mellitus, it is important to determine the status of vitamin D and to start compensation in time if it is needed. Finally, it is important to note some facts, the research was conducted on a sample of 30 respondents, and the vitamin concentration was recorded at only one point in time. However, epidemiological evidence and observational studies suggesting that adequate vitamin D status is associated with a reduced risk of developing

type 1 diabetes further support the concept of this research paper.

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ZNAČAJ ODREĐIVANJA KONCENTRACIJE VITAMINA D3 U BOLESNIKA SA ŠEĆERNOM BOLESTI TIP 1

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SAŽETAK

Uvod: Mnoga epidemiološka istraživanja pokazala su povezanost između nedostatka vitamina D i povećane incidencije dijabetesa tipa 1. Cilj: Cilj ovog istraživanja je utvrditi utjecaj vitamina D kod djece s novootkrivenom šećernom bolesti tip 1, uzimajući u obzir sljedeće parametre: spol, mjesto stanovanja, pozitivna/negativna obiteljska anamneza, pridružene bolesti te koncentracija vitamina D u trenutku otkrivanja bolesti. Ispitanici i metode: Istraživanje je provedeno retrospektivnom analizom medicinske dokumentacije pismohrane Klinike za dječje bolesti SKB Mostar. Istraživanjem je obuhvaćen uzorak od 30 djece s dijagnozom šećerne bolesti tip 1, liječenih na Odsjeku za endokrinologiju i bolesti metabolizma Klinike za dječje bolesti Sveučilišne kliničke bolnice Mostar. Rezultati: U istraživanju je sudjelovalo 30 ispitanika liječenih na Odsjeku za endokrinologiju i bolesti metabolizma. Uzorak sačinjava 40% (n=12) ispitanika muškog spola, a 60% (n=18) ispitanika ženskog spola. Nešto više od polovice ispitanika, odnosno njih 53,3% (n=16) je živjelo u gradu, dok je preostalih 46,7% (n=14) živjelo na selu. Statističkom obradom podataka se utvrdilo da među bolesnicima s novootkrivenom šećernom bolesti tip 1 značajno je više onih koji imaju pozitivnu obiteljsku anamnezu od bolesnika s negativnom anamnezom. Ispitanika s pozitivnom obiteljskom anamnezom je bilo 70%, dok je njih samo 30% imalo negativnu anamnezu. U ovom istraživanju je 26,7% (n=8) bolesnika s novootkrivenom šećernom bolesti tip 1 imalo pridružene bolesti, u odnosu na 73,3% bolesnika bez pridruženih bolesti (n=22). Bolesnici koji žive na selu imaju značajno veće vrijednosti koncentracije vitamina D3 u odnosu na one koji žive u gradu. Zaključak: 83,3% ispitanika s novootkrivenom šećernom bolesti tip 1 ima sniženu razinu vitamina D u trenutku otkrivanja bolesti. Brojne su studije pokazale poveznicu između nedostatka vitamina D i povećanog rizika za nastanak dijabetesa. Zbog svega navedenog preporučuje se nadoknada i kontrola vitamina D, osobito kod djece koja imaju rizik u vidu pozitivne obiteljske anamneze te pridruženih bolesti kao što je Hashimotov tireoiditis, celijakija od najranije dobi u svrhu prevencije.

Ključne riječi: Vitamin D, diabetes mellitus tip 1, šećerna bolest, djeca

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PREVALENCE OF PSYCHOLOGICAL SYMPTOMS IN STUDENTS OF THE FACULTY OF HEALTH STUDIES UNIVERSITY OF MOSTAR

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Received on 08.04.2023.

Reviewed on 16.04.2023.

Accepted on 28.04.2023.

ABSTRACT

Introduction: The student population is in a period of psychological maturation during which a person searches for their identity and gradually accepts the role and responsibilities of an adult. Studentship is considered a very sensitive period, because up to the age of 24 years has the highest prevalence of mental disorders appearing for the first time.

Objective: Investigate the prevalence of psychological symptoms in students of the Faculty of Health Studies of the University of Mostar.

Subjects and methods: The study group consisted of students of the Faculty of Health Studies of the University of Mostar (N=100), and the control group consisted of students of the Faculty of Kinesiology of the University of Mostar (N=100). The data were collected using a socio-demographic questionnaire designed specifically for this research and The Symptom Checklist-90-R (SCL-90-R).

Results: Students who used psychoactive substances were statistically significantly more likely to drink alcoholic beverages and smoke tobacco when compared to the group of students who do not use psychoactive substances. Students of the Faculty of Health Studies achieved statistically significantly higher scores on the scales for psychological symptoms (SCL-90-R): obsessive-compulsive symptoms, interpersonal sensitivity, depression, anxiety, paranoia, psychotic features and non-specific psychological symptoms when compared to kinesiology students.

Conclusion: Students of the Faculty of Health Studies of the University of Mostar have a statistically significantly higher prevalence of psychological symptoms when compared to students of the Faculty of Kinesiology.

Key words: prevalence, psychological symptoms, students

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INTRODUCTION

According to the World Health Organization (WHO) mental health is state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community (1). It is an indisputable fact that there is no health without mental health, and that mental health is extremely important, both from an individual and social perspective (2). Mental symptoms present a risk factor for many physical diseases accompanied by the development of various mental disorders (3).

Studentship is considered a very sensitive period, because up to the age of 24 years there is the highest prevalence of mental disorders appearing for the first time. Students are exposed to added stress such as fulfillment of academic requirements, creating more stable partner relationships, increased financial difficulties, harmonizing family and work responsibilities, and the problem related to separation from a familiar social environment, which makes students more sensitive to the problem of adaptation (4). Epidemiological data show that, on average, one in four people will face mental disorders during their lifetime, and one in five will have difficulties that can be diagnosed as a mental disorder or illness (5). It should be emphasized that a mental disorder or mental illness is most often the result of the interaction of biological inheritance, social influences and unfavorable stressful situations (6). The term stress denotes

different types of life experiences and physical reactions to life experiences that disrupt a person's homeostasis, that is, it is a state of threat to a person's physical, mental, social and spiritual balance caused by life experiences - stressors. Stress causes different body responses to stressors (7). Stress is not a situation in which an individual finds himself, but a reaction to a situation (8). A high level of stress can result in anxiety, which has a negative impact on the quality of life, work and social functioning, especially in adolescents (9). The depressive disorder is one of the mood disorders and one of the most common psychiatric disorders. It is characterized by a number of psychological, cognitive, behavioral, and physical symptoms, the most pronounced of which are low mood, lack of interest and ability to enjoy normal activities, and a decrease in energy (10). According to WHO data, the frequency of depression in the adult population is 4.6-8.8% (11). The student population is in the period of adolescence. It is a period of psychological maturation during which a person searches for their identity and gradually accepts the role and responsibilities of an adult (12-14). The objective of this study is to investigate the prevalence of psychological symptoms in students of the Faculty of Health Studies.

SUBJECTS AND METHODS

The study was conducted on students of different study years of undergraduate and graduate university programmes at the Faculty of Health Studies (FHS) of the University of Mostar, and

the control group consisted of students of the Faculty of Kinesiology (FK) of the University of Mostar. A total of 200 respondents were included in the study, of which 100 students of FHS were the study group, and 100 FK students were the control group. The subjects were selected using a random sample method in the months of November and December 2023. The study was approved by the two faculties, and a cross-sectional study was conducted with data collected by a questionnaire, students were given clear and brief instructions on filling out the questionnaire at the very beginning. Estimated time period for answering the questionnaire is 20 minutes.

The subjects were selected using a random sampling method and agreed to voluntarily participate in the study. Students with diagnosed health problems were excluded from the study.

The data was collected using an anonymous survey questionnaire, consisting of:

The general socio-demographic questionnaire was created specifically for the purpose of this study. The variables analyzed in the questionnaire are sex, place of residence, title and year of study, grade average, economic status, and frequency of psychoactive substance use.

The Symptom Checklist-90-R (SCL-90-R) assesses the current level of psychological symptoms and discomfort caused by stressful life situations. One of the main advantages of the SCL-90-R scale is that, although it requires a short time to complete, it provides a multidimensional profile of symptoms, which significantly increases the quality of measurement compared to unidimensional scales. The scale

consists of 90 questions and the subjects answer by assessing the level of discomfort caused by the described symptom on a five-point scale (from 0 - not at all, to 4 - very much). The SCL-90-R scale was defined to measure nine primary symptom dimensions and three global indices of distress. The primary dimensions of psychological symptoms are: somatization, obsessive compulsiveness, sensitivity in interpersonal relationships, depression, anxiety, hostility, phobia, paranoid ideas, and psychoticism. The three global indices are: Global Severity Index, Positive Symptom Distress Index, and Positive Symptom. (15).

Statistical analysis

Statistical software SPSS (Statistical Package for Social Sciences) for Windows (version 17.0, SPSS Inc., Chicago, Illinois, USA) was used for statistical data processing. The obtained results were processed using descriptive, non-parametric and parametric methods of inferential statistics depending on data distribution. The distribution of the sample for each continuous variable and for each study group was tested with the Kolmogorov-Smirnov test. Categorical variables were presented by descriptive statistics in the form of frequency and percentage, while continuous variables were presented as arithmetic mean and standard deviation. Differences in categorical variables were tested with the Chi-squared test and Fisher's exact test where necessary. Differences among continuous variables were tested with the Student's t-test.

Values lower than 0.05 were considered statistically significant.

RESULTS

There was a statistically significantly higher proportion of female subjects than male among FHS students when compared to kinesiology students ($p < 0.001$). A significantly higher percentage of kinesiology students enrolled in the faculty of their own choice, and were more often above the average standard than FHS students,

while FHS students were more often smokers ($p < 0.001$). Psychoactive substances users (PAT) smoked and drank alcoholic beverages more often than the group that did not use PAT ($p < 0.001$).

FHS students achieved statistically higher results on the scales for Obsessive-compulsive symptoms, Interpersonal sensibility, Depression, Anxiety, Paranoia, Psychotic features and Non-specific symptoms of the SCL 90-R questionnaire (Table 1).

Table 1 - Differences in the intensity of psychological symptoms between groups.

SCL-90-R	University study				t	p
	FHS		KF			
	\bar{X}	SD	\bar{X}	SD		
Somatization	0.71	0.56	0.61	0.51	1.304	0.194
Obsessive-compulsive symptoms	1.16	0.62	0.90	0.61	2.954	0.004
Interpersonal sensibility	0.74	0.47	0.55	0.52	2.644	0.009
Depression	0.79	0.54	0.62	0.54	2.243	0.026
Anxiety	0.87	0.62	0.64	0.50	2.862	0.005
Aggression	0.65	0.53	0.51	0.59	1.819	0.070
Phobia	0.38	0.44	0.28	0.38	1.726	0.086
Parania	0.91	0.63	0.61	0.54	3.590	<0.001
Psychotic features	0.53	0.46	0.32	0.38	3.489	0.001
Non-specific symptoms	0.82	0.52	0.64	0.55	2.411	0.017

SCL-90-R – The Symptoms Checklist-90-R; FHS - Faculty of Health Studies; FK - Faculty of Kinesiology; \bar{X} - arithmetic mean; SD - standard deviation; t - Student's T-test

Female students achieved statistically significantly higher results on the Somatization scale of the SCL-90-R questionnaire when compared to male students. There were no statistically significant differences between the groups of respondents in relation to their gender on other variables of the SCL-90-R (Table 2).

Table 2 - Differences in the intensity of psychological symptoms between the sexes.

SCL-90-R	Sex				t	p
	M		F			
	\bar{X}	SD	\bar{X}	SD		
Somatization	0.52	0.39	0.71	0.57	2.088	0.038
Obsessive-compulsive symptoms	0.93	0.64	1.07	0.62	1.331	0.185
Interpersonal sensibility	0.57	0.51	0.67	0.50	1.204	0.230
Depression	0.64	0.59	0.72	0.53	0.866	0.387
Anxiety	0.68	0.60	0.78	0.56	1.040	0.300
Aggression	0.51	0.56	0.60	0.56	0.946	0.346
Phobia	0.26	0.31	0.35	0.44	1.375	0.171
Parania	0.76	0.62	0.75	0.60	0.110	0.913
Psychotic features	0.43	0.52	0.42	0.41	0.133	0.895
Non-specific symptoms	0.71	0.52	0.73	0.55	0.224	0.823

SCL-90-R – The Symptoms Checklist-90-R; M-male, F-female; \bar{X} - arithmetic mean; SD - standard deviation; t - Student's T-test

No statistically significant difference was spotted among subjects in the intensity of psychological symptoms in relation to the use of marijuana (Table 3).

Table 3 - Differences in the intensity of psychological symptoms in relation to the use of marijuana.

SCL 90-R	PAT				t	p
	Marijuana		No			
	\bar{X}	SD	\bar{X}	SD		
Somatization	0.65	0.44	0.67	0.54	0.110	0.912
Obsessive-compulsive symptoms	1.17	0.66	10.02	0.62	0.963	0.337
Interpersonal sensibility	0.79	0.54	0.63	0.49	1.346	0.180
Depression	0.84	0.55	0.69	0.55	1.186	0.237
Anxiety	0.77	0.60	0.76	0.57	0.118	0.906
Aggression	0.63	0.53	0.58	0.57	0.385	0.701
Phobia	0.44	0.66	0.31	0.37	0.829	0.416
Parania	0.75	0.67	0.76	0.60	0.030	0.976
Psychotic features	0.54	0.41	0.41	0.44	1.261	0.209
Non-specific symptoms	0.88	0.61	0.71	0.53	1.243	0.226

SCL-90-R – The Symptoms Checklist-90-R; PAT – psychoactive substance; \bar{X} - arithmetic mean; SD - standard deviation; t - Student's T-test

DISCUSSION

The study investigated the prevalence of psychological symptoms in the student population of the Faculty of Health Studies and the Faculty of Kinesiology of the University of Mostar. The study includes a comparison between groups of subjects according to their university study programme, sex structure and general characteristics. The study confirmed that female students achieved significantly higher results on the Somatization scale of the SCL-90-R questionnaire when compared to their male counterparts. Despite numerous theories, it is not yet clear why women are more susceptible to the mentioned psychological disorders. A significantly higher percentage of KF students enrolled in the study according to their personal choice, as many as 95% stated that KF was their first choice when selecting a study, while among FHS students, the same was stated by 61% of subjects. KF students had a significantly higher-grade average when compared to FHS students, and more often stated that they belonged to an above average socioeconomic group, 23% of them, while among FHS students, 85% declared that they belonged to an average socioeconomic group. Students who did not enroll in the study of their personal choice achieved significantly higher results on the Interpersonal sensibility, Depression, Anxiety, Psychotic features and Non-specific symptoms scales of the SCL-90-R questionnaire. Kumaraswamy states that at any given time, about 25% of students report reduced subjective and psychological well-being precisely

because of the feeling of anxiety caused by the demands of the academic environment. Stress and anxiety lead to alcohol and drug abuse because students consider these substances as a way to relieve the pressure they feel (16). Although the largest number of students (approximately 75%) still have relatively mild and temporary disturbances in the form of anxiety and tension, it is worrisome information that a significant number of students face long-term and more serious psychological problems (17). Eisenberg and associates proved that depression in students has a negative effect on academic efficiency and significantly affects their studies (18). The current study confirms the use of tobacco among students. Namely, 40% of FHS students declared themselves as smokers, which is higher than in KF students, of whom 16% identified themselves as smokers. Numerous studies confirm the increased prevalence of anxiety in groups of people with unhealthy lifestyle habits (19, 20). Previous studies state that factors leading to drinking alcoholic beverages and "drugs" in students include: openness, lack of inhibitions, increased anxiety in interpersonal communication, emotional immaturity, lower level of frustration tolerance, lack of self-confidence, feeling of isolation, perfectionism, guilt, and compulsive behaviors. The data of the current study indicate that a large number of students drink alcoholic beverages, that is 68% of KF students and 63% of FHS students. The study confirms the results of other researches, and we can conclude that students generally drink large amounts of alcoholic beverages. In line with this,

the results of Dawson and associates show that students are more prone to drinking than young people who are not students (21). Chow and associates point out that there is a problem of frequent drinking among the student population in Hong Kong. Their study shows that drinking alcoholic beverages is significantly associated with the prevalence of depressive symptoms in students. Continuous education of students on the perception of the risk of drinking alcoholic beverages is an important factor in the preservation of their mental health (22).

Our study determined that a smaller number of respondents use PAT, of which marijuana is the most common one used. While filling out the questionnaire, a few respondents canceled their answers on the use of marijuana and speed, and circled a different answer to the statement, "I don't use", so we can conclude that the actual percentage of subjects is slightly higher than the percentage obtained in the study. It was confirmed that students who use PAT were more likely to use alcoholic beverages and tobacco when compared to the group without PAT use. Studies conducted in many countries of the world have established a significant prevalence of the use of addictive substances in the student population. The results of a study conducted in Portugal, on a sample of 182 nursing students, show that 79.2% of students use psychoactive substances without a doctor's prescription (23). A study conducted in Poland shows that most students who smoke cigarettes also use marijuana and other similar psychoactive substances (24). In accordance with our results, Adere and associates,

in their study conducted in Ethiopia on a sample of 730 students, state that more than half of the students use PAT, mostly students who frequently drink alcoholic beverages (25).

Several studies were conducted on the mental health of students at the University of Mostar. In a 2016 study, Dilber and associates state that the subscales of the SCL-90-R questionnaire negatively correlate with religiosity and that students who believe in God and practice religion have fewer mental symptoms and better mental health when compared to students who are not religious (26). In a 2017 study, Brajković and associates state that students who live with their parents have a better quality of life, less pronounced psychological symptoms and lower self-esteem when compared to students who live as tenants (27). Babić and associates state that physical education students achieved significantly lower scores of psychological symptoms and thus showed better mental health when compared to medical students (28).

This study could be improved by additional investigation on whether students suffer from some diseases, given that a large number of autoimmune diseases contain physical as well as psychological symptoms that are organically conditioned, and in this way more realistic results on students' psychological conditions could be obtained. Furthermore, many studies indicate the importance of engaging in physical activities for the purpose of improving and reducing psychological symptoms (29-33). This study did not investigate students' physical activities, which we recommend for future studies. This way, we

would get a more complete picture of their free time and the way they deal with stress apart from the use of addictive substances. The results indicate that a large number of students are predisposed to further development of various psychological disorders, therefore it is necessary to additionally engage in this type of research in order to determine the best preventive measures to keep students mentally healthy.

CONCLUSION

Students of the Faculty of Health Studies of the University of Mostar have a significantly higher incidence of psychological symptoms when compared to students of the Faculty of Kinesiology. Female students achieved statistically significantly higher results on the Somatization scale when compared to male students. Users of psychoactive substances drink alcoholic beverages and smoke tobacco more often than the group without psychoactive substance use.

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POJAVNOST PSIHIČKIH SIMPTOMA U STUDENATA FAKULTETA ZDRAVSTVENIH STUDIJA SVEUČILIŠTA U MOSTARU

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SAŽETAK

Uvod: Studentska populacija nalazi se u razdoblju psihološkog sazrijevanja tijekom kojeg osoba traži svoj identitet i postupno prihvaća ulogu i odgovornosti odrasle osobe. Studentsko razdoblje smatra se vrlo osjetljivim razdobljem jer u dobi do 24. godine postoji najveća prevalencija psihičkih poremećaja koji se pojavljuju prvi put.

Cilj: Istražiti pojavnost psihičkih simptoma studenata Fakulteta zdravstvenih studija Sveučilišta u Mostaru.

Ispitanici i metode: Ispitnu skupinu činili su studenti Fakulteta zdravstvenih studija Sveučilišta u Mostaru (N=100), a kontrolnu skupinu činili su studenti Kineziološkog fakulteta Sveučilišta u Mostaru (N=100).

Podaci su prikupljeni pomoću socio - demografskog upitnika osobne izrade namjenski sačinjenog za ovo istraživanje i standardiziranog upitnika skale psihičkih simptoma SCL 90-R.

Rezultati: Studenti koji su upotrebljavali psihoaktivne tvari su statistički značajno češće pili alkoholna pića i pušili duhan u odnosu na skupinu studenata koja ne koriste psihoaktivne tvari. Studenti Fakulteta zdravstvenih studija su na SCL 90-R upitniku postizali statistički značajno više rezultata na skalama psihičkih simptoma: opsesivno - kompulzivni simptomi, interpersonalna vulnerabilnost, depresivnost, anksioznost, paranoja, psihotična obilježja i nespecifični psihički simptomi u odnosu na studente kineziologije.

Zaključak: Studenti Fakulteta zdravstvenih studija Sveučilišta u Mostaru imaju statistički značajno veću pojavnost psihičkih simptoma u odnosu na studente Kineziološkog fakulteta.

Ključne riječi: pojavnost, psihički simptomi, studenti

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IDENTITY STYLES IN EMERGING ADULTHOOD: THE ROLE OF PERFECTIONISM AND PERSONAL GROWTH INITIATIVE

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Received on 11.01.2023.

Reviewed on 23.01.2023.

Accepted on 09.02.2023.

ABSTRACT

Introduction: The formation of a stable identity plays an important role throughout life, but it becomes a key developmental task during the period of adolescence and emerging adulthood.

Objective: Examine the role of different dimensions of perfectionism and personal growth initiative in the explanation of identity styles in emerging adulthood.

Method: A total of 228 participants (28 male and 200 female) between the ages of 18 and 28 from Bosnia and Herzegovina, Croatia, Serbia and Montenegro took part in the research. The data was collected by filling out an online questionnaire that used the Identity Style Inventory, the Positive and Negative Perfectionism Scale and the Personal Growth Initiative Scale.

Results: Young men scored higher on Positive perfectionism and Intentional behavior than young women. A significant positive association of the Diffuse-avoidant identity style with Negative perfectionism was obtained, as well as its negative association with all personal growth initiative components. Informational and Normative style were positively related to both components of perfectionism, with the fact that Informational style was also positively related to all personal growth initiative components. Lower Positive and higher Negative perfectionism proved to be significant predictors of the Diffuse style, while higher Positive and Negative perfectionism predicted Informational and Normative style.

Conclusion: Different components of perfectionism and personal growth initiative significantly contribute to the process of identity formation in emerging adulthood.

Key words: identity styles, perfectionism, personal growth initiative

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INTRODUCTION

The formation of a stable identity plays an important role throughout life, but it becomes a key developmental task during the period of adolescence and emerging adulthood (1). Emerging adulthood is a culturally determined, unique developmental period of extended adolescence that occurs at the age of 18 and extends until the age of 25 or longer, during which there are key developmental tasks that enable an individual to broadly explore possible life paths, participate in self-exploration and identity formation (2 - 6). Berzonsky and Barclay (7) distinguish three process orientations in identity formation: information - oriented, normative - oriented and diffuse - avoidant identity style. These orientations or identity styles refer to relatively stable differences in the way individuals process identity-essential information while participating in or managing to avoid the challenges of constructing, maintaining and / or reconstructing a sense of identity. For example, informational types are inclined to a rational, information-oriented way of thinking and acting when dealing with identity issues, thus engaging in the deliberate search, evaluation and use of identity-important information, and show a willingness to accommodate their own viewpoints in the light of dissonant feedback. In contrast, normative types are prone to an automatic, normative and conforming way of thinking and acting when dealing with identity issues, i.e. automatic internalization and adherence to the goals, expectations and standards of significant

others or reference groups, as well as a tendency to defend and maintain existing beliefs and identity structures. Finally, diffuse types are prone to an inconsistent, evasive way of thinking and acting when dealing with identity issues. This means that they avoid and postpone dealing with them as long as possible, with the fact that the way of thinking and acting is not consistent, but is determined by situational requirements and consequences (8).

Emerging adulthood is marked by making important decisions in different life domains. As one of the personality characteristics that strongly influences decision-making is perfectionism (9), it can be assumed that this trait plays an important role in the processes of identity formation, which research has confirmed (10 - 12). Some authors suggest that the cognitive and emotional consequences of perfectionism make perfectionists extremely sensitive to feedback that indicates that their life is not going according to plan (13, 14) and make it difficult for them to create a definitive identity commitment in different domains, which leads to a long - term feeling of insecurity and identity diffusion. However, by reviewing the literature, it is possible to notice inconsistencies in the findings of older and more recent research. The modern understanding of perfectionism considers this construct as a complex phenomenon that can manifest itself in an adaptive, but also in a maladaptive fashion (15 - 18). Researchers who examined perfectionism with multidimensional measures obtained results that imply that its individual aspects are actually important

indicators of mental health, and that they facilitate optimal identity development (10, 11). At the same time, the high standards, which a person sets for their own performance or behavior, are considered an inseparable aspect of perfectionism, whether adaptive or maladaptive. A key feature of maladaptive perfectionism is attributing self-worth to one's achievements, fear of failure, and worry about potentially disappointing significant others. In contrast, the key feature of adaptive perfectionism is the desire for personal growth and development, which manifests itself in the pursuit of high, but realistic and attainable goals, the achievement of which leads to satisfaction and an increased level of self-esteem. Accordingly, Terry - Short, Owens, Slane and Dewey defined the Positive perfectionism dimension as a tendency towards perfectionistic striving that takes place in the function of positive reinforcement, that is, a person is motivated to achieve a certain goal in order to achieve a desired outcome; while the Negative perfectionism dimension is defined as a tendency towards perfectionistic striving in the function of negative reinforcement, that is, a person is motivated to achieve a certain goal in order to avoid unfavorable outcomes (18).

In addition to perfectionism, it can be expected that the tendency to initiate personal development will be of crucial importance for individuals who are establishing their identity, especially at the transition to adulthood (19 - 21). Personal growth initiative (PGI) is a fairly new construct and the assumption of its association with identity formation processes has been relatively neglected

in previous research on identity. PGI implies active and intentional engagement in the process of personal development (22) and is examined through four dimensions. Readiness for change refers to the tendency to evaluate change, while Planfulness represents knowledge about the process of personal development and together these two dimensions make up the cognitive components of personal growth initiative (23). Using resources represents the tendency to use external resources for the purpose of intentionally stimulating the process of personal development, while Intentional behavior examines the tendency to utilize opportunities for personal development and together they form the behavioral components of personal growth initiative (23). By reviewing previous research, it is possible to conclude that the positive association of PGI with desirable traits and life outcomes is common in research that includes this construct (24). Therefore, it is justified to assume that PGI plays a significant role in the optimal identity formation of young individuals. Key features of this search for identity are planning for the future and commitment to specific goals (19, 20), and PGI is believed to influence the setting of clear future-oriented goals and the ways in which individuals strive for and implement them (21). The findings of previous research conducted in this area show that the cognitive and behavioral components of PGI are related to identity styles (25 - 27). In the research conducted by Morsunbul (27), it was shown that active and intentional engagement in personal development facilitates positive identity development, with informational types

intentionally seeking, processing and evaluating identity-relevant information (28, 29), because they are actively interested in their personal development. In contrast, none of the components of PGI were significantly related to the Normative style, except for the Readiness for change component, suggesting that normative types consider change, but that does not seem to translate into behavior. Furthermore, the findings showed that all components of PGI, except Readiness for change, were negatively related to the Diffuse-avoidant style. This result suggests that diffuse types delay and avoid solving identity problems because they are not interested in their personal development (27).

The aim of this research is to examine the role of certain dimensions of perfectionism and personal growth initiative in the explanation of identity styles in emerging adulthood.

METHOD

Participants and procedure

A total of 228 young individuals between the ages of 18 and 28 (28 male and 200 female with an average age of 23) from Bosnia and Herzegovina (61.8%), Croatia (20.6%), Serbia (14.9%) and Montenegro (2.6%) participated in the research. Students made up 62.7% of the sample, employed individuals 27.6% and unemployed 9.6%. The majority of participants (53.5%) had a university Master's degree, 40.8% a high-school degree and 5.7% a university Bachelor's degree. As for current partner/marital status, 50% of the participants were single, 42.1% in a relationship, 6.1% married and 1.8% divorced. Out of the

participants who were students, 13.2% answered that they have retaken a university year, 6.1% that they transferred to another faculty or study course, 1.3% both, and 47.8% none of the above. Participation in the research was voluntary and anonymous, in accordance with the research ethics code. Data were collected by filling out an online questionnaire that was advertised through various social media channels. The questionnaire was constructed for the purposes of validating the Croatian translation of the Identity Style Inventory (ISI-5) (30) and the Personal Growth Initiative Scale (PGIS-2) (30), as well as for the purposes of the current research.

Measuring instruments

The following measuring instruments were applied: a sociodemographic questionnaire constructed for the purposes of this research, the Croatian adaptations of the Identity Style Inventory (8, 30), the Positive and Negative Perfectionism Scale (18, 31) and the Personal Growth Initiative Scale (23, 30). The Identity Style Inventory or ISI-5 consists of 27 items that examine three identity styles (9 items for each subscale): Information oriented, Normative oriented and Diffuse-avoidant. The Positive and Negative Perfectionism Scale or PANPS consists of 40 items that examine Positive and Negative perfectionism (20 items for each subscale). The Personal Growth Initiative Scale or PGIS-2 consists of 16 items that examine Readiness for change (4 items), Planfulness (5 items), Using resources (3 items) and Intentional behavior (4 items). All of the applied questionnaires were of

Likert-type with values ranging from 1 to 5 (1 – completely disagree; 5 – completely agree).

Statistical analyses

The data collected by this research were analyzed using statistical software SPSS Statistics 25 (IBM Corp., Armonk, NY, USA).

The basic descriptive parameters of the investigated variables were calculated, which confirmed the suitability of the data for conducting parametric statistics. Although the distribution of results on most subscales significantly deviated from normal according to the Kolmogorov-Smirnov test, the indices of skewness and kurtosis were in satisfactory ranges, i.e. index of skewness <3 and index of kurtosis<10 (32).

Gender differences in all measured variables were examined using the t-test for independent samples, but only after the equalization of groups was achieved. The method of equivalent pairs (33) was carried out by pairing each male participant with an equivalent female participant who is either identical to him or as similar as possible (in terms of the collected sociodemographic data). In doing so, all characteristics of the participants collected by the sociodemographic data questionnaire were taken into account (listed in the subsection Participants and procedure). This method was applied due to the large difference in the number of female and male participants in the collected sample.

The relationship between all measured variables was examined with the Pearson correlation

coefficient, while using the data obtained on the entire sample (N=228). Then, three multiple regression analyses were conducted with identity styles as criterion variables, and with the components of perfectionism and personal growth initiative as predictor variables. In order for the preconditions for performing regression analyses to be met, it is necessary for the variance inflation factor (VIF) to not exceed a value of 10 and for the tolerance to be greater than 0.10, as other values would indicate multicollinearity (34). These prerequisites were met for all regression analyses.

RESULTS

Examination of gender differences in individual identity styles, components of perfectionism and personal growth initiative

Statistically significant gender differences were obtained in Positive perfectionism and the PGI component Intentional behavior (Table 1). Male participants achieved significantly higher results on Positive perfectionism and Intentional behavior than female participants did (for the basic descriptive parameters of the examined variables with regard to gender, see Table 2). No statistically significant gender differences were found in the other examined variables.

Table 1. Examination of the significance of gender differences in individual identity styles, components of perfectionism and personal growth initiative (N=56)

Measuring instruments	Subscales	Leven's test		t-test		
		F	p	T	Df	p
ISI-5	Diffuse	2.823	.099	-.421	54	.675
	Informational	.696	.408	.478	54	.635
	Normative	.007	.935	.835	54	.408
PANPS	Positive perfectionism	.737	.395	2.206	54	.032*
	Negative perfectionism	.211	.648	-.531	54	.597
	Readiness for change	.000	.988	.467	54	.643
PGIS-2	Planfulness	.884	.351	-.115	54	.909
	Using resources	5.360	.024*	1.251	54	.217
	Intentional behavior	.116	.735	2.096	54	.041*

Note: *p<.05

Table 2. Basic descriptive parameters of individual identity styles, components of perfectionism and personal growth initiative with regard to gender (N=56)

Measuring instruments	Subscales	Gender	M	SD
ISI-5	Diffuse	Male	20.821	4.603
		Female	21.429	6.076
	Informational	Male	37.464	4.517
		Female	36.857	4.979
	Normative	Male	21.821	5.800
		Female	20.500	6.046
PANPS	Positive perfectionism	Male	80.214	7.795
		Female	75.286	8.890
	Negative perfectionism	Male	56.107	14.753
		Female	58.357	16.870
PGIS-2	Readiness for change	Male	16.286	2.551
		Female	15.964	2.603
	Planfulness	Male	17.821	4.252
		Female	17.964	5.015
	Using resources	Male	10.321	2.178
		Female	9.429	3.084
	Intentional behavior	Male	17.464	2.472
		Female	16.000	2.749

Note: M – mean; SD – standard deviation

Examination of the relationship between identity styles, components of perfectionism and personal growth initiative.

Young individuals with an expressed Diffuse style were significantly inclined to Negative perfectionism and were significantly less inclined to initiate personal development on all PGI

dimensions. Among young individuals with an expressed Informational and Normative identity style, both components of perfectionism are significantly represented, with the fact that among

those with a pronounced Informational style, all personal growth initiative components are also significantly represented (Table 3).

Table 3. Examination of the significance of the relationship between all measured variables (N=228)

Subscales	1	2.	3.	4.	5.	6.	7.	8.	9.
1. Diffuse	1	.043	.261*	-.041	.451*	.269*	.306*	-.140*	.262*
2. Informational		1	-.057	.358*	.214*	.244*	.153*	.220*	.251*
3. Normative			1	.336*	.249*	-.090	-.089	-.010	-.043
4. Positive perfectionism				1	.276*	.167*	.141*	.098	.196*
5. Negative perfectionism					1	.171*	.291*	-.124	-.144*
6. Readiness for change						1	.748*	.468*	.660*
7. Planfulness							1	.455*	.625*
8. Using resources								1	.488*
9. Intentional behavior									1

Note: *p<.05; **p<.01

Examination of the relative contributions of individual components of perfectionism and personal growth initiative in the explanation of different identity styles.

All conducted regression models of predictors of individual dimensions of perfectionism and

personal growth initiative for different identity styles proved to be statistically significant (Table 4). The examined predictors together explain 26.7% of the variance of the results on the Diffuse-avoidant, 21.3% on the Informational and 15.4% on the Normative identity style.

Table 4. Examination of the predictive value of different dimensions of perfectionism and personal growth initiative as determinants of different identity styles (N=228)

Diffuse-avoidant identity style						
Measuring instruments	Predictors	R	R²	β	F	p
		.517	.267		13.411	.000**
PANPS	Positive perfectionism			-.127		.043*
	Negative perfectionism			.448		.000**
PGIS-2	Readiness for change			-.083		.378
	Planfulness			-.046		.622
	Using resources			.042		.543
	Intentional behavior			-.110		.184
Information oriented identity style						
Measuring instruments	Predictors	R	R²	β	F	p
		.461	.213		9.950	.000**
PANPS	Positive perfectionism			.259		.000**
	Negative perfectionism			.180		.007**
PGIS-2	Readiness for change			.157		.110
	Planfulness			-.071		.466
	Using resources			.124		.079
	Intentional behavior			.106		.217
Normative oriented identity style						
Measuring instruments	Predictors	R	R²	β	F	p
		.393	.154		6.718	.000**
PANPS	Positive perfectionism			.319		.000**
	Negative perfectionism			.140		.042*
PGIS-2	Readiness for change			-.116		.255
	Planfulness			-.014		.892
	Using resources			.049		.502
	Intentional behavior			-.025		.778

Note: R –multiple correlation coefficient; R²–multiple determination coefficient; β - beta coefficients of the listed predictors; F – value on the F distribution; *p<.05; **p<.01

The Positive and Negative perfectionism dimensions proved to be significant predictors for all three identity styles. Lower Positive perfectionism and higher Negative perfectionism significantly predict higher scores on the Diffuse-avoidant identity style. In contrast, higher scores on Positive and Negative perfectionism

significantly predicted higher scores on the Information oriented and Normative oriented identity style. Personal growth initiative components did not prove to be significant predictors in the explanation of individual identity styles.

DISCUSSION

The obtained results partially confirm the findings and theoretical assumptions of previous research (10, 11, 26, 27), although some unexpected results were also obtained. When it comes to gender differences in the examined variables (Table 1), the results show that male and female individuals are equally inclined to use all three identity processing orientations. However, male participants achieved significantly higher results on Positive perfectionism and Intentional behavior compared to female participants. The explanation can be found in the socialization patterns according to which men are often raised in such a way that they are expected to demonstrate activity, confidence, dominance, easiness in making decisions, persistence and independence, while women are expected to be dedicated to children, passive, sensitive, warm in relation to others, caring and tender (35, 36). Throughout history, men have been noted as the initiators of activities in most life domains, which was extremely important for increasing the probability of reproduction and survival of the species (37). With this in mind, it is not surprising that the young men in this research achieve higher scores on Intentional behavior and Positive perfectionism, most likely because the aforementioned dominant characteristics enable them to strive towards achieving goals, i.e. positive feelings they get from achievements and reaching their own high standards.

The results of correlation analyses show that young individuals with a pronounced Diffuse-

avoidant identity style are significantly prone to negative perfectionistic aspirations, and that they are significantly less prone to initiate personal development on all dimensions, which is consistent with other research (11, 27). Namely, Negative perfectionism of the PANPS scale (18) is defined as the motivation to achieve goals in order to avoid undesirable outcomes. Consequently, individuals with high Negative perfectionism are not intrinsically motivated and experience fewer positive emotions even after achieving goals. Instead, their actions are aimed at avoiding punishment, that is, negative emotions associated with failure, disappointing significant others, and other undesirable life outcomes. At the same time, their actions are postponed as long as possible, until the threat in the form of punishment appears, which is also an important feature of the Diffuse-avoidant identity style (38, 39). In addition, the negative association of this style with all PGI components suggests that diffuse types are not interested in their personal development, which is one of the reasons for their avoidance and postponement of identity-related questions and issues (27). The Informational style was significantly positively related to both perfectionism components and to all PGI components. As established in previous research (10, 11, 25 - 27), positive perfectionistic aspirations and initiating personal development facilitate adaptive self-exploration and identity commitment, which is simultaneously a part of the informational orientation. Therefore, it is not surprising that informational types have a strong motivation for personal development and are

intrinsically motivated to achieve desirable outcomes from which they derive positive feelings, which is the basis of Positive perfectionism. However, a positive association of this style with Negative perfectionism was also obtained, which was not expected. This result implies that the active resolution of identity problems, which is characteristic of the Informational style, is at least partially conditioned by the fear of failure or undesirable life outcomes. Namely, it is clear that facing important identity-relevant questions and reconsidering them is not always a pleasant process, especially if it takes place in the function of avoiding undesirable outcomes, which is not rare. The obtained results suggest that informational types still decide to deal with unpleasant emotions and solve identity problems in order to avoid life outcomes that are considered undesirable, which is why Negative perfectionism becomes apparent in informational types. The Normative identity style was positively related to both components of perfectionism as well. According to Berzonsky et al. (8), conscientiousness and self-control, as well as a high level of commitment and a sense of purpose, all of which are also characteristics of the informational orientation, characterize people with a normative orientation. Thus, these two styles achieve important points of agreement, including similar tendencies in terms of perfectionistic aspirations, as shown by the obtained results. Furthermore, the Normative style was not related to personal growth initiative on any component. In other words, in the sample

of normative types there are individuals who are inclined as well as those who are not inclined to initiate personal development. This suggests that initiating personal development is not out of the question for normative individuals, but is not a characteristic of this identity style either. Additionally, the results of some previous research (30, 40) indicate that the Normative style may be underpinned by similar deficits in the processing of identity-important information as the Diffuse style. Thus, it seems that the Normative style embraces some characteristics of the Informational, as well as the Diffuse-avoidant style, but is still distinct enough in order to form a separate category among the identity styles.

The results of the regression analyses show that both components of perfectionism significantly predict the results on all three identity styles. At the same time, lower scores on Positive perfectionism predict a more pronounced Diffuse-avoidant style. In contrast, higher scores on Negative perfectionism predict higher scores on the Diffuse-avoidant style, which is consistent with the findings and theoretical assumptions of previous research (10, 11). The obtained findings can be explained in that young individuals who do not have sufficient motivation to achieve desirable outcomes (low Positive perfectionism), and whose action is mainly driven by the avoidance of unfavorable outcomes (high Negative perfectionism), are subject to a sense of insecurity and identity diffusion. Namely, individuals who are not motivated by positive, but exclusively by negative reinforcement (removal of an unpleasant stimulus such as punishment,

failure, disappointment, financial consequences, etc.), are usually encouraged to act and deal with identity issues by urgent situational demands, which represent a greater threat (38, 39). As potential reasons for this, one should consider a lack of self-confidence regarding the achievement of desirable life outcomes, due to which there is a lack of motivation for the same, or that the person does not value achievement, or does not have their own definition of desirable outcomes and therefore does not know which areas to focus on. Future research should focus on identifying these reasons and counseling and/or psychotherapeutic work that would help young individuals in developing skills for dealing with life challenges and identity issues. In contrast, higher scores on Positive and Negative perfectionism significantly predicted higher scores on the Informational and Normative identity style. The significant predictive value of Negative perfectionism for these identity styles was not expected, while the predictive value of Positive perfectionism is in line with other research (10, 11). It seems that the existence of a strong commitment to identity, which is characteristic of informational as well as normative types (28, 39), carries accompanying advantages and disadvantages. Along with strong commitments and goals, there is often a strong motivation for achievement but also a certain and inevitable fear of failure, which is probably the reason why these characteristics predict both, the Informational and the Normative identity style. However, when one considers that Negative perfectionism positively predicted the Diffuse-avoidant style as well, it seems that a certain

amount of fear of failure and avoidance of unfavorable outcomes are inevitable human characteristics that act as a driving force regardless of identity style. However, it should be pointed out that the Positive and Negative perfectionism of the PANPS scale are defined exclusively in terms of its motivational components. Thus, this instrument is potentially not a comprehensive measure of perfectionism. It is certain that milder deviations from the results of previous research are the result of the application of different measures of perfectionism.

An unexpected result in this research is that the PGI components did not prove to be significant predictors of any identity style, which contradicts the theoretical assumptions and findings of other research (25 - 27). Namely, although the calculated VIF values suggested the appropriateness of conducting regression analyses, it should be noted that the correlations among the PGI components are very high (see Table 3). High correlation between predictors, i.e. multicollinearity, is a problem because it reduces the statistical power and increases the type 2 error, by which significant results remain hidden (41). According to Tomić and Macuka (30), the psychometric validation of the Croatian translation of the PGIS-2 and ISI-5 questionnaires resulted only with marginally acceptable indices of model fit with the obtained data and the need to verify their characteristics on larger samples was emphasized. Therefore, it should be taken into account that the lack of predictive value of the PGIS-2 subscales for identity styles in the

current research could also be a reflection of the measuring instruments' shortcomings and does not reflect the real predictive value of these variables in the population. The obtained results of this research should be taken with caution and checked in future research on larger samples of young individuals.

CONCLUSION

On a sample of emerging adults, different components of perfectionism and personal growth initiative together significantly explain 26.7% of the variance of the results on the Diffuse - avoidant, 21.3% on the Informational and 15.4% on the Normative identity style. Thus, these variables significantly contribute to identity formation processes in emerging adulthood.

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STILOVI IDENTITETA U PREDODRASLOSTI: ULOGA PERFEKCIONIZMA I INICIRANJA OSOBNOG RAZVOJA

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SAŽETAK

Uvod: Formiranje stabilnog identiteta igra važnu ulogu tijekom cijelog života, no postaje ključni razvojni zadatak tijekom razdoblja adolescencije i predodraslosti.

Cilj istraživanja: Ispitati ulogu nekih dimenzija perfekcionizma i iniciranja osobnog razvoja u objašnjenju stilova identiteta u predodrasloj dobi.

Metoda: U istraživanju je sudjelovalo ukupno 228 sudionika (28 mladića i 200 djevojaka) u dobi od 18 do 28 godina sa područja BiH, Hrvatske, Srbije i Crne Gore. Podaci su prikupljeni ispunjavanjem online upitnika kojim su primijenjeni Inventar stilova identiteta, Skala pozitivnog i negativnog perfekcionizma i Skala iniciranja osobnog razvoja.

Rezultati: Mladići su postizali više rezultate na Pozitivnom perfekcionizmu i Namjernom ponašanju u odnosu na djevojke. Utvrđena je značajna pozitivna povezanost Difuzno izbjegavajućeg stila identiteta sa Negativnim perfekcionizmom, te negativna povezanost istog sa svim komponentama iniciranja osobnog razvoja. Informacijski i Normativni stil bili su pozitivno povezani s obje komponente perfekcionizma, s time da je Informacijski stil bio pozitivno povezan i sa svim komponentama iniciranja osobnog razvoja. Značajnim prediktorima Difuznog stila pokazali su se niži Pozitivni i viši Negativni perfekcionizam, dok su viši Pozitivni i Negativni perfekcionizam predviđali Informacijski i Normativni stil.

Zaključak: Različite komponente perfekcionizma i iniciranja osobnog razvoja bitno doprinose procesima formiranja identiteta u predodrasloj dobi.

Ključne riječi: stilovi identiteta, perfekcionizam, iniciranje osobnog razvoja

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INDIVIDUAL CHARACTERISTICS AS CORRELATES AND PREDICTORS OF ADOLESCENT GAMBLING

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Received on 12.01.2023.

Reviewed on 27.02.2023.

Accepted on 09.03.2023.

ABSTRACT

Introduction: Adolescents are at risk groups to develop problematic gambling, which over time and intensification can develop into pathological gambling with numerous and harmful psychosocial consequences. Today, significant emphasis is placed on individual characteristics and personality traits as factors that influence and contribute to the development or maintenance of gambling.

Objective: To gain insight into the relationship between individual characteristics (personality traits) and adolescent gambling. **Subjects and methods:** A total of 402 participants (197 males and 204 females), the average age of 17 ($M= 17.41$, $SD= 0.59$), participated in the research. Data were collected by filling out questionnaires, in the schools that participants attend in Mostar, in which the Gambling Activities Questionnaire, Canadian Adolescent Gambling Questionnaire, Excitement Seeking Scale, Emotional Competence Questionnaire (UEK-15), Emotional Empathy Questionnaire and IPIP-50 were applied.

Results: Significant differences in the intensity of gambling and harmful psychosocial consequences were determined with regard to gender. On average, male adolescents gamble more intensively and report more harmful psychosocial consequences of gambling compared to female adolescents. A significant correlation between emotional competence, empathy, conscientiousness, agreeableness, sensation seeking and the intensity of gambling of male adolescents and a significant correlation between sensation seeking and the intensity of gambling of female adolescents was determined. Male adolescents, who are more prone to seeking sensations, have a lower level of empathy, conscientiousness, agreeableness and emotional competence, on average gamble more and more intensively, as do female adolescents with a more pronounced sensation seeking. Significant predictors of male adolescents' gambling are sensation seeking and empathy, and female adolescents' sensation seeking, while a significant predictor that contributes to explaining the psychosocial consequences of gambling in both gender is also sensation seeking.

Conclusion: significant contributions of personality traits and individual characteristics in the explanation of adolescent gambling are confirmed.

Keywords: personality traits, adolescent gambling, predictors, correlates.

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INTRODUCTION

Problem gambling is an individual's need to gamble constantly, despite the harmful consequences that gambling has on life (1), characterized by difficulties in limiting money and time invested in gambling (2, 3). Problem gamblers manifest behaviors that seriously impair the functioning of the individual, they have a reduced ability to control gambling, disrupted daily functioning, the need for increasingly intense gambling with larger amounts of money to experience the desired excitement, and they withdraw socially (3, 4). Research continuously confirms that gambling leads to harmful psychosocial consequences for some players, especially among young people who represent a vulnerable group, where the term problem gambling is more often used to avoid stigmatization and labeling (5). According to the DSM-IV, pathological gambling is characterized as a permanent or periodic loss of control over gambling and is categorized into impulse control disorders not classified elsewhere (1, 3, 4). In the DSM-V, the diagnosis of pathological gambling was reclassified to the group of addictions not related to a psychoactive substance and defined as persistent and recurrent gambling that leads to clinically significant impairment, characterized, among others, by restlessness and irritability while trying to reduce or stop gambling, repeated unsuccessful attempts to control, reduce or stop gambling, compensating for lost money, lying to conceal the extent of involvement in gambling, etc. (6). Pathological gambling is more common

in men, it mostly appears in adolescence and between the ages of 40 and 50 (7). Adolescent gambling differs from adult gambling due to the developmental specifics of age. Changes in the part of the brain that is in charge of social and emotional functioning result in an increased tendency of risk-taking and an increased need for reward (8), which makes young people especially susceptible to gambling with regard to the reward element. Developmental characteristics such as increased sensation seeking, egocentrism, feelings of invincibility and invulnerability increase the likelihood of developing risky behaviors. Previous research has largely established the significant role of individual personality traits in gambling and other addictive and risky activities (9,10), and the personality traits and constructs of interest in this research will be briefly explained below.

The Big Five personality model is one of the most famous descriptive models used to study personality traits and represents a hierarchical organization of personality traits in terms of five basic dimensions. Extraversion refers to the quantity and intensity of interpersonal interactions, the level of activity, seeking experiences, positive emotionality, warmth and dominance (11). Agreeableness represents the quality of interpersonal interactions and the degree of harmony in relationships with other people. Conscientiousness refers to the degree of respect for another person when making decisions and the characteristics that are manifested in the social control of impulses and when performing certain tasks (12). Neuroticism describes the

features of an individual's emotional response to stimuli from the environment and contains facets of calmness, relaxation and poise (12). Openness to experience indicates openness to intellectual and artistic challenges, active imagination, need for change and orientation to feelings (11). Adolescents involved in problem gambling achieve higher scores on the scales of irritability, extraversion and anxiety, and lower scores on the scales of adjustment and self-discipline (13, 14). Greater gambling risk correlates with higher neuroticism and lower agreeableness and conscientiousness (15). Adolescents with serious gambling problems are less conscientious, agreeable and cooperative than those without gambling problems, and adolescents with low to moderately serious psychosocial consequences of gambling are somewhat more extroverted and less emotionally stable than those without gambling problems (16). As the main risk factors for the development of harmful consequences of gambling, the authors cite negative effects and traits associated with the inability to inhibit. Sensation seeking is a dimension of personality characterized by the need to seek new, diverse, layered and intense stimuli from the environment, manifests itself in various forms of the need for mental and physical stimulation, and includes a certain level of risk in the physical, social and financial areas, most often due to the experiences themselves (17). A moderate amount of change in the environment is desirable due to adaptive significance, but excessive excitement-seeking can threaten the survival of the individual. Most people are somewhere between the mentioned

extremes - they do not have such a pronounced need for excitement, but they are not so dependent on security and predictability either. The negative consequences of a high need for excitement are delinquent individuals prone to crime and rejecting social rules, who are more impulsive and aggressive, score higher on the psychoticism scale and are prone to all kinds of addictions (18, 19). Gambling is highly associated with thrill-seeking, i.e. experiences that have elements of risk (20). In the study by Powell et al., the tendency to take risks was positively correlated with the degree of involvement in gambling activities and was primarily a characteristic of males (15).

Empathy is an emotional response that arises from the emotional state and conditions of another person and is consistent with their situation or emotional state (21). It is a multidimensional construct with significant cognitive and affective components (22) and is considered a regulator of several different interpersonally important behaviors.

The construct of emotional intelligence is described as the ability to understand personal emotions and the emotions of other people, distinguish between feelings and correctly label emotions, use emotional information as a guideline for thinking and behavior (23) and as the effective management of one's own and other people's emotions and the ability to solve problems that arise in emotional context (24). Emotional intelligence is described as a set of four abilities: (1) the ability to accurately perceive, evaluate, and express emotions, (2) the ability to access and/or invoke feelings when they facilitate

thinking, (3) the ability to understand emotions including general knowledge about emotions, and (4) the ability to regulate emotions for emotional and intellectual growth (24). The risk of developing an addiction is closely related to the degree to which a person has developed emotional and social skills. Improving emotional intelligence helps in achieving the goals of primary prevention, that is, resisting young people from experimenting with addictive substances and finding healthy alternatives and better coping skills. Preventive programs increasingly include elements related to emotional competence because many studies have shown that the inability to regulate emotions is more common in those with lower emotional intelligence and that it represents a risk factor for the development of problem gambling (25) and addictive behaviors (26). This research aimed to gain insight into the connection between gender, personality traits and adolescent gambling, as well as to examine the contribution of individual variables (sensation seeking, emotional competence, empathy and personality traits) to the explanation of the intensity of gambling and the severity of harmful psychosocial consequences associated with gambling among high school students.

METHOD

Participants and procedure

A total of 402 high school seniors from the area of Mostar between the ages of 16 and 19 participated in the research ($M=17.41$, $SD= .598$),

of which 197 were males and 204 were females. Participation in the research was anonymous and voluntary. Filling out the questionnaire was done during class, it took about 45 minutes, and the questionnaires were administered in groups.

Instruments of the study

The sociodemographic part had questions about characteristics such as gender, age and school of the participants.

The gambling activities questionnaire contained questions about the types and frequency of gambling activities (11 types), on which the participants checked the playing of a certain game and the frequency on a scale from "every day" to "once a year and less than that" (11). The obtained results were used in this research as a measure of the frequency and intensity of adolescent gambling.

The Canadian Adolescent Gambling Questionnaire (27) is the first instrument designed specifically to assess the level of severity of adolescent gambling problems. A part of the instrument, which contains 24 items divided into four factors: psychological, financial and social consequences of gambling and lack of control (the total result is a linear combination of the answers to the questions) was used in this study. A factor analysis using the method of principal components with varimax rotation was verified, however, the existence of a two-factor solution was not confirmed as in the Croatian research (15). The obtained factor structure is unidimensional, and the reliability of the instrument (Cronbach alpha) is high .95.

The Sensation Seeking Scale (18) is an instrument for measuring the level of sensation seeking, which consists of a total of 40 items with four subscales: (1) sensation seeking and adventure scale, (2) experience seeking scale, (3) scale disinhibition or disengagement and (4) boredom sensitivity scale. The reliability coefficient of .82 confirms the good psychometric properties of this scale.

The emotional competence questionnaire (28) examines individual differences in emotional competence on a total of 15 items with answers on a five-point scale. The scale is one-dimensional, and the reliability of the internal consistency type questionnaire is satisfactory and is .82 in the sample of students.

The scale of emotional empathy (21) represents a one-dimensional measure of the tendency to react emotionally caused by the emotional state of others, it contains 19 statements answered on a five-point scale and the reliability is high .91.

IPIP-50 is the Croatian version of the International Personality Item Pool scale for examining personality traits, which is based on the lexical approach to personality (29). The Big Five dimensions of personality are examined using 50 items (five-point scale) that measure extraversion, agreeableness, conscientiousness, neuroticism and openness to experience. Cronbach's alpha reliability coefficients of the subscales are satisfactory and amount to .76 (extraversion), .80 (pleasantness), .73 (conscientiousness), .75 (neuroticism), and .70 (openness to experience).

Statistical analysis

Statistical analysis of the collected data was performed using the computer program for statistical data processing SPSS Statistics 25 (IBM Corp., Armonk, NY, USA). The Shapiro-Wilk's test determined a statistically significant deviation of the obtained distributions from normal, and non-parametric tests were used in the analysis. Mann-Whitney U and Kruskal-Wallis tests were used to determine differences between data groups. The correlation between the results was verified by Spearman's correlation coefficient, and the contribution and predictive value of individual characteristics to the explanation of the variance of adolescent gambling behavior using multiple regression analysis.

RESULTS

A descriptive analysis of the data shows that only 29.1% of adolescents did not gamble during their lifetime, while a high proportion of them participated in one or more gambling activities during their lifetime (70.9%). Significant differences were found in the intensity of gambling and the psychosocial consequences of gambling between males and females ($U_1=10206.5$, $p_1<0.001$, $U_2=8901$, $p_2= 0.001$). On average, male adolescents gamble significantly more and report more psychosocial consequences of this behavior.

The correlation of individual characteristics and gambling indicators was examined on a sub-sample of male and female adolescents with

regard to the gender difference in gambling activities. The intensity of male adolescent's gambling activities is related to empathy ($r_s = -.222$, $p < .001$), conscientiousness ($r_s = -.305$, $p < .001$), extraversion ($r_s = .233$, $p < .001$) and sensation seeking ($r_s = .442$, $p < .001$), while the psychosocial consequences of male adolescent's are significantly related to empathy ($r_s = -.150$, $p < .05$), conscientiousness ($r_s = -.274$, $p < .001$), agreeableness ($r_s = -.154$, $p < .05$) and sensation seeking ($r_s = .333$, $p < .001$). Sensation seeking is significantly related to the intensity of female gambling ($r_s = .307$, $p < .001$) and psychosocial

consequences ($r_s = .273$, $p < .001$), while other individual characteristics did not show a significant correlation with gambling indicators. The contribution of individual characteristics (empathy, emotional competence, conscientiousness, openness to experience, neuroticism, agreeableness, extraversion and sensation seeking) to the explanation of the intensity of gambling and the severity of the psychosocial consequences of gambling among adolescents was verified by multiple regression analysis on subsamples of male and female adolescents.

Table 1. Results of multiple regression analysis with individual variables as predictors and gambling intensity as a criterion on the subsamples of male and female adolescents.

Predictors	Males (N=197)					Females (N=205)				
	R	R ²	β	F	P	R	R ²	B	F	P
	.452	.204		6.054	.000**	.439	.193		5.834	.000**
Sensation seeking			.215		.007*			.460		.000**
Agreeableness			-.028		.744			.045		.628
Extraversion			.152		.064			-.147		.052
Neuroticism			-.018		.801			.034		.634
Openness to experience			-.036		.634			-.069		.353
Conscientiousness			-.149		.058			.011		.894
Empathy			-.185		.028*			-.041		.647
Emotional competence			.030		.716			-.006		.940

p* < .05, p** < .001

The predictive value of sensation seeking and empathy for the intensity of male adolescents' gambling is significant. The sensation-seeking variable has a greater influence as a predictor - more pronounced sensation seeking in adolescents contributes to more intense gambling,

while adolescents who show a lower level of empathy are more likely to gamble more intensively. The results of the regression analysis on the sub-sample of females show that sensation seeking is a significant predictor of the intensity of gambling among girls.

Table 2. Results of the multiple regression analysis with individual variables as predictors and psychosocial consequences of gambling as a criterion on subsamples of male and female adolescents.

Predictors	Males (N=197)					Females (N=205)				
	R	R ²	B	F	P	R	R ²	B	F	p
	.399	.159		4.473	.000**	.315	.099		2.692	.000**
Sensation seeking			.196		.016*			.287		.001*
Agreeableness			-.080		.369			-.014		.886
Extraversion			.081		.334			-.062		.871
Neuroticism			-.088		.228			.073		.341
Openness to experience			-.048		.534			-.057		.469
Conscientiousness			-.134		.097			-.015		.863
Empathy			-.123		.155			.022		.815
Emotional competence			.061		.472			-.062		.477

p* < .05

p** < .001

For the intensity of the psychosocial consequences of gambling, the sensation-seeking variable proved to be a significant predictor. Male and female adolescents who have the above trait more pronounced had more harmful consequences of gambling activities.

DISCUSSION

In this research, gender differences in gambling and the psychosocial consequences of adolescent gambling were determined. On average, male adolescents gamble significantly more and show more psychosocial consequences of gambling compared to females, which can be justified by the fact that young males are more impulsive, disinhibited, more extroverted, have a greater need for excitement and stimuli, are more competitive and more money-oriented than females (30 -32)

By examining the correlations, it was determined that male adolescents who report lower emotional intelligence, empathy, conscientiousness, agreeableness and a more pronounced sensation seeking and female adolescents with a more pronounced sensation-seeking trait gamble more intensively. Furthermore, sensation seeking and empathy were found to be significant predictors of gambling intensity in the sub-sample of male adolescents, and sensation seeking in the sub-sample of females. Since personality traits are stable traits, they are manifested in almost all areas of life, and their influence can also be seen in adolescent gambling. The association of personality traits that are included in the Big Five personality model (agreeableness and

conscientiousness) with the intensity of gambling is in accordance with the research of MacLaren and associates (15), who realized that higher gambling risk correlates with lower agreeableness and conscientiousness, and Croatian research where it is found that adolescents with serious gambling problems are less conscientious and less agreeable than those without gambling problems and are less inclined to cooperate and tend to put their own needs first (16). It was found that individuals who are low on agreeableness gamble more intensively, which is in line with the conceptualization of the mentioned personality trait according to the five-factor model, which states that an unpleasant person is egocentric and competitive, and gambling certainly represents an activity in which a person puts his needs first and in which there is a certain competitive aspect. The basis of conscientiousness is self-discipline and self-control of behavior, which can also be manifested when engaging in gambling activities, which is in accordance with the results of this research, in which it was found that more conscientious adolescents engage in gambling less, and if they gamble, they do it with less intensity compared to their peers who are not as conscientious. Irresponsibility, on the other hand, in contrast to reliability, is a risk factor for the development of gambling, and those with more pronounced irresponsibility have more problems with gambling (20). In a Croatian study (20), irresponsibility was shown to be a significant correlate of the global measure of adolescent gambling risk.

The highest contribution to the explanation of the intensity of gambling is the sensation seeking of adolescents - those who are more inclined to sensation seeking are more inclined to gamble more intensively. Engaging in gambling activities provides a sense of excitement and adventure (33), and gambling characteristics such as fun, risk in the context of monetary investment and possible loss, and illegality are attractive to high sensation-seeking adolescents, especially given the youth's sensitivity to current gratification, reduced possibility of long-term planning, low ability to delay, wait and tolerate boredom (14). The obtained results can be explained by Zuckerman's optimal level of arousal theory, according to which adolescents who tend to seek sensation are chronically low-arousal persons and need more stimuli to reach the most efficient functioning. Such individuals will seek appropriate situations and experiences that will help them achieve and maintain an appropriate level of arousal given their high excitability threshold, and given that gambling often involves a high degree of sensory and mental stimulation, the likelihood that intense sensation-seekers and new experiences develop gambling problems (20).

Emotional competence and empathy are the last two correlates significantly related to the intensity of gambling among male adolescents in this study. Emotional competence affects the intensity of adolescent gambling, which is in line with several older studies (25). Namely, individuals who have higher levels of emotional intelligence better control their emotional states, which is

associated with more adequate regulation, improved mood and better impulse control (34), while individuals with low emotional intelligence have difficulties with impulse control and addiction disorders (25). This is by the integrative model of gambling called the Pathways Model (35), which singles out emotionally vulnerable gamblers characterized by anxiety, depression, a history of poor coping with stress, and poor coping skills. For this group, gambling represents a way of dealing with negative emotional states and a kind of escape from reality, which affects the further development and strengthening of this behavior.

When considering the construct of empathy, the fact that pathological gambling and other forms of addiction most often affect a wide social network is taken into account. It is estimated that the consequences of gambling affect eight to ten people around the individual with a gambling problem (15). Some authors (36) state that problem gamblers lack empathy, which is one of the main complaints of family members. Research shows that problem gamblers report a weaker sense of connectedness with their family compared to risky and social gamblers and those who do not gamble at all (20), and that family cohesion is negatively related to the degree of engagement in risky behaviors such as gambling. Furthermore, the development of empathy is often a central theme in the recovery process of addicts (36). Research on the construct of empathy within gambling activities is scarce, and the results obtained in this study are guidelines for future researchers to examine more closely the

relationship and influence of this individual variable, as well as possible moderator or mediator variables that may influence this relationship.

Examining the connection between individual characteristics and the expression of psychosocial consequences of youth gambling, similar results were found with the intensity of gambling, where the same characteristics, except emotional competence, were obtained as significant correlates of the expression of psychosocial consequences of youth gambling.

CONCLUSION

On average, male adolescents gamble more intensively and report more psychosocial consequences of gambling compared to female adolescents. There is a significant connection between emotional competence, empathy, conscientiousness, agreeableness and sensation seeking with the intensity of gambling in male adolescents, as well as the connection between excitement seeking and the intensity of gambling in female adolescents. Male adolescents who are more prone to sensation seeking, have a lower level of empathy, conscientiousness, agreeableness and emotional competence, gamble more and more intensively, as do females with a more pronounced trait of sensation seeking. Significant predictors of gambling intensity in male adolescents are sensation seeking and empathy, and in females sensation seeking. The correlations of the mentioned variables with the psychosocial consequences of gambling in male

and female adolescents were also examined, and a correlation was established with sensation seeking, empathy, agreeableness and conscientiousness in male adolescents and sensation seeking in female adolescents. Male adolescents who achieve high scores on the sensation-seeking scale, low on empathy, agreeableness, and conscientiousness, report more psychosocial consequences of gambling, as do female adolescents with a more pronounced sensation-seeking trait. A significant predictor of the psychosocial consequences of gambling in male and female adolescents is sensation seeking. The results of this research confirm the significant contributions of personality traits and individual characteristics in explaining the variance of adolescent gambling, thus confirming the importance of a comprehensive approach to clarifying the emergence and maintenance of problematic adolescent gambling, as well as the importance of early identification and treatment of at-risk adolescents taking into account relevant factors.

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INDIVIDUALNE KARAKTERISTIKE KAO KORELATI I PREDIKTORI KOCKANJA ADOLESCENATA

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SAŽETAK

Uvod: Adolescenti predstavljaju rizičnu skupinu za razvoj problematičnog kockanja koje s vremenom i intenziviranjem može prerasti u patološko kockanje s brojnim i štetnim psihosocijalnim posljedicama. Danas se značajan naglasak stavlja na individualne karakteristike i osobine ličnosti kao faktore koji utječu i doprinose razvoju ili održavanju kockanja.

Cilj: Stjecanje uvida u odnos između individualnih karakteristika (crta ličnosti) i kockanja adolescenata.

Ispitanici i metode: U istraživanju je sudjelovalo 402 učenika (197 mladića i 204 djevojke) završnih razreda srednjih škola iz Mostara prosječne dobi od 17 godina ($M= 17.41$, $SD= .59$). Podaci su prikupljeni ispunjavanjem upitnika uživo, u školama koje pohađaju te su primijenjeni Upitnik kockarskih aktivnosti, Kanadski upitnik kockanja adolescenata, Skala traženja uzbuđenja, Upitnik emocionalne kompetentnosti (UEK-15), Upitnik emocionalne empatije i IPIP-50.

Rezultati: Utvrđene su značajne razlike u intenzitetu kockanja i štetnim psihosocijalnim posljedicama s obzirom na spol, mladići u prosjeku intenzivnije kockaju i izvještavaju o više štetnih psihosocijalnih posljedica kockanja u odnosu na djevojke. Utvrdila se značajna povezanost emocionalne kompetentnosti, empatije, savjesnosti, ugodnosti i traženja uzbuđenja s intenzitetom kockanja mladića i značajna povezanost traženja uzbuđenja s intenzitetom kockanja djevojaka. Mladići koji su skloniji traženju uzbuđenja, imaju nižu razinu empatije, savjesnosti, ugodnosti i emocionalne kompetentnosti u prosjeku više i intenzivnije kockaju kao i djevojke s izraženijom crtom traženja uzbuđenja. Kao značajni prediktori kockanja mladića se ističu osobina ličnosti traženje uzbuđenja i empatija, a kod djevojaka traženje uzbuđenja, dok je značajan prediktor koji doprinosi objašnjavanju psihosocijalnih posljedica kockanja mladića i djevojaka također osobina traženja uzbuđenja.

Zaključak: potvrđuju se značajni doprinosi osobina ličnosti i individualnih karakteristika u objašnjenju kockanja adolescenata.

Ključne riječi: osobine ličnosti, kockanje adolescenata, prediktori, korelati

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EFFECTIVENESS OF MAGNETOTHERAPY IN THE TREATMENT OF PATIENTS WITH LUMBAR SYNDROME

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Received on 05.02.2023.

Reviewed on 27.02.2023.

Accepted on 09.03.2023.

ABSTRACT

Introduction: The term low back pain means a feeling of pain at rest or during movement in the lower, lumbar part of the spine. In order to reduce pain, various physical procedures are used: electrotherapy, thermotherapy, laser therapy, magnetotherapy, ultrasound therapy, cryotherapy, kinesitherapy and manual massage. **Aim:** To examine the effectiveness of magnetotherapy in the treatment of patients with lumbar syndrome. **Materials and Methods:** The study included patients treated from 01.01.2013. to 31.12.2015. year due to the diagnosis of lumbar pain syndrome in persons whose treatment process included magnetotherapy in the "Beljan" practice as a research group where were treated 113 patients (73 male and 40 female). There were 262 (114 male and 148 female) patients in the Health Center in Metković as a control group in which magnetotherapy was not included in the treatment of any patient. Pain was assessed on the basis of a visual analogue scale. **Results:** Research showed that the Chi-square test showed a statistically significant difference between the duration of physical therapy by days between the examined and control groups, $\chi^2(2, n=375) = 237.715$; $p < 0.001$. Pearson's correlation coefficient $r = 0.68$ shows a large statistical difference between the duration of physical therapy of the examined and control groups. The chi-square test showed a statistically significant difference between the kinesitherapy procedures and the examined or control group, $\chi^2(2, n=375) = 28.743$; $p < 0.001$. Pearson's correlation coefficient $r = -0.156$ shows an extremely small statistically significant difference between the tested and control groups and kinesitherapy procedures.

Conclusion: The shortest time that the patients spent on physical therapy in the examined group (80 patients) is 0 - 6 days of therapy, the shortest, and in the control group (197 patients) it is 7 - 10 days, the shortest. The working hypothesis that magnetotherapy affects the duration of treatment and the improvement of the functional status of patients with lumbar syndrome has been proven.

Keywords: Lumbar pain syndrome, effectiveness of magnetotherapy

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INTRODUCTION

Millions of people worldwide suffer from low back pain, and extensive research indicates that low back pain affects eight out of ten people (1). Lumbar pain syndrome (LPS) includes a group of different diseases and disorders, the common symptom of which is pain in the lumbar or lumbosacral part of the spine, with or without radiation to the lower extremities (2).

LPS is the most common pain syndrome of modern man and almost 75% of the population has low back pain (3). An intervertebral disc is inserted between each individual vertebra, which enables the mobility of the spine (4,5). The coordinated activity and relationships of the bony, connective and muscular systems in the area of the lumbar spine significantly dictate the biomechanical properties (6). The spinal cord is a cylindrical column 40 to 50 cm long, located in the upper two-thirds of the spinal canal (7). Primary pain is caused by irritation of nerve endings within the annulus fibrosus (mechanical stretching of the annulus or chemical irritation as a result of inflammation caused by mechanical trauma) (8). Already after the age of 30, the intervertebral disc becomes avascular. In cases where all the lamellae of the fibrous ring rupture and the nucleus pulposus protrudes into the spinal canal, we are talking about disc herniation (9,10). The described changes can also cause stenosis of the bony part of the spinal canal with compromise of the dural sac and nerve roots (11). The pathophysiology of radiculopathy has not been fully elucidated (12). The acute syndrome lasts up

to six weeks, and the subacute syndrome lasts from 6 to 12 weeks. We speak of chronic pain when pain lasts longer than 12 weeks or when painful episodes are repeated at shorter intervals (13,14). In the advanced stage, we see narrowing of the intervertebral space, sclerosing and osteophytes on the X-ray image (15). Personal history is one of the most important parts of the examination (16). In clinical practice, several tests are used to diagnose low back pain. Most clinical tests cause pain, which requires gentle and quick performance and avoidance of repeated test performance (17). Clinically, it is necessary to differentiate between two basic forms of low back pain: vertebral and vertebrogenic syndrome (18). Laboratory tests in degenerative lumbar disc disease (DLDD) show normal findings. Determination of the erythrocyte sedimentation rate, examination of blood and urine, and if malignancy is suspected, laboratory tests include alkaline phosphatase, ionogram and protein electrophoresis (19).

Treatment of lumbar pain syndrome depends on the cause. A conservative approach is most often used because the pain tends to self-heal (in 90% of cases the pain subsides within two months). Conservative (non-surgical) therapeutic measures consist of drug therapy and kinesitherapy treatment (strengthening of the stabilizer muscles of the lumbar segment of the spinal column) and physical agents (20). Orthopedic aids in the sense of corsets and orthoses have not proven to be effective in the treatment of lumbar pain syndrome (21). The treatment of the chronic form of LPS is multimodal, and the most consistent

therapeutic recommendations include a multidisciplinary approach, informing the patient (education), exercises, physical and psychological interventions (22). New treatment strategies include stem cells, growth factor and gene therapy (23).

Physical therapy

The physical therapy methods we use in the treatment of lumbar syndrome are cryotherapy, TENS (TENS, from English Transcutaneous electrical nerve stimulation), interference or Nemeć currents, diadynamic currents, ultrasound therapy, laser, kinesitherapy and exercises according to Brunk, McKenzie and Regan (8,13,24-27).

Magnetic therapy

Indications for magnetotherapy are: functional disorders caused by exogenous, endogenous or iatrogenic harmful substances, rehabilitation, mobilization after injuries in accidents and serious events due to injury or illness, such as stroke. Treatment with a wide range of indications, relatively minor side effects and almost no contraindications. It also works to improve oxygen supply and improve circulation, psychological stabilization, stimulation of metabolism, acceleration of regeneration and increase of immune activities and general increase of overall psychophysical ability. The magnetic fields of all magnetic systems in the modern world are pulsating. This is why we talk about pulsed electrical magnetic fields (PEMF). This is a feature that distinguishes magnetic field

therapy from numerous physiotherapy devices, which have low penetration (low depth), which is why their effect manifests itself mostly superficially. Magnetic field strength or flux density is expressed in tesla (T) or gauss (G), which is an old but still the most common unit of measurement, where 1 T corresponds to a value of 10,000 G (8). Contraindications are acute and serious circulatory disorder, diabetic angiopathy, coronary insufficiency or pre-infarction condition, pacemaker, risk of bleeding, hypotension, pregnancy, juvenile diabetes, acute infections and fungal diseases (24).

The effect of magnetotherapy on the human body
The effects of magnetotherapy on the human body are: stimulation of cartilage cells, regeneration of nerves where damaged cells can be stimulated by PEMF that encourages nerve cells to grow, wound healing and pain relief (8). Treatment with a magnetic field is applied using devices that can determine the intensity, polarity of the waves, the shape of the waves, the frequency and duration of the pulses, as well as the constant or changing magnetic field and the frequency. The number of procedures can range from several consecutive days to several months. Depending on the goal to be achieved, it is necessary to dose the optimal intensity (24). In the work of Beljan et al. the research included patients treated in the Physical Therapy and Rehabilitation Clinic "Beljan" as a test group in which 113 patients were treated in which magnetotherapy was included, and in the Health Center in Metković as a control group in which 262 patients were treated in which

magnetotherapy was not included. The research showed that the duration of treatment is shorter in patients who were treated with magnetotherapy in the Beljan Clinic. The aim of this study was to examine effectiveness of magnetotherapy in the treatment of patients with lumbar syndrome.

MATERIALS AND METHODS

The research was conducted from 01.01.2013. – 31.12.2015. year in the Physical Therapy and Rehabilitation Practice "Beljan" as a test group in which 113 (73 male and 40 female) patients were treated and in the Health Center in Metković as a control group in which 262 (114 male and 148 female) patients were treated. Of the physical procedures, PEMF, multidisk applicator" BTL 5800 with a maximum frequency of 166 MHz and a maximum intensity of a pulsed magnetic field of 950 G was used in all subjects in the examined group, while in the control group, interfering currents and TENS were used the most. Of the kinesitherapy procedures, Regan exercises were performed the most in both the examined (73 patients) and control (189 patients) groups. The research compared the duration of therapy by days between the tested and control groups, as well as the intensity of pain, which was measured by the VAS scale, where magnetotherapy was included in all patients in the tested group, in contrast to the control group where not a single patient had magnetotherapy included in the treatment LBS.

The criteria for inclusion in the therapy are:

1. patients diagnosed with lumbar pain syndrome based on clinical examination and supplementary procedures (X-ray, CT, MRI),
2. patients in whom magnetotherapy was included in the examined group,
3. control group patients without magnetic therapy,
4. patients regardless of age, gender and occupation.

Exclusion criteria are:

1. patients who stopped coming to therapy,
2. patients without complete diagnostics.

The research is retrospective, analytical, descriptive and control. The location of the study was the Physical Therapy and Rehabilitation Clinic "Beljan" in Tomislavgrad (examined group) and the Health Center in Metković (control group). In the period from January 1, 2013 to December 31, 2015.

Descriptive statistics procedures were used to describe the sample and sub-sample, taking into account the set hypotheses, and in accordance with the types and characteristics of the measuring instruments:

1. the significance of differences between subsamples, that is, different categories of participants, was calculated using the Pearson chi-square test (with Yates correction when necessary) when it came to nominal variables.
2. Microsoft Excel 2007 and the statistical package IBM SPSS, version 21.0 (SPSS, Inc., 2009, Chicago, IL, USA) were used for data analysis.

RESEARCH RESULTS

Table 1. Ratio of duration of physical therapy by days.

Duration in days	Groups					
	M	Examined F	Total (%)	M	Control F	Total (%)
0 – 6	51	29	80 (70,8)			
7 – 10	20	10	30 (26,5)	85	112	197 (75,2)
11 – 15	2	1	3 (2,7)	29	36	65 (24,8)
Total	73	40	113 (100)	114	148	262 (100)

The chi-square test showed a statistically significant difference between the duration of physical therapy per day between the tested and control groups. $\chi^2(2, n=375) = 237,715$; $p < 0.001$. Pearson's correlation coefficient $r = 0.68$ shows a significant difference between the duration of physical therapy of the tested and control groups.

In the largest number of respondents, 80 (51 male and 29 female), treatment with physical therapy in the examined group lasted from 1 to 6 days, the shortest. For the largest number of subjects, 197 (85 male and 112 female), treatment with physical therapy in the control group lasted 7-10 days, the shortest.

Table 2. Physical therapy procedures.

Physical therapy procedures	Groups					
	M	Examined F	Total (%)	M	Control F	Total (%)
Magnetic therapy	73	40	113 (100)			
TENS	55	29	84 (74)	89	119	208 (79)
Interference currents	35	24	59 (52)	92	123	215 (82)
Cryotherapy	26	6	32 (28)			
Ultrasound therapy	21	14	35 (31)	66	94	160 (61)
Diadynamic currents	32	12	44 (39)	46	82	128 (48)
Laser therapy	51	28	79 (69)			

The chi-square test of independence showed a statistically significant difference between the tested and control groups and magnetotherapy. $\chi^2(1, n=375) = 370.265$; $p < 0.001$. Pearson's correlation coefficient $r = -1$ shows a complete negative difference between the tested and control groups with magnetic therapy.

The chi-square test of independence (with continuity correction according to Yates) did not show a statistically significant difference between the control and test groups with TENS. $\chi^2(1, n=375) = 0.895$; $p = 0.344$. Pearson's correlation coefficient $r = 0.056$ shows an extremely small statistically significant difference between the tested and control groups with TENS.

The chi-square test of independence (with continuity correction according to Yates) showed a statistically significant difference between the tested and control groups with interfering currents. $\chi^2(1, n=375) = 34.242$; $p < 0.001$. Pearson's correlation coefficient $r = 0.309$ shows a small statistically significant difference between the tested and control groups with interfering currents.

The chi-square test of independence (with continuity correction according to Yates) showed a statistically significant difference between the control and test groups with cryotherapy. $\chi^2(1, n=375) = 77.529$; $p < 0.001$. Pearson's correlation coefficient $r = -0.465$ shows a mean negative statistically significant difference between the tested and control groups with cryotherapy.

The chi-square test of independence (with continuity correction according to Yates) showed

a statistically significant difference between the tested and control groups and ultrasound therapy. $\chi^2(1, n=375) = 26.032$; $p < 0.001$. Pearson's correlation coefficient $r = 0.269$ shows a mean negative statistically significant difference between the tested and control groups with ultrasound therapy.

The chi-square test of independence (with continuity correction according to Yates) did not show a statistically significant difference between the tested and control groups with diadynamic currents. $\chi^2(1, n=375) = 2.740$; $p = 0.098$. Pearson's correlation coefficient $r = 0.091$ shows an extremely small statistically significant difference between the tested and control groups with diadynamic currents.

The chi-square test of independence (with continuity correction according to Yates) showed a statistically significant difference between the tested and control groups with laser therapy. $\chi^2(1, n=375) = 227,869$; $p < 0.001$. Pearson's correlation coefficient $r = -0.787$ shows a large negative statistical difference between the tested and control groups with laser therapy.

All subjects in the examined group were covered by magnetic therapy (113). In the control group, the largest number of respondents was affected by interference currents (215). Magnetotherapy was included in the treatment process for all patients in the study group, while magnetotherapy was not included in any of the subjects in the control group.

Table 3. Kinesitherapy procedures.

Kinesitherapy procedures	Groups					
	Examined			Control		
	M	F	Total (%)	M	F	Total (%)
Regan exercises	45	28	73 (64,6)	86	103	189 (72,1)
McKenzie exercises	19	9	28 (24,8)	28	45	73 (27,9)
Brunck exercises	9	3	12 (10,6)			
Total	73	40	113	114	148	262

The chi-square test showed a statistically significant difference between the kinesitherapy procedures and the examined or control group, $\chi^2(2, n=375) = 28.743$; $p < 0.001$. Pearson's correlation coefficient $r = -0.156$ shows an extremely small statistically significant difference between the tested and control groups and kinesitherapy procedures.

Exercises according to Brunck were statistically

significantly more used by patients in the study compared to the control group. All respondents in the examined group were included in one of the mentioned exercise programs, and the largest number was in the Regan program, 73 of them (45 male and 28 female). In the control group, the largest number of respondents, 189 (86 male and 103 female), was included as in the examined group according to Regan's exercise program.

Table 4. Chi square test of VAS scale for pain.

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	165,067	6	,000
Likelihood Ratio	154,288	6	,000
Linear-by-Linear Association	,246	1	,620
N of Valid Cases	113		

The chi-square test showed a statistically significant difference in the average pain rating according to the VAS scale before and after therapy in the examined group, $\chi^2(6, n=113) = 165.067$; $p < 0.001$. The average pain rating according to the VAS scale in the examined group

is significantly lower after the therapy compared to the time before the therapy.

Assessment of pain intensity in patients before and after therapy in the control group was not performed.

DISCUSSION

In this research, we examined the length of therapy and the effectiveness of magnetotherapy in the test and control groups. Through research, we obtained results indicating that the duration of physical therapy for the largest number of patients 80 (51 male and 29 female) in the test group was 1-6 days, the shortest, and in the control group the duration of physical therapy for the largest number of patients 197 (85 male and 112 female) was 7-10 days, the shortest.

In the work Miladinović et al. where they examined the effects of magnetotherapy and TENS in chronic low back pain. A group of 16 patients was treated with TENS and a group of 17 patients with magnetotherapy, where magnetotherapy showed better effectiveness (28). The results they show are in accordance with the results of our research.

In the work Omar et al. they examined 40 patients, 20 with PEMF and 20 with placebo, who suffered from lumbar radiculopathy. The effects of PEMF versus placebo in patients with lumbar radiculopathy, they found significant differences in patients treated with PEMF who had less pain. They found that PEMF therapy is an effective method for the conservative treatment of lumbar radiculopathy caused by lumbar disc prolapse. In addition to improving clinically observed radicular symptoms, PEMF also appears to be effective in reducing nerve root compression as evidenced by improvement in SSEP parameters after treatment (29). The results of this research are consistent with our research.

In the work of Khoromi et al. they examined the effect of the magnetic field in patients with chronic low back pain in two groups, with different strengths of the PEMF and obtained the same effect in reducing pain and that higher strength and longer duration of therapy are more effective in patients with chronic lumbar syndrome (30). The results of this study confirming the reduction of pain in patients with lumbar syndrome are consistent with our research.

In the work of Fortin et al. applied the electromagnetic field to 38 patients with low back pain and 30 patients with pain in the cervical spine. The patients underwent 4 therapies with a duration of 30 min. The average value of the VAS scale decreased by 30% in the group of patients with lumbar syndrome and by 70% in patients with cervical spine pain. The treatment showed good results in both groups, without side effects (31). The results of this research are consistent with our research.

In the work of Andrade et al it was performed a comprehensive database search using Pubmed, Scopus, Cochrane Library and PEDro databases to assess the effectiveness of the PEMF therapy in reducing pain and clinical symptomatology in patients with low back pathological conditions. The search was performed from January 2005 to August 2015 and conducted by two independent investigators, which scrutinize the reference list of most relevant studies. The methodological quality was assessed by the PEDro scale and the level of evidence was set according Oxford Center for Evidence-Based Medicine scale. Six

studies were eligible inclusion on the qualitative analysis and five into the quantitative analysis, scoring an overall 6.8 points according the PEDro scale. The studies showed heterogeneity concerning the intervention protocols. Nevertheless, the effect sizes' indicated a clear tendency to reduction of the pain intensity favoring the PEMF groups, reaching a minimal clinically important difference. Conclusion is that PEMF therapy seems to be able to relieve the pain intensity and improve functionality in individuals with low back pain conditions (32). The results of this research are consistent with our research.

A low-frequency magnetic field is often used in the treatment of pain syndromes and chronic wounds. It is considered that there is a stabilization of the potassium-sodium pump, and thus the membrane potential; the energy metabolism increases and the partial pressure of oxygen increases, which contributes to a better supply of nutrients in the affected area (27).

There is no doubt that PEMF create numerous biophysical effects in the human body at different levels. These effects relate to an increase in the resistance of the cell membrane, an effect on the enzyme-coenzyme correlation, an effect on the antigen-antibody reaction, an increase in the crystallization rate of certain substances, an increase in oxygen concentration, and an increase in the coagulation rate. Under the influence of magnetic field, a piezoelectric effect is created in the collagen (26).

The disadvantages of this research are that in the control group, no cryotherapy or laser was included in the treatment of LBS. In the examined

group, cryotherapy was included in 32 patients and laser in 79 out of 113 patients. Although in the examined group, cryotherapy and laser were not included in the treatment of all patients and magnetotherapy was included, this still represents certain limitations where it is not possible to prove how successful cryotherapy and laser were. We can say that cryotherapy and laser therapy, as well as the uneven number of respondents who used other therapeutic methods, significantly influenced the results of the study. Additional limitations can be: a small sample, including more health institutions, insufficient research into the mode of action of magnetotherapy. The contribution of this research is the fact that, despite the mentioned limitations, PEMF was included in all patients in the examined group, in whom the duration of therapy by days as well as by the VAS scale was significantly reduced. This proved that PEMF affects the reduction of pain and duration of symptoms as well as functional status in patients with lumbar syndrome.

CONCLUSION

The shortest time that the patients spent on physical therapy in the examined group (80 patients) is 0 - 6 days of therapy, the shortest, and in the control group (197 patients) it is 7 - 10 days, the shortest. After performing physical therapy for people with lumbar pain syndrome, a greater effectiveness in the duration of the therapy was shown in patients who were treated in the "Beljan" Clinic, in which the patients were treated with pulsed electrical magnetic field compared to

the control group in which the patients were not treated with magnetotherapy. Given that in practice, certain currents (TENS, interference, etc.) are most often used as agents of physical therapy, in diagnoses related to painful conditions of the spine, it is evident from this research that PEMF should be used as one of the first choices in compared to the mentioned agents.

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EFIKASNOST MAGNETOTERAPIJE U LIJEČENJU PACIJENATA S LUMBALNIM SINDROMOM

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SAŽETAK

Uvod: Pojam križobolje označava osjećaj boli u mirovanju ili pri kretanju u donjem, slabinskom dijelu kralježnice. U cilju smanjenja bolova koriste se različite fizikalne procedure: elektroterapija, termoterapija, laserska terapija, magnetoterapija, ultrazvučna terapija, krioterapija, kineziterapija i manualna masaža.

Cilj: Ispitati efikasnost magnetoterapije u liječenju pacijenata s lumbalnim sindromom.

Materijal i metode: U istraživanju su obuhvaćeni pacijenti liječeni od 01.01.2013 g. do 31.12.2015 g. zbog dijagnoze lumbalnog bolnog sindroma kod osoba kod kojih je u proces liječenja bila uključena magnetoterapija u Ordinaciji „Beljan“ kao ispitivanoj grupi gdje je liječeno 113 (73 muškog i 40 ženskog spola) pacijenata. U Domu zdravlja u Metkoviću kao kontrolnoj grupi kod koje u liječenju nije bila uključena magnetoterapija ni kod jednog pacijenta bilo je 262 (114 muškog i 148 ženskog spola) pacijenata. Procjena boli rađena je na osnovu vizualne analogne skale.

Rezultati: Istraživanja su pokazala da je Hi - kvadrat test pokazao je statistički značajnu razliku između trajanja fizikalne terapije po danima između ispitivane i kontrolne grupe, $\chi^2(2, n=375) = 237,715$; $p < 0,001$. Pearsonov koeficijent korelacije $r=0,68$ pokazuje veliku statističku razliku između trajanja fizikalne terapije ispitivane i kontrolne grupe. Hi-kvadrat test pokazao je statistički značajnu razliku između procedura kineziterapije i ispitivane odnosno kontrolne skupine, $\chi^2(2, n=375) = 28,743$; $p < 0,001$. Pearsonov koeficijent korelacije $r=-0,156$ pokazuje izuzetno malu statistički značajnu razliku između ispitivane i kontrolne grupe i procedura kineziterapije.

Zaključak: Najkraće vrijeme koje su pacijenti proveli na fizikalnoj terapiji u ispitivanoj grupi (80 pacijenata) iznosi 0 - 6 dana terapije najkraće, a u kontrolnoj grupi (197 pacijenata) iznosi 7 – 10 dana, najkraće. Dokazana je radna hipoteza da magnetoterapija utječe na trajanje liječenja i poboljšanje funkcionalnog statusa pacijenata s lumbalnim sindromom.

Ključne riječi: Lumbalni bolni sindrom, pulsirajuće magnetno polje

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SERUM ACTIVITY OF ENZYMES AND BILIRUBIN IN PATIENTS WITH CIRRHOSIS AND LIVER CANCER

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Received on 02.02.2023.

Reviewed on 28.02.2023.

Accepted on 09.03.2023.

ABSTRACT

Introduction: The most important biochemical reactions of the human organism take place in the liver, and therefore it represents one of the most important organs for life. Parameters that play an important role in the diagnosis and monitoring of patients are the enzymes ALT, AST, GGT, ALP, and bilirubin.

Objective: To evaluate the serum activity of enzymes and bilirubin in patients with liver cirrhosis and liver cancer. **Materials and methods:** The study included 120 patients aged over 50 years. Among them, 40 patients had liver cirrhosis, 40 had cancer and liver metastases, and 40 patients were apparently healthy (control group). The concentrations of AST, ALT, GGT, and ALP were determined on Abbott Architect i2000sr biochemical analyzer and Dimension analyzer.

Results: The study showed that the mean values of the studied parameters were significantly higher in subjects with liver cirrhosis and cancer with liver metastases than in the control group. A statistically significant difference ($p < 0.05$) was found in ALP and bilirubin concentrations between the studied groups. In addition, the study revealed a statistically significant difference ($p < 0.05$) in ALT, AST, and GGT activity between subjects with cancer and the control group and subjects with cirrhosis and the control group.

Conclusions: The results confirm that the activities of enzymes ALT, AST, GGT, ALP, and bilirubin were increased in subjects with cirrhosis and cancer compared to the control group.

Keywords: enzymes, bilirubin, liver cirrhosis, liver cancer

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INTRODUCTION

The liver is responsible for several functions, including primary detoxification, protein synthesis, and digestive enzyme production. It plays an important role in metabolism, in the regulation of red blood cells, and in the synthesis and storage of glucose. Liver function tests include alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), 5'nucleotidase, total bilirubin, conjugated (direct) bilirubin, unconjugated (indirect) bilirubin, prothrombin time (PT), international normalized ratio (INR), lactate dehydrogenase, total protein, globulins, and albumin (1).

Chronic liver injury leads to inflammation and fibrosis of the liver. The occurrence of fibrosis completely alters the structure of the liver and disrupts the liver parenchyma and vascular architecture. Progressive fibrosis and cirrhosis then lead to decreased metabolic and synthetic function of the liver, causing increased bilirubin levels and decreased production of clotting factors and platelets. Cirrhosis can be the result of chronic liver injury from any cause. Factors associated with an increased risk of progression to cirrhosis include older age, male gender, and comorbidities (especially in patients coinfecting with HIV and HCV) (2, 3). Recent research has shown that liver fibrosis is a dynamic process, and that early cirrhosis is even reversible (4).

Primary liver cancer accounts for 6 % of all cancers and 9 % of all cancer deaths, is the sixth most common cancer, and the second leading

cause of cancer death. Major primary liver cancers include hepatocellular carcinoma (HCC), which accounts for about 75 %, and cholangiocarcinoma (6 %). Although either surgical resection or liver transplantation can be used to treat liver cancer, there are limitations due to the high recurrence rate and the low acceptance of transplantation, as this cancer is often detected at a late stage (5, 6).

Aminotransferases, including aspartate transaminase (AST) and alanine aminotransferase (ALT), which are known circulating blood-based biomarkers, have historically been used to demonstrate liver injury. However, elevated aminotransferases have also been found to be associated with human disease and systemic dysregulation of metabolic function (7).

Gamma-glutamyl transferase (GGT) is an enzyme in the liver located mainly on the capillary side of liver cells and the membrane of bile duct epithelial cells. Hypersynthesis in the liver, obstruction of bile secretion, and injury and hyperplasia of the bile duct epithelium can cause elevated serum GGT. Elevated GGT is found in many liver diseases and understanding the characteristics of GGT in different liver diseases may be helpful to better understand the pathogenesis of liver diseases and select therapeutic targets (8).

Intestinal alkaline phosphatase (IAP) is a subtype of the alkaline phosphatase family and is produced exclusively in the intestine, with the highest expression in the duodenum (9). Endogenous IAP levels have been shown to be lower in inflammatory bowel diseases such as

inflammatory bowel disease and diabetes. IAP levels have not yet been studied in the context of liver fibrosis (10, 11). The aim of this study is to investigate serum enzyme and bilirubin activity in patients with liver cirrhosis and liver cancer.

MATERIALS AND METHODS

The retrospective study was conducted in the Hospital "Dr. fra Mato Nikolić", Nova Bila, and included data from medical records collected from the beginning of 2014 to the end of 2018. The study included 120 patients aged over 50 years. Among them, 40 patients had liver cirrhosis, 40 patients had cancer and liver metastases, and 40 patients were apparently healthy (control group). Medical documentation was used for data on laboratory, clinical, and demographic characteristics: sex, age, and enzyme activity of ALT, AST, GGT, ALP, and total bilirubin levels.

The activities of enzymes AST, ALT, GGT, and ALP were determined on the biochemical analyzer Abbot Architect i2000sr and Dimension analyzer. The basis of all methods for measuring enzyme activity is based on the same principle - the enzyme acts on its specific substrate, whereupon the concentration of the resulting reaction product or the decrease in the concentration of the substrate is usually measured, and rarely the concentration of the enzyme itself. The measurement of the concentration of the resulting product actually determines the rate of the enzymatic reaction, i.e., the catalytic concentration.

Microsoft Excel was used to prepare and store the data for statistical analysis. The software package used for data processing was IBM SPSS Statistics for Windows, version 21.0 (Armonk, NY: IBM Corp) and MedCalc. Qi Macros 2019 program was used for the graphical layout. The data obtained are presented in tables and figures. The tested results were statistically processed for $p < 0.05$.

RESULTS

A total of 120 subjects participated in the study. Of these, 33% of subjects were diagnosed with liver cirrhosis, 33 % had cancer, and 33 % of subjects were in the control group. The group with liver cirrhosis consisted of 65 % men and 35 % women, and in the group with cancer were 55% of men and 45 % of women. In the control group, we had the same number of males and females. The average age of the subjects in the whole sample was 68.1 +/-8.5 years, with the youngest subject being 53 years old and the oldest 94 years old. In the group of subjects with liver cancer, 68 % were at the stage of metastasis, and 33% had already been diagnosed with cancer. The results show that the group with liver cancer had the highest mean ALT values, followed by the group with liver cirrhosis, and the lowest in the control group, as shown in Figure 1. ALT enzyme activity in the control group had the lowest value of 10 U/L, and the highest value was 39 U/L. In the disease groups of patients with liver cirrhosis, the lowest value was 20 U/L, and the highest was 118 U/L, while in the group with cancer, the lowest activity was 12 U/L and the highest was 422 U/L.

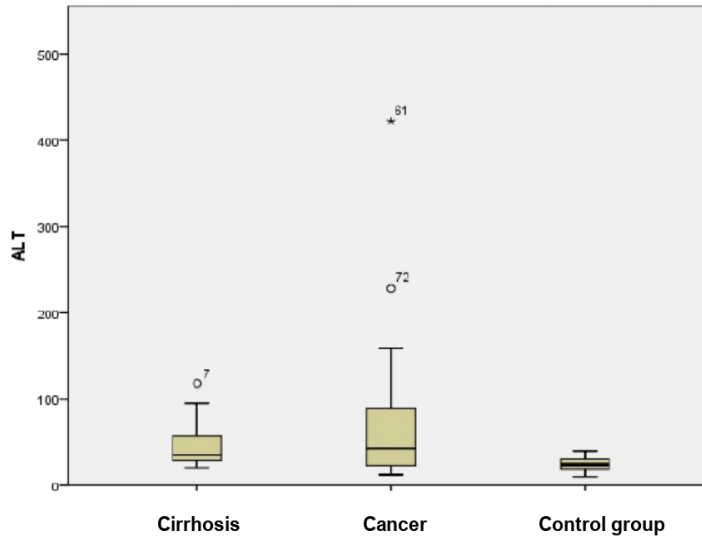


Figure 1. Graphic representation of the average value for ALT.

A statistical difference between groups was determined using the Mann-Whitney U test for ALT and a statistical difference of $p < 0.0001$ was found between the control group and the cancer group and the control group and cirrhosis. Using the same test, no statistical difference was found between the liver cirrhosis and liver cancer groups ($p = 0.6100$). The results are shown in Table 1.

Table 1. Comparison of the catalytic activity of the enzyme ALT between the tested groups.

Comparative groups	Mann-Whitney U	Z	p
ALT Cancer/Control group	360.50	4.23	<0.0001

ALT Cirrhosis/Control group	264.00	5.15	<0.0001
ALT Cancer/Cirrhosis group	747.00	0.51	0.601

The study showed that the enzymatic activity of AST in the control group had the lowest value of 11 U/L and the highest value of 33 U/L. In the other groups studied, the lowest enzymatic activity of AST in patients with liver cirrhosis was 18 U/L and the highest was 114 U/L, while in the group with cancer, the lowest activity was 10 U/L and the highest was 576 U/L. The results are shown in Figure 2.

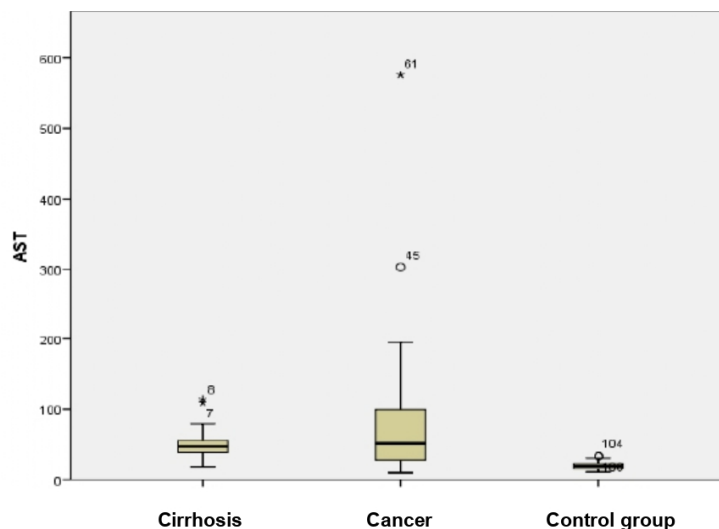


Figure 2. Graphic representation of the average value for AST.

A statistically significant difference ($p < 0.0001$) was found with the Mann-Whitney U test for AST between the control group and the cancer group, as well as between the control group and the liver cirrhosis group. No statistically significant difference was found between the liver cirrhosis and liver cancer groups using the same test ($p = 0.358$). The results are shown in Table 2.

The enzyme activity of GGT had the lowest value of 7 U/L in the control group, and the highest value was 50 U/L. The liver enzyme activity in patients with liver cirrhosis had the lowest value of 70 U/L and the highest value of 743 U/L, while in the group with cancer, the lowest activity was 36 U/L and the highest was 1892 U/L. The results are shown in Figure 3.

Table 2. Comparison of the catalytic activity of the AST enzyme between the tested groups

Comparative groups	Mann-Whitney U	Z	p
AST Cancer/Control group	200.00	5.7 7	<0.000 1
AST Cirrhosis/Control group	43.00	7.2 8	<0.000 1
AST Cancer/Cirrhosis group	704.50	0.9 1	0.358

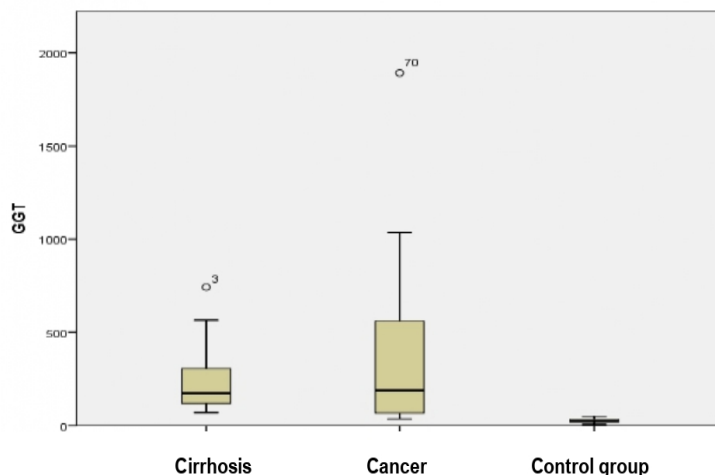


Figure 3. Graphic representation of the average value for GGT

Using the Mann-Whitney U test, statistically significant differences for GGT were found between the control group and the cancer group and between the control group and liver cirrhosis ($p < 0.0001$). No statistically significant difference ($p = 0.613$) was found between the liver cirrhosis group and the liver cancer group. The results are shown in Table 3.

The control group had the lowest value of ALP enzyme activity at 35 U/L and the highest at 114 U/L. Patients with liver cirrhosis had the lowest ALP value of 65 U/L and the highest of 235 U/L, whereas in the group with cancer, the lowest activity was 47 U/L and the highest was 929 U/L. The results are shown in Figure 4.

Table 3. Comparison of the catalytic activity of the GGT enzyme between the tested groups.

Comparative groups	Mann-Whitney U	Z	p
GGT Cancer/Control group	16.50	7.54	<0.0001
GGT Cirrhosis/Control group	0.00	7.69	<0.0001
GGT Cancer/Cirrhosis group	747.5	0.505	0.613

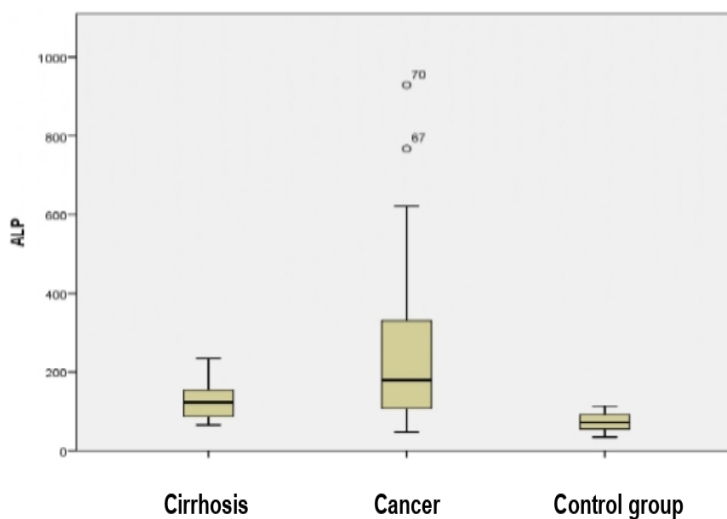


Figure 4. Graphic representation of the average value for ALP.

A statistically significant difference for ALP using the Mann-Whitney U test was found between the control group and the cancer group and the control group and the liver cirrhosis ($p < 0.0001$). Using the same test, a statistical difference of $p = 0.0009$ was found in the liver cirrhosis and liver cancer groups, and the results are shown in Table 4.

Table 4. Comparison of the catalytic activity of the ALP enzyme between the tested groups.

Comparative groups	Mann-Whitney U	Z	p
ALP Cancer/Control group	152.50	6.23	<0.0001
ALP Cirrhosis/Control group	251.50	5.27	<0.0001

ALP	454	3.3	0.0009
Cancer/Cirrhosis group		9	

Serum bilirubin concentration in the control group had the lowest concentration of 4 $\mu\text{mol/L}$ and the highest of 18 $\mu\text{mol/L}$. Patients with liver cirrhosis had the lowest bilirubin concentration of 9.90 $\mu\text{mol/L}$ and the highest concentration of 48.30 $\mu\text{mol/L}$, while in the group with cancer the lowest concentration was 5 $\mu\text{mol/L}$ and the highest was 578.20 $\mu\text{mol/L}$. The results are shown in Figure 5.

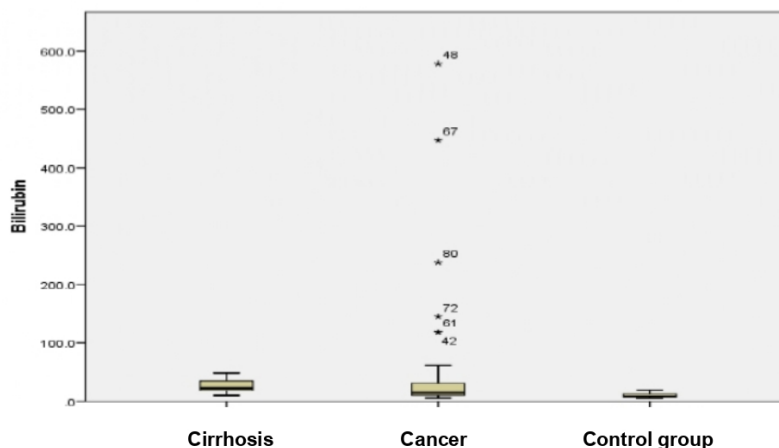


Figure 5. Graphic representation of average values for bilirubin.

A statistically significant difference for bilirubin was found using the Mann-Whitney U test between the control group and the cancer group and the control group and the liver cirrhosis at $p < 0.0001$. Using the same test, a statistically significant difference of $p = 0.0078$ was found in the groups with liver cirrhosis and liver cancer. The results are shown in Table 5.

Table 5. Comparison of serum bilirubin concentration between the examined groups.

Comparative groups	Mann-Whitney U	Z	p
Bilirubin cancer/Control group	363	4.08	<0.0001
Bilirubin cirrhosis/Control group	60	7.06	<0.0001
Bilirubin cancer/Cirrhosis group	523.50	2.66	0.0078

DISCUSSION

The aim of our study was to analyze the activities of ALT, AST, GGT, ALP, and bilirubin in patients diagnosed with liver cancer, i.e., with liver metastases, and in patients diagnosed with liver cirrhosis. We also determined the values of the same parameters in the control group of subjects and compared the obtained results to determine the difference between the studied groups. The study included three groups of patients, namely 40 patients with cirrhosis, 40 patients with cancer, i.e., liver metastases (68 % were at the stage of metastases and 33% had cancer), and a control group of also 40 subjects. Determination of aspartate transaminase (AST) and alanine aminotransferase (ALT) activity, which is used to measure liver damage, has been associated with some chronic diseases and mortality. The highest value of average enzyme activity was found in the group with cancer, 65.5 U/L, followed by the group of subjects with cirrhosis, 45.2 U/L, while the subjects in the control group had the lowest activity, 24.6 U/L.

The minimum in the control group was 10 U/L, while the group with cancer had the highest value of 422 U/L (Figure 1).

For the parameter AST, the highest average values of 82.5 U/L were recorded in the group with cancer, followed by the group of subjects with cirrhosis at 49.0 U/L, while the lowest values of 19.5 U/L were obtained in the control group. The lowest value is in the group with cancer and is 10 U/L, while the highest value of 576 U/L was recorded in the group with cancer (Figure 2).

The highest mean values of the GGT parameter were found to be 345.4 U/L in the group with cancer, followed by the group with cirrhosis, 225.1 U/L, and the expected lowest values of 26.2 U/L were obtained in the control group. The minimum activity for GGT in the control group of subjects corresponds to 7 U/L, whereas the group with cancer had the highest value of 1892 U/L (Figure 3).

The average enzyme activity for ALP, ie, the highest activity was measured in the group of subjects with cancer with a value of 245.2 U/L, followed by the group with cirrhosis at 123.0 U/L, and the lowest values of 73.7 U/L were obtained in the control group. The lowest value was found in the control group of subjects and was 35 U/L, while the highest value of 929 U/L was found in the group with cancer (Figure 4).

The results of a study by Lopez JB. et al (12) showed that the values of the parameters ALP [U/L], GGT [U/L], and AST [U/L] were abnormal in about 90% of patients with HCC. Elevated ALP values with normal bilirubin were a more common feature of HCC than in healthy subjects,

although this association was not statistically significant.

The mean bilirubin concentration in the cancer group recorded the highest values, 55.1 $\mu\text{mol/L}$. This was followed by the group of subjects with liver cirrhosis, in which the bilirubin was 26.1 $\mu\text{mol/L}$, and finally the control group, in which the bilirubin was 9.4 $\mu\text{mol/L}$. The high values of the standard deviation in the group of subjects with cancer indicate that the bilirubin levels in this group vary considerably. The lowest value of this parameter was 4.4 $\mu\text{mol/L}$ and was found in the control group, while the highest value of 578.2 $\mu\text{mol/L}$ was found in the group of cancer patients (Figure 5).

In a study by Whitfield J. et al (13), the results of laboratory tests in 1578 patients were compared between cases (with alcoholic cirrhosis, 753 men, 243 women) and controls (with concomitant alcohol consumption during life but without liver disease; 439 men, 143 women). The mean value of the parameter bilirubin in the control group of subjects was 9.3 $\mu\text{mol/L}$, whereas its mean value in alcoholic cirrhosis was 88.7 $\mu\text{mol/L}$. The mean value for the parameter ALT [U/L] in this study was 38.0 U/L in the control group and 45.0 U/L in the case of alcoholic cirrhosis. The mean value of the parameter AST [U/L] was 41 U/L in the control group and 83.4 U/L in the case of alcoholic cirrhosis. The mean value of the GGT parameter in the control group was 113.6 U/L, and in alcoholic cirrhosis, the mean value was 424.0 U/L (13). The analysis showed that the mean values of the measurements of all five tested parameters in the control group were within the

limits. The highest values of the parameters ALT, AST, GGT, ALP, and bilirubin are in the group of patients with cancer, i.e., liver metastases.

Biomarkers of liver function (gamma-glutamyl transferase, GGT; alanine aminotransferase, ALT; aspartate aminotransferase, AST; alkaline phosphatase, ALP; total bilirubin) are used in the clinical diagnosis of various diseases, including those associated with liver function damage and impairment. Higher levels of specific combinations of these liver function biomarkers have been shown to be independently associated with liver cirrhosis, hepatitis infection, biliary obstruction (14), and risk of diabetes (15, 16), which in turn is also associated with increased risk of HCC (17). Previous case-control studies found that GGT, ALT, and AST were elevated in approximately 90% of diagnosed HCC cases, while half of the cases also had elevated liver-specific alkaline phosphatase (ALP) or bilirubin levels (18). In our study, the differences between the serum levels of ALP and bilirubin were statistically significant at $p < 0.05$ in the group of patients with liver cirrhosis and cancer (Tables 4 and 5). Using the Mann-Witney test, no statistical significance was found for $p < 0.05$ when examining enzymes AST, ALT, and GGT in the groups with liver cirrhosis and cancer (Tables 1-3). Statistical significance was found for $p < 0.0001$ by examining the statistical significance between the control group and the group with cirrhosis and with cancer for the parameters AST, ALT, GGT, ALP, and bilirubin (Tables 1-5).

Fifty patients with cirrhosis and fifty patients with HCC were included in the study by Mehinovic L.

et al. Significant differences were observed between these two groups for the parameters AST, GGT, and ALP ($p < 0.05$), while there were no statistically significant differences for the parameter's bilirubin and ALT ($p > 0.05$) (19). Authors Xu Liu et al. studied markers of liver function and compared them in cirrhosis and HCC. There was a total of 339 patients and 162 women with a mean age of 52 years. They were 185 patients with cirrhosis and 166 patients with hepatocellular carcinoma. The Mann-Whitney U test was used to compare the group with HCC and cirrhosis. Statistical significance was found for all parameters except ALP (0.220) and GGT (0.529) (20).

In a recent systematic review, GGT, but not ALT, was associated with an increased risk of liver cancer, but geographic differences were observed for ALT (21). Existing prospective observational studies that examined the association between biomarkers of liver function and liver cancer were mostly based on Asian patients (22, 23) and/or limited to specific enzymes (either transaminases, ALT, and AST or GGT) (16, 17). A cohort study based on predominantly hepatitis-negative markers measured only transaminases and found that both enzymes were good independent predictors of HCC development (24). Studies in the hepatitis-infected population found positive associations of HCC risk with many liver enzymes but not with bilirubin (23, 24). In a Swedish study, higher GGT levels were prospectively associated with an increased risk of cancer, including liver cancer, suggesting that this

single enzyme is not specific to liver and biliary tract disease (25, 26).

CONCLUSION

The highest mean values for the biomarkers ALT, AST, GGT, ALP, and bilirubin were recorded in the group with liver cancer and liver metastases, then in the group of subjects with liver cirrhosis and the lowest values in the control group of subjects. The highest mean value was recorded for the parameter GGT in the group with cancer. The results show that there is a statistically significant difference between the values of the parameters ALP and bilirubin in the groups of subjects with cancer and the control group. Subjects with cancer had statistically significantly higher values for the parameter ALP, while subjects with cirrhosis had statistically significantly higher values for bilirubin. The study shows that the catalytic activity of enzymes and bilirubin is significantly higher in the group with cancer compared to subjects with cirrhosis as well as in the control group.

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SERUMSKA AKTIVNOST ENZIMA I BILIRUBINA U PACIJENTA S CIROZOM I TUMOROM JETRE

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SAŽETAK

UVOD: U jetri se odvijaju glavne biokemijske reakcije čovjekovog organizma, te samim tim ona predstavlja jedan od najvažnijih organa za život. Parametri koji imaju značajnu ulogu u dijagnosticiranju i praćenju oboljena jesu enzimi ALT, AST, GGT, ALP, te bilirubin.

CILJ: Istražiti serumsku aktivnost enzima i bilirubina u pacijenata s cirozom i karcinomom jetre.

MATERIJALI I METODE: Ispitivanjem je obuhvaćeno 120 pacijenata, starosti iznad 50 godina, odnosno 40 pacijenata s cirozom jetre, 40 pacijenata s karcinomom i metastazama na jetri, te 40 pacijenata kontrolne skupine. Koncentracije AST, ALT, GGT, ALP-a u ovom radu određene su na biokemijskom analizatoru Architect i2000sr, marke Abbott, te analizatoru Dimension.

REZULTATI: Istraživanje je pokazalo da su srednje vrijednosti ispitivanih parametara bile znatno više kod ispitanika s dijagnosticiranom cirozom jetre i karcinomom, odnosno metastazama na jetri, u odnosu na kontrolnu skupinu ispitanika. Ispitivanjem razlike parametara ALP i bilirubina između ispitivanih grupa, došli smo do zaključka da postoji statistički značajna razlika između ispitivanih parametara ($p < 0,05$) kod naših skupina ispitanika. Istraživanje je pokazalo i da postoji statistički značajna razlika ($p < 0,05$) za ALT, AST i GGT između ispitanika sa karcinomom i kontrolne skupine kao i ispitanika s cirozom i kontrolne skupine.

ZAKLJUČCI: Rezultati su potvrdili da su povišene aktivnosti enzima ALT, AST, GGT, ALP i bilirubina kod ispitanika s cirozom jetre i karcinomom u odnosu na kontrolnu skupinu ispitanika.

Ključne riječi: enzimi, bilirubin, ciroza jetre, karcinom jetre

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FREQUENCY OF LOWER LIMB INJURIES IN PROFESSIONAL SOCCER, RISK FACTORS AND CONSEQUENCES; A RETROSPECTIVE STUDY

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Received on 10.03.2023.

Reviewed on 17.04.2023.

Accepted on 29.04.2023.

ABSTRACT

Introduction: There are many factors that can have an impact on the injury of soccer players. It is very difficult to predict all factors, so turning to prevention, collecting data on injury patterns, and designing new strategies for injury prevention among soccer players is extremely important.

Objective: To determine the condition of lower limb injuries in football players of the Premier League of Bosnia and Herzegovina

Methods: Professional soccer players competing in the Premier League of Bosnia and Herzegovina participated in a retrospective study. For this study, each soccer player filled out a questionnaire that was not standardized but was designed for the purposes of this research. Complaints about injuries during 2019 were requested, as well as insight into types of injuries, methods of treatment, use of orthoses, bandages, and the like.

Results: Out of a total of 129 subjects, 57.4 % had injuries, of which 50 had only one injury. Most respondents were injured during training (64.9 %), on normal surfaces (82.4 %). In 44.6 % of respondents, it was a non-contact, new injury, more often on the non-dominant leg, the most frequently injured were muscles. 26 of them had an operation, and the recovery of the majority lasted up to 40 days.

Conclusion: Exposure to various risk factors resulted in lower limb injuries in more than half of the respondents.

Key words: football, injury factors, injuries, outcome

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INTRODUCTION

A sedentary lifestyle and insufficient physical activity are the causes of various health problems. A sedentary lifestyle has widespread adverse effects on the human body, including increased mortality from various causes, mortality from cardiovascular disease, risk of cancer, risk of metabolic disorders, and risk of musculoskeletal disorders. Reducing a sedentary lifestyle and increasing physical activity are important for promoting public health (1).

Although exercise can result in a number of well-documented fitness and health benefits, obtaining such benefits carries the risk of exercise-related injuries. Musculoskeletal injuries often occur among participants in fitness programs, runners, athletes, and others who engage in vigorous exercise (2).

The rise in the reputation of sports, its popularity, as well as the desire for increased earnings, influence the increase in the risk of injuries among professional athletes. Improper, unprofessionally dosed activity leads to an unbalanced relationship between muscles and joints, which can result in injuries. Therefore, a better understanding of the effects of training parameters and other factors on exercise-related injury risks is needed to more carefully decide how to best achieve the benefits of exercise and prevent injury (2).

Sports injuries are associated with high direct and indirect costs, and can even lead to early sports retirement in about 24.0 % of athletes (3). The too-frequent injury of athletes results in the

allocation of large amounts of money for rehabilitation. When we talk about injuries, injuries in football can be divided into two primary groups: contact, where we cannot have too much influence, and non-contact, when the athlete injures himself (4).

When we talk about contact injuries, we mean injuries that occur due to contact with an opposing player. Non-contact injuries are something that we try to influence in various ways, primarily through prevention. The North Carolina High School Athlete Injuries Study, a sample of 100 high school athletic teams conducted from 1996 to 1999, produced startling results. Three types of costs were assessed: medical, human capital (medical costs plus loss of future earnings), and comprehensive capital (human capital costs plus lost quality of life). Annual statewide estimates were US\$9.9 million in medical costs, US\$44.7 million in human capital costs, and US\$144.6 million in comprehensive costs (5).

We are witnessing the exceptional popularity of football as a sport. It is often heard that it is a sport for the masses, but lately, it has become more than a sport. Football, or Soccer as it is called in North America, is the most popular sport in the world (6). Today, football is played at a professional level in more than two hundred countries around the world. It is interesting that according to FIFA (Fédération Internationale de Football Association) there are more amateurs than professionals. While for many football is a great love and lifestyle, for some it is just a favorite sport, for others it represents business and of course money (7).

Soccer is becoming so popular that there is even research that suggests that soccer can begin to be considered medicine. Today it turns out that Voltaire and his main character, the philosopher Zadig, were right: Football is breathtaking and can be used as therapy. Fifteen years of research have produced strong evidence showing that football is indeed a breathtaking, high-intensity, multi-purpose training exercise that is effective as physical and psycho-social therapy. In fact, football is medicine, and we are ready to act on this knowledge (8)!

There are many factors that can have an impact on the injury of soccer players. Once risk factors for lower limb injury are identified, intervention studies can be used to reduce the incidence and severity of injury, along with associated medical costs (9). Collecting data on injury patterns and related risk factors can provide important information for the design of new injury prevention strategies among athletes (4). Traumatic and lower limb overexertion syndrome injuries are common and, unfortunately, injury prediction is complex and multifactorial (10, 11). Researchers have estimated that 50 % to 80 % of injuries result from overexertion syndrome and affect the lower limbs (10-12). The too-frequent injury of football players results in the allocation of large sums of money for rehabilitation and as such represents a certain financial problem. The financial problem is not the only one, football players also face psychological difficulties resulting from injuries. The aim of this research was to determine the state of lower limb injuries

in football players of the Premier League of Bosnia and Herzegovina.

RESPONDENTS AND METHODS

A retrospective study was conducted. 129 professional soccer players, aged 18 to 37, who compete in the Premier League of Bosnia and Herzegovina, participated in the study. The research included injuries from 2019. Each respondent filled out a questionnaire that provided insight into previous injuries, contact or non-contact, current lower limb symptoms, use of prostheses or tapes, etc. Data were collected from the aforementioned clubs, and all lower limb injuries during the past 12 months were recorded and processed. The respondents were informed about the study in an appropriate manner and only those respondents who agreed to participate were included in the study. For this study, a convenient, non-standardized questionnaire was created, which was divided into clubs and selected groups. Respondents who are under a professional contract are included in the study. All respondents signed the consent form at the end of the questionnaire. Respondents who refused the same and possible errors in data processing by the therapist were excluded from the study.

For this study, a questionnaire was created that is not standardized but was designed for the needs of this research, related to previous injuries, contact or non-contact, current symptoms of the lower limbs, use of prostheses or tape, etc. The questionnaire was distributed to all respondents who met the criteria for inclusion in the study, and

the results were analyzed. It was explained in detail how to fill out the questionnaire and enough time was left for it, i.e. one day. After that, the completed questionnaires were collected and analyzed.

RESULTS

Table 1. Basic characteristics and assessment of the current state of football players enrolled in the study, first part (n=129).

Characteristics	N (%)
Average age (range) Years	24.4 (18-37)
18-25	57 (44.2)
25-30	39 (30.2)
≥30	33 (25.6)
Average height in cm (range)	183.6 (163-199)
Average weight in kg (range)	78.7 (60-100)
Average BMI in kg/m ² (range)	23.3 (19.8-27.7)
Dominant leg	
Left	28 (21.7)
Right	101 (78.3)
How many injuries have you had in the past year? (Number of football players who had only one injury)	74 (50)
The injury occurred on: †	
Training	48 (64.9)
Matches	26 (35.1)
The injury occurred in: ‡	
In the first half	15 (57.7)
In the second half	11 (42.3)
The surface on which you were injured: †	
Normal grass	61 (82.4)
Artificial grass	11 (14.9)
Other training surfaces	2 (2.7)
Have you renewed the injury? †	
Yes	21 (28.4)
No	53 (71.6)
Use of recovery aids	
Tape	4 (5.4)

Kinesiotape	3 (4.1)
Elastic bandage	4 (5.4)

† - Number of football players with injury, ‡ - Number of football players injured in the match

Table 1. shows that the average age of the respondents who participated in this research is 24.4 years. After the rehabilitation process, a certain number of respondents use aids in the training process: four respondents use an elastic bandage, four respondents also use tape, and three respondents use kinesio tape. Out of a total of 74 injuries reported by the respondents, 48 of them occurred during training, while 26 injuries occurred during the match. Out of the total number of injured (n=74), 21 respondents had a renewed injury, while 53 had a new injury.

Table 2. Basic characteristics and assessment of the current state of football players enrolled in the study, second part (n=129).

Characteristics	N (%)
It was about: †	
New injury	66 (89.2)
Insufficiently healed injury from previous season	8 (10.8)
Was the injury (due to a kick from an opposing football player or was he injured himself)? †	
Contact	8 (10.8)
Non-contact	66 (89.2)
Are injuries more common on the dominant leg?	
Yes	14 (18.9)
No	60 (81.1)
The part you injured: †	
Muscle	33 (44.6)
Bone	11 (14.9)
Ligament	10 (13.5)
Tendon	6 (8.1)
Joint	11 (14.9)
Other	3 (4)

Did you have surgery? †	
Yes	26 (35.1)
No	48 (64.9)
What surgery did you have: ‡	
Knee	11 (42.3)
Ankle joint	2 (7.7)
Other	13 (50)
Foreign bodies where the injury occurred: †	
Left	31 (41.9)
Right	43 (58.1)
Of the diagnostic procedures (n=88) you did:	Number of tests (%)
Magnetic resonance imaging	41 (46.6)
CT	1 (1.1)
Ultrasound	35 (39.8)
RTG	11 (12.5)

† - Number of football players with an injury, ‡ - Number of operated football players

Table 2. shows that the majority of respondents had new injuries. Only 8 out of 74 injured subjects confirmed that it was an insufficiently healed injury from the previous season. As the cause of the injury, 66 respondents stated that it was a non-contact injury, while only 8 injuries were caused by contact with an opposing respondent. It was mainly about injuries to the non-dominant leg, while only 14 respondents out of a total of 74 had an injury to the dominant leg.

Table 3. Basic characteristics and assessment of the current state of football players enrolled in the study, third part (n=129).

Characteristics	N (%)
How many days did the recovery take? †	
Under 20 days	30 (40.5)
From 20 to 40 days	21 (28.4)
Od 40 days to 3 months	7 (9.5)
More than three months	16 (21.6)
Did you have to do rehabilitation somewhere other than in the club? †	

Yes	27 (36.5)
No	47 (63.5)
In training I use: †	
Elastic bandage	4 (5.4)
Tape	4 (5.4)
Kinesiotape	3 (4.1)
Braces	2 (2.7)
None of the above	61 (82.4)

† - Number of football players with an injury

Table 3. shows the different recovery times of the injured subjects, most of them, 47 subjects, were rehabilitated in their home clubs, while 27 of them had to undergo additional treatment in other institutions.

DISCUSSION

The main purpose of this research was to find out how many injuries soccer players had in the past 12 months, during 2019. Considering that we live in a country where sports clubs are not able to allocate large funds for rehabilitation, it would be very useful to find valid tests that could help prevent injuries. This is precisely why many are turning to prevention and finding new ways to prevent a certain problem, that is, to take certain measures to prevent injuries. The too-frequent injury of football players results in the allocation of large sums of money for rehabilitation and as such represents a certain financial problem. The financial problem is not the only one, football players also face psychological difficulties resulting from injuries. Most football players go through many questions after an injury. This is where, among other things, anger, pain, and fear appear. The American Sports Medicine Association convened a panel of experts to provide an evidence-based best practice

document to assist sports medicine physicians and other members of the athlete care team in detecting, treating, and preventing mental health problems in athletes (13).

When the acute situation calms down, when the facts are looked at, then the reaction of football players can go in several directions. Some footballers direct and focus on rehabilitation, while others may worry about their position, status in the club, and finally, the financial situation, which, unfortunately, is still very important. How much we can do as individuals or as professional teams in injury prevention is the subject of several studies that have been conducted around the world. It is difficult to catch all the threads, but it would be good to minimize the possibility of injury. Through continuous research, planning, and lifelong learning and training, it should be possible to contribute to reducing the errors that occur in the preparation and training processes as much as possible. It is to be expected that in better-off countries, that is, those that invest significant financial resources in injury prevention, the results will be much better than in the environments where we live and work. Given that there are many factors that affect football players' injuries, it is necessary to record them and try to influence them part by part so that, within the limits of what is possible, we all do our best to prevent them from occurring or to the smallest extent possible. Recognizing and understanding injury risk factors is key to guiding injury-prone athletes and developing injury prevention measures (14). It is necessary to review the popular model of providing sports

medicine and scientific services to top athletes, which is based on the existing reductionist multi-specialist system, which in practice lacks an integrated approach and effective communication (15).

Dealing with an injury to a football player brings certain difficulties both for the club and for the football player himself. A football player receives a certain fee for his services. If a football player cannot help the club for a long time due to injury, the consequences will be felt by both sides. Elite soccer players strive to train and compete even when they are sick or injured. Their motivation can be internal or the result of pressure from the coach and the team (15). The financial component is very important. Clubs are also financially dependent in some way on the success of the season through sponsorship contracts in such a way that the placement determines the amount of money the club receives depending on the place in the table, exit to the Euro scene, etc... Financial rewards increase the motivation of football players for better preparation for sports performances, which is proven by better-setting performance goals and more careful psychological preparation. It seems that soccer players with higher incomes are more worried about the failure of the match, which increases their anxiety, especially since it is a cognitive part and affects their sports performance (16).

Every injury leaves certain consequences for football players, whether they want to admit it or not. In the beginning, the football players are frustrated, the people inside themselves and everyone around them. In a fit of rage, they are

ready to end their careers. The document of the American Society for Sports Medicine lists numerous mental health disorders in football players: eating disorders, depression, which in extreme cases can end in suicide, anxiety and stress, sleep disorders, attention-deficit/hyperactivity disorder, and sexual disorders (17). They bring home changes in behavior, anger, and frustration, and it often happens that quarrels break out in the family of the injured party, primarily with the spouse. The fact is that an injured athlete goes through different emotional states. It is important to allow football players to complete short-term or long-term mental training conducted by a trained sports psychologist, not only at the time of failure of the athlete but also as a preventive measure against increasing cognitive anxiety (16).

A soccer player must not feel rejected at any stage of rehabilitation, which is often the case in our region. He has to have the support of the club and he has to feel that everyone cares, that they care because they really notice. Research shows that the perception of social support has the greatest impact on the rehabilitation and well-being of injured athletes (18). Emotional and cognitive reactions of athletes after an injury, the importance of social support, the attitude of athletes towards recovery, the roles of therapists, doctors, and coaches during rehabilitation, strategies to increase adherence to rehabilitation principles, and effective communication between football players and medical professionals are extremely important (19).

The insufficient education of the football players themselves is also one of the problems we face every day. In England, research was conducted on the topic of training soccer players in the practice of injury prevention. The main gaps in awareness of injury prevention strategies among football players were identified as insufficient use of shin guards during training, inadequate nutrition before, after training, and after matches, regeneration after training and matches, and flexibility work. These shortcomings point to the need for a broader education of players about current injury prevention strategies (20). Also, training processes set by coaches and fitness trainers for soccer players are often copied from the Internet by other clubs without taking into account whether the psychophysical abilities of the soccer players are adequate to be able to follow the same programs. It should be noted that excessive and rapid increases in training load are probably responsible for a large proportion of non-contact soft tissue injuries. However, physically demanding (and appropriate) training develops physical qualities, which in turn protects against injury. This paper emphasizes the importance of monitoring the load during training, including the load for which athletes are ready (by calculating the ratio of acute to chronic load), as the best approach to the long-term reduction of training-related injuries (21).

Insufficient investment by clubs in the necessary and continuous education of the medical team, given that medicine, especially sports medicine, is constantly changing, inventing faster, more advanced methods of prevention and recovery, is

also one of the factors that can have a great impact on injuries. Research by Eyal Eliakim and colleagues shows how important it is to invest in prevention and rehabilitation. They sought to assess the effect of injuries on the performance of English Premier League (EPL) football teams and the financial implications arising from this effect. By calculating the effects of injuries on the standings, they concluded that this was reflected in the table position, and in terms of costs, they estimated that an EPL team loses an average of £45 million due to injury-related loss of performance per season. The conclusion is that professional football clubs have a strong economic incentive to invest in injury prevention and rehabilitation programs (22).

CONCLUSION

During this research, it was observed that exposure to various risk factors in soccer players can result in injuries. The research showed that more than half of the respondents had injuries on their lower limbs. Injuries can have different effects on football players, which greatly affects their quality of life. The results of this questionnaire call for a more serious approach to identifying factors that can affect injuries in both elite and recreational soccer players.

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UČESTALOST OZLJEDA DONJIH UDOVA U PROFESIONALNOM NOGOMETU, ČIMBENICI RIZIKA I POSljedICE: RETROSPEKTIVNA STUDIJA

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SAŽETAK

Uvod: Postoje mnogi čimbenici koji mogu imati utjecaja na ozljeđivanje nogometaša. Jako teško je predvidjeti sve čimbenike te je okretanje prevenciji, prikupljanju podataka o obrascima ozljeda i izrada dizajna novih strategija za prevenciju ozljeda među nogometašima od izuzetne važnosti.

Cilj: Utvrditi stanje s ozljedama donjih udova u nogometaša Premijer lige Bosne i Hercegovine

Metode: U retrospektivnoj studiji sudjelovali su profesionalni nogometaši koji se natječu u Premijer ligi Bosne i Hercegovine. Za ovu studiju svaki nogometaš ispunio je upitnik koji nije standardiziran, već je osmišljen za potrebe ovog istraživanja. Tražene su pritužbe na ozljede tijekom 2019. godine, te uvid u vrste ozljeda, načine tretiranja, korištenje ortoza, bandaža i slično.

Rezultati: Od ukupno 129 ispitanika njih 57,4 % imalo je ozljede od čega je njih 50 imalo samo jednu ozljedu. Najviše se ispitanika ozlijedilo na treningu (64,9 %), na normalnoj podlozi (82,4 %). Kod 44,6 % ispitanika radilo se o nekontaktnoj, novoj ozljedi, češće na nedominantnoj nozi, najčešće ozlijeđeni bili su mišići. Njih 26 imalo je operativni zahvat, oporavak kod većine trajao je do 40 dana.

Zaključak: Izloženost raznim čimbenicima rizika imala je za posljedicu nastanak ozljeda donjih udova kod više od polovice ispitanika.

Ključne riječi: nogomet, čimbenici ozljeđivanja, ozljede, ishod

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FREQUENCY AND CHARACTERISTICS OF STROKE IN PATIENTS HOSPITALIZED AT THE CLINIC FOR NEUROLOGY OF THE CLINICAL CENTRE OF THE UNIVERSITY OF SARAJEVO

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Received on 09.02.2023.

Reviewed on 27.02.2023.

Accepted on 08.03.2023.

ABSTRACT

Introduction: Stroke is by far the most frequent and significant neurological disease in adulthood. In transition countries such as Bosnia and Herzegovina, stroke is at the top of the mortality scale, together with heart diseases. **Objective:** Review the frequency of stroke in patients hospitalized at Clinic for Neurology, Clinical Centre of the University of Sarajevo (CCUS), to present their clinical-epidemiological characteristics, and point out to the importance of diagnostic methods and the identification of stroke risk factors. **Subjects and methods:** In this retrospective, descriptive and clinical-epidemiological study, data were collected in the period from 2013 to 2015. The study included 4258 hospitalized patients, with 1694 suffered from stroke. The study is based on the analysis of data from patients' medical histories.

Results: The prevalent type of stroke was ischemic (84.5%, in average) while the most represented was thrombotic stroke (34.6% in average). Motor deficit is the leading symptom (61%), while arterial hypertension is the most represented (80.0%) factor of risk. The patients, at the most (72.4%), are the retired persons, most commonly (17.1%) sales persons as professional occupation recorded. Ischemic CVI is more common in patients from urban areas, while in patients from rural areas it is the hemorrhagic CVI. Complete independence with lighter consequences (62.0%) is the most common post incidence outcome, while death (50.0%) is the statistically significant outcome in patients with ischemic CVI with hemorrhagic transformation. **Conclusion:** The study reveals an evident escalation in the number of stroke patients pertinent to the aging, while the younger population is not being spared either. Despite the fact that the prevention is the best approach to stroke issue, there are high frequency of risk factors present.

Key words: stroke, frequency, risk factors

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INTRODUCTION

Cerebrovascular diseases (CVD) is a name for a group of diseases that affect blood vessels of the brain or in the neck; most often the arteries, and less often veins and venous sinuses. In most cases, these diseases cause circulatory disorders that manifest in form of stroke syndrome (1). Cerebrovascular disease is the final act of long-term changes in blood vessels that began many years before the first manifestation of the disease. These blood system changes gain the momentum in person's middle age and quietly prepare the ground for the occurrence of the initial symptoms (2). Stroke is by far the most frequent and significant neurological disease in adulthood and accounts for at least 30 to 70% of all patients (3). Annually, out of a million citizens, around 2400 will suffer stroke. For about 75% of them it would be the first stroke, while the rest would be relapses of the previous one (1). In transition countries such as Bosnia and Herzegovina, stroke is at the top of the mortality scale, together with heart diseases (4). All patients with suspected acute stroke should be treated with the same priority level that is applied for patients with acute myocardial infarction or with severe trauma, regardless of severity and deficit, because it would significantly improve the prognosis of the disease outcome. Patients who come to emergency medical care unit represent the mainstream of patients who reach an adequate health facility within a three-hour window. Prompt evaluation and diagnosis are necessary, due to the fact that therapy timeslot to treat acute

ischemic stroke with thrombolytic therapy is a narrow one. It is necessary to provide general supportive care and treat acute complications. Detecting the etiology of stroke is a prerequisite for optimal treatment and the secondary prevention (1, 5). The development of diagnostic methods has made it possible to differentiate and have better understanding of the different etiopathogenetic causes of stroke, thus adapting therapy to a particular type of stroke, which includes medicinal, surgical or endovascular therapy (1). Each stroke is specific and depends on many factors, primarily the side of the brain affected, the severity of the damage, as well as the overall condition of the patient. Generally, in case of stroke, the rule of thirds applies; out of the total number of patients, approximately one-third would die immediately after a stroke, a third would be permanently disabled, thus dependent on others, and one third of the patients would recover into complete independence or possibly suffer milder consequences (6). The social and economic consequences of a stroke are an encumbrance for the patient, while for society it reflects in terms of premature death, long-term disability, and cost of care and loss of productivity (7).

A stroke causes physical, mental and emotional sufferings and in the process of recovery, in addition to the patient himself, medical team, family and friends play a special role. Diagnostic and therapeutic procedures require a multidisciplinary approach, where in everyday's work it is very important to detect and act on reducing and/or eliminating of risk factors for the

occurrence of stroke, for the purposes of primary or secondary prevention (8).

The main aim of this study was to review the frequency of stroke in patients hospitalized at Clinic for Neurology, Clinical Centre of the University of Sarajevo (CCUS) in period from 2013 to 2015, to present their clinical-epidemiological characteristics, and point out to the importance of diagnostic methods and the identification of stroke risk factors.

SUBJECTS AND METHODS

In this retrospective, descriptive and clinical-epidemiological study, data were collected from the Clinic for Neurology of the Clinical Centre of the University of Sarajevo (CCUS) in the period from 2013 to 2015. The study involved all of the hospitalized patients, 4258 in total, with 1694 patients diagnosed with stroke.

The study included: 1) all the patients hospitalized under the diagnosis of: ischemic cerebrovascular insult (ICVD); classified by type of thrombosis, embolism, thromboembolism, lacunar infarction and with hemorrhagic transformation, hemorrhagic CVI, by type of intracerebral and subarachnoid hemorrhage, and transient ischemic attacks, as well as their recurrence, 2) patients of both sexes, and 3) all patients regardless of their age (patients in this study were aged 18 to 102 years old).

The data collected for the study consist of the following parameters: prevalence, type and subtypes of stroke, gender and age of the patients, prevalence of the leading symptoms, presence of risk factors for the occurrence of stroke,

employment status and the most common type of profession, marital status, division according to residence type, frequency in relation to the season, number of days spent in hospital, the outcome, and the presence of atherosclerotic changes determined by ultrasound diagnostics performed.

The study utilized and analyzed the available data from the patient histories at the Clinic for Neurology of the CCUS, with the approval of the Clinic.

Statistical analysis

In the statistical processing of the results, standard methods of descriptive statistics have been applied. The Hi-square (χ^2) test, Fisher's (F) test and Student's (t) test have been applied to test the statistical significance of the differences between the selected variables. The statistical significance of the difference of the results was tested at the level of $p \leq 0.05$ which means that a value of $p < 0.05$ is considered as statistically significant.

RESULTS

In the observed period, the representation by type of insult is approximately at the same level, where ischemic CVI accounts for the largest number of patients (84.5%). Out of that percentage, the most represented is the one by type of thrombosis (34.6%), followed by recurrent by type of thrombosis (29.7%) and recurrent by type of embolism (14.0%). A significant statistical difference was observed in ischemic CVI by type of embolism; 14.0% in 2013 compared to 9.9% in 2014, $p=0.02$ (Table 1.).

Table 1. Total number of hospitalized patients with stroke at the Clinic for Neurology of the CCUS in the period from 2013-2015.

	2013		2014		Total	
ISCHEMIC CEREBROVASCULAR INSULT						
By type of thrombosis	240	29.7%	255	28.8%	495	29.2%
By type of embolism	71	8.8%	69	7.8%	140	8.3%
By type of thromboembolism	0	0.0%	1	0.1%	1	0.1%
By type of lacunar infarction	27	3.3%	40	4.5%	67	4.0%
With hemorrhagic component	19	2.4%	17	1.9%	36	2.1%
Recurrent by type of thrombosis	193	23.9%	233	26.3%	426	25.1%
Recurrent by type of embolism	113	14.0%	88	9.9%	201	11.9%
Recurrent by type of thromboembolism	0	0.0%	1	0.1%	1	0.1%
Recurrent by type of lacunar infarction	20	2.5%	30	3.4%	50	3.0%
Recurrent with hemorrhagic component	2	0.2%	13	1.5%	15	0.9%
Total ischemic CVI	685	84.8%	747	84.3%	1,432	84.5%
HEMORRHAGIC CEREBROVASCULAR INSULT						
Intracerebral hemorrhage	85	10.5%	86	9.7%	171	10.1%
Subarachnoid hemorrhage	4	0.5%	0	0.0%	4	0.2%
Recurrent intracerebral hemorrhage	4	0.5%	6	0.7%	10	0.6%
Total hemorrhagic CVI	93	11.5%	92	10.4%	185	10.9%
TRANSIENT ISHEMIC ATTACK						
Transient ischemic attack	28	3.5%	40	4.5%	68	4.0%
Recurrent transient ischemic attack	2	0.2%	7	0.8%	9	0.5%
Total transient ischemic attack	30	3.7%	47	5.3%	77	4.5%
TOTAL STROKE	808	100.0%	886	100.0%	1,694	100.0%

There is approximately the same total number of male and female patients affected by stroke, with a slightly larger number of female patients, thus statistically women were significantly more likely to get affected by ischemic CVI by type of embolism, 85 out of 863 or 9.8 %, $p=0.016$ (men 55 out of 831 or 6.6%), as well as by the recurrent

ischemic CVI by type of embolism, 136 out of 863 or 15.8% (men 65 out of 831 or 7.8%) while men suffered more often from ischemic thrombotic CVI with 30.9% compared to women (257 out of 831) as well as recurrent by type of thrombosis, 28.5% or 237 out of 831 (Table 2).

Table 2. Gender distribution of study population.

	Male		Female		Total	
ISCHEMIC CEREBROVASCULAR INSULT						
By type of thrombosis	257	30.9%	238	27.6%	495	
By type of embolism	55	6.6%	85	9.8%	140	
By type of thromboembolism	1	0.1%	0	0.0%	1	
By type of lacunar infarction	27	3.2%	40	4.6%	67	
With hemorrhagic component	21	2.5%	15	1.7%	36	
Recurrent by type of thrombosis	237	28.5%	189	21.9%	426	
Recurrent by type of embolism	65	7.8%	136	15.8%	201	
Recurrent by type of thromboembolism	1	0.1%	0	0.0%	1	
Recurrent by type of lacunar infarction	22	2.6%	28	3.2%	50	
Recurrent with hemorrhagic component	9	1.1%	6	0.7%	15	
Total ischemic CVI	695	83.6%	737	85.4%	1,432	
HEMORRHAGIC CEREBROVASCULAR INSULT						
Intracerebral hemorrhage	90	10.8%	81	9.4%	171	
Subarachnoid hemorrhage	1	0.1%	3	0.3%	4	
Recurrent intracerebral hemorrhage	5	0.6%	5	0.6%	10	
Total hemorrhagic CVI	96	11.6%	89	10.3%	185	
TRANSIENT ISHEMIC ATTACK						
Transient ischemic attack	35	4.2%	33	3.8%	68	
Recurrent transient ischemic attack	5	0.6%	4	0.5%	9	
Total transient ischemic attack	40	3.7%	37	4.3%	77	
TOTAL STROKE	831	100.0%	863	100.0%	1,694	

Ischemic CVI is the most represented one in all the age groups observed; in the youngest group, aged up to 45 years, the rate is 67.3%, in the middle age group (people aged 46-75) with 84.6%, and in the eldest age group, persons older than 75 years, with 85.7%. Analyzing individual types of stroke, cerebral embolism is the most common with the eldest age group (over 75 years) with 11.7% compared to the middle age group 6.4%, which is highly statistically significant ($p < 0.001$), as well as repeated cerebral embolism with 16.7% compared to the data for the middle age group, which is 9.4% ($p < 0.001$). Thrombotic

CVI is highly, statistically significantly, present with patients of the middle age group with 33.2% than in the eldest group with 22.9% ($p < 0.001$). In the youngest patients group, 12.2%, recurrent thrombotic CVI occurs statistically significantly more often than in patients of the middle age group 25.5% ($p = 0.036$), as well as lacunar infarction 14.3%, than in the middle age group 4.2%, and the oldest group 2.7% ($p = 0.0002$), as well as transient ischemic attack with 20.4%, than in elderly patients 4.5% and oldest patients 1.9% ($p < 0.001$) (Table 3).

Table 3. Age distribution of the study population.

	15-45		46-75		76-	
ISCHEMIC CEREBROVASCULAR INSULT						
By type of thrombosis	14	28.6%	337	33.2%	144	22.9%
By type of embolism	1	2.0%	65	6.4%	74	11.7%
By type of thromboembolism	0	0.0%	1	0.1%	0	0.0%
By type of lacunar infarction	7	14.3%	43	4.2%	17	2.7%
With hemorrhagic component	2	4.1%	16	1.6%	18	2.9%
Recurrent by type of thrombosis	6	12.2%	259	25.5%	161	25.6%
Recurrent by type of embolism	1	2.0%	95	9.4%	105	16.7%
Recurrent by type of thromboembolism	0	0.0%	0	0.0%	1	0.2%
Recurrent by type of lacunar infarction	2	4.1%	33	3.3%	15	2.4%
Recurrent with hemorrhagic component	0	0.0%	10	1.0%	5	0.8%
Total ischemic CVI	33	67.3%	859	84.6%	540	85.7%
HEMORRHAGIC CEREBROVASCULAR INSULT						
Intracerebral hemorrhage	5	10.2%	96	9.5%	70	11.1%
Subarachnoid hemorrhage	0	0.0%	2	0.2%	2	0.3%
Recurrent intracerebral hemorrhage	0	0.0%	5	0.5%	5	0.8%
Total hemorrhagic CVI	5	10.2%	103	10.1%	77	12.2%
TRANSIENT ISHEMIC ATTACK						
Transient ischemic attack	10	20.4%	46	4.5%	12	1.9%
Recurrent transient ischemic attack	1	2.0%	7	0.7%	1	0.2%
Total transient ischemic attack	11	22.4%	53	5.2%	13	2.1%
TOTAL STROKE	49	100.0%	1,015	100.0%	630	100.0%

Multiple symptoms of the occurrence of stroke in patients were registered, where motor deficit, with 61.0%, is the leading symptom compared to other symptoms (Table 4).

Table 4. Registered symptoms of stroke.

Type of stroke	Motor deficit	Speech disorders	Disorder of consciousness	Vertigo	Headache	Walking uncertainty	Sensory disorders	Visual disturbances	Vomiting	Nausea	General weakness	Epileptic seizure	Other symptoms
ISCHEMIC CEREBROVASCULAR INSULT													
By type of thrombosis	277	192	81	77	60	52	44	26	41	30	27	11	6
By type of embolism	114	96	18	4	8	2	1	2	3	1	5	2	1
By type of thromboembolism	0	0	1	0	0	0	0	0	0	0	0	0	0
By type of lacunar infarction	17	11	18	22	11	11	5	6	4	8	11	1	1
With hemorrhagic component	15	12	12	3	5	1	0	2	2	1	2	1	0
Recurrent by type of thrombosis	290	168	62	26	36	34	14	23	25	13	20	19	3
Recurrent by type of embolism	146	95	33	7	4	8	2	5	9	2	5	7	1
Recurrent by type of thromboembolism	1	0	0	0	0	1	0	0	0	0	0	0	0
Recurrent by type of lacunar infarction	28	9	19	11	7	6	11	4	4	3	3	1	0
Recurrent with hemorrhagic component	7	6	4	3	3	1	0	0	0	2	0	0	0
Total ischemic CVI	895	589	248	153	134	116	77	68	88	60	73	42	12
HEMORRHAGIC CEREBROVASCULAR INSULT													
Intracerebral hemorrhage	95	62	43	4	32	1	10	3	9	8	6	7	0
Subarachnoid hemorrhage	3	2	1	0	1	0	0	0	1	0	0	0	0
Recurrent intracerebral hemorrhage	5	3	3	0	0	0	0	0	1	0	1	0	0
Total hemorrhagic CVI	103	67	47	4	33	1	10	3	11	8	7	7	0
TRANSIENT ISHEMIC ATTACK													
Transient ischemic attack	31	30	11	6	10	3	14	7	4	4	1	0	2
Recurrent transient ischemic attack	5	3	2	0	1	0	3	0	0	0	0	0	0
Total transient ischemic attack	36	33	13	6	11	3	17	7	4	4	1	0	2
TOTAL STROKE	1,034	689	308	163	178	120	104	78	103	72	81	49	14

The most represented risk factor was arterial hypertension (80.0 %), which is also the most statistically significant risk factor for stroke compared to other risk factors recorded by this study ($p < 0.001$), followed by previous stroke

and/or transient ischemic attack (42.0 %), coronary disease (35.4 %), diabetes mellitus (29.9 %), heart rhythm disorder (25.6 %), dyslipidemia (20.6 %), smoking (20.1 %), cardiomyopathy (18.2 %) (Table 5).

Table 5. Stroke risk factors.

Type of stroke	Arterial hypertension	Heart rhythm disorder	Coronary disease	Cardiomyopathy	Diabetes mellitus	Smoking	Dyslipidemia	Alcohol	Previous stroke and/or TIA	Family anamnesis of stroke
ISCHEMIC CEREBROVASCULAR INSULT										
By type of thrombosis	383	45	191	85	144	127	108	14	0	5
By type of embolism	111	100	39	37	40	13	22	3	0	2
By type of thromboembolism	0	0	0	0	0	0	0	0	0	0
By type of lacunar infarction	45	12	29	6	12	12	19	1	0	2
With hemorrhagic component	28	20	18	5	12	3	6	0	0	0
Recurrent by type of thrombosis	358	62	135	73	148	104	105	11	426	8
Recurrent by type of embolism	167	141	70	62	68	25	23	2	201	6
Recurrent by type of thromboembolism	1	1	1	0	0	0	0	0	1	0
Recurrent by type of lacunar infarction	39	6	17	6	16	5	16	0	50	2
Recurrent with hemorrhagic component	17	3	9	5	9	1	4	0	15	0
Total ischemic CVI	1,149	390	509	279	449	290	303	31	693	25
HEMORRHAGIC CEREBROVASCULAR INSULT										
Intracerebral hemorrhage	148	27	58	17	40	28	21	5	0	1
Subarachnoid hemorrhage	1	0	0	1	0	0	0	0	0	0
Recurrent intracerebral hemorrhage	7	1	2	2	4	0	1	0	10	0
Total hemorrhagic CVI	156	28	60	20	44	28	22	5	10	1
TRANSIENT ISHEMIC ATTACK										
Transient ischemic attack	46	14	24	9	12	19	20	5	0	2
Recurrent transient ischemic attack	5	2	6	0	2	4	4	0	9	0
Total transient ischemic attack	51	16	30	9	14	23	24	5	9	2
TOTAL STROKE	1,356	434	599	308	507	341	349	41	712	28

The majority of patients hospitalized due to stroke are retired persons, accounting for 72.4 %, which is expected, having the pensioners as the oldest group of residents (which is the most represented with stroke suffering patients), the second most represented category are employees/ working age patients with 13.5 % of the total number of patients hospitalized due to stroke, and housewives with 11.7 % are in third place (Figure 1).

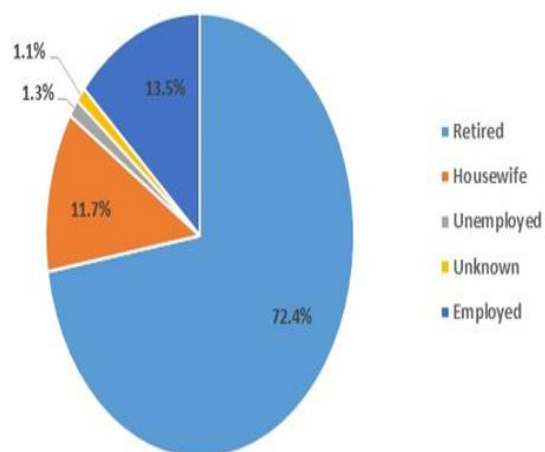


Chart 1. Employment status of the study population.

Distributed by profession, most commonly, patients affected with stroke are sales persons, accounting for 17.1 %, then drivers, making 5.7

%, and economists 5.3 %. Thrombosis and recurrent thrombosis, with 54.3 %, is the leading cause of strokes in the observed period, while patients, according to the professions and the leading cause of stroke are sales persons with 82 % and drivers with 76.9 %, statistically highly significantly affected by strokes with thrombosis and with recurrent thrombosis compared to economists in whom thrombosis participates with 25.0 % ($p < 0.001$).

The majority of the patients comes from urban areas, 85.1 % (74.6 % from Sarajevo). Patients residing in urban areas are highly, statistically significantly more represented as patients suffering from ischemic CVI than patients from rural areas (80.9 %), as well as with recurrent stroke with 26.4 % compared to patients coming from rural areas who account for 17.4 % ($p < 0.01$). Patients coming from rural areas are highly statistically significantly more represented as patients with hemorrhagic CVI 17% compared to patients from urban areas 10.0 % ($p = 0.003$), as well as patients with intracerebral hemorrhage 14.8 % compared to patients from populated areas with 9.4 % ($p = 0.011$) (Table 6).

Table 6. Structure of study population in respect to the place of residence.

Type of stroke	Rural		Urban		Unknown	
By type of thrombosis	65	28.3%	430	29.4%	6	26.1%
By type of embolism	25	10.9%	115	7.9%	3	13.0%
By type of thromboembolism	0	0.0%	1	0.1%	0	0.0%
By type of lacunar infarction	7	3.0%	60	4.1%	1	4.3%
With hemorrhagic component	6	2.6%	30	2.0%	0	0.0%
Recurrent by type of thrombosis	40	17.4%	386	26.4%	6	26.1%
Recurrent by type of embolism	28	12.2%	173	11.8%	3	13.0%
Recurrent by type of thromboembolism	1	0.4%	0	0.0%	0	0.0%
Recurrent by type of lacunar infarction	11	4.8%	39	2.7%	0	0.0%
Recurrent with hemorrhagic component	3	1.3%	12	0.8%	0	0.0%
Total ischemic CVI	186	80.9%	1,246	85.1%	19	82.6%
Intracerebral hemorrhage	34	14.8%	137	9.4%	3	13.0%
Subarachnoid hemorrhage	1	0.4%	3	0.2%	0	0.0%
Recurrent intracerebral hemorrhage	4	1.7%	6	0.4%	0	0.0%
Total hemorrhagic CVI	39	17.0%	146	10.0%	3	13.0%
Transient ischemic attack	4	1.7%	64	4.4%	1	4.3%
Recurrent transient ischemic attack	1	0.4%	8	0.5%	0	0.0%
Total transient ischemic attack	5	2.2%	72	4.9%	1	4.3%
TOTAL STROKE	230	100.0%	1,464	100.0%	23	100.0%

The incidence of stroke is almost the same for all of seasons. Ischemic CVI deviate in the spring. A statistically significant deviation was observed in the case of transient ischemic attack with an evidently significant increase in the number of patients in the spring of 2014 (18 patients)

compared to the spring of 2013 (9 patients) ($p=0.023$). In the case of intracerebral hemorrhage, as the most represented type of hemorrhagic CVI, most patients are represented in winter (Table 7).

Table 7. Frequency of stroke in the study population, in respect to the season.

Type of stroke	Spring		Summer		Autumn		Winter	
By type of thrombosis	130	29.3%	127	30.6%	103	25.5%	135	31.3%
By type of embolism	26	5.9%	38	9.2%	34	8.4%	42	9.7%
By type of thromboembolism	0	0.0%	0	0.0%	0	0.0%	1	0.2%
By type of lacunar infarction	17	3.8%	17	4.1%	15	3.7%	18	4.2%
With hemorrhagic component	7	1.6%	13	3.1%	9	2.2%	7	1.6%
Recurrent by type of thrombosis	114	25.7%	111	26.7%	118	20.2%	83	19.2%
Recurrent by type of embolism	47	10.6%	45	10.8%	54	13.4%	55	12.7%
Recurrent by type of thromboembolism	0	0.0%	0	0.0%	0	0.0%	1	0.2%
Recurrent by type of lacunar infarction	20	4.5%	3	0.7%	10	2.5%	17	3.9%
Recurrent with hemorrhagic component	2	50.0%	5	1.2%	3	0.7%	5	1.2%
Total ischemic CVI	363	81.9%	359	86.5%	346	85.6%	364	84.3%
Intracerebral hemorrhage	44	9.9%	35	8.5%	38	9.4%	54	12.5%
Subarachnoid hemorrhage	3	0.7%	0	0.0%	1	0.2%	0	0.0%
Recurrent intracerebral hemorrhage	4	0.9%	2	0.5%	3	0.7%	2	0.2%
Total hemorrhagic CVI	51	11.5%	37	8.9%	42	10.4%	55	12.7%
Transient ischemic attack	27	6.1%	15	3.6%	15	3.7%	11	2.5%
Recurrent transient ischemic attack	2	0.5%	4	1.0%	1	0.2%	2	0.5%
Total transient ischemic attack	29	6.5%	19	4.6%	16	4.0%	13	3.0%
TOTAL STROKE	443	100.0%	415	100.0%	404	100.0%	432	100.0%

The most frequent outcome of a stroke, as recorded by this study, is complete independence of the patient with milder consequences (62.0 %), the second most common outcome is death (19.3 %), while the third place ranked are the patients affected with permanent disability and dependence on others (18.9 %). According to the age, in year 2014, outcome of permanent disability and dependence on others increased for ischemic CVI (30.9 %) patients, when compared to year of 2013 (8.5 %), as well as in hemorrhagic CVI (27.2 %) when compared to 2013 (5.4 %), while the percentage of complete independence with milder consequences in patients with ischemic CVI decreased from 76.3 %, year 2013, to 51.8 % in year 2014, which is statistically significant ($p < 0.001$) and in hemorrhagic CVI from 53.8 % in 2013 to 38.0 % in 2014, which is highly statistically significant ($p < 0.001$). In case of recurrent transient ischemic attack, death occurred in 11.1 % of the cases (1 out of 9 patients), which indicates its importance (Figure 2).

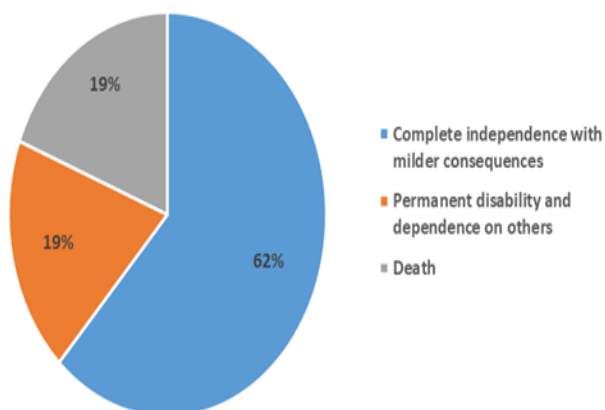


Figure 2. Outcome of stroke for the study population

A total of 27.8 % of hospitalized patients have undergone diagnostic procedures; in 35.7 % of the tested, the results were normal, while with the rest, there were atherosclerotic changes found, most prevalent with patients affected by ischemic CVI by type of embolism (76.9 %), then with patients suffering recurrent insults by type of thrombosis (71.2 %), and then the ones affected by type of thrombotic insult (69.1 %). Ischemic CVI by type of lacunar infarction was statistically significantly more common in patients with atherosclerotic changes in 2013 (71.4 %) than in 2014 ($p = 0.018$). The conducted study determines that, most commonly, it is atherosclerotic changes with stenosis up to 90 %, occlusion, and reduced values of mean blood flow velocity (MBV). The changes are most pronounced with the internal carotid arteries (ACI), in the artery vertebralis (AV), and artery basilaris (AB). As for the circle of Willis, the most commonly affected ones are the middle cerebral artery (ACM), as well as the anterior cerebral artery (ACA) and the posterior cerebral artery (ACP) (Table 8).

Table 8. Presence of atherosclerotic changes.

Type of stroke	Normal results		Presence of atherosclerotic changes		Total procedures
By type of thrombosis	56	30.9%	125	69.1%	181
By type of embolism	3	23.1%	10	76.9%	13
By type of thromboembolism	1	50.0%	1	50.0%	2
By type of lacunar infarction	24	54.5%	20	45.5%	44
With hemorrhagic component	2	50.0%	2	50.0%	4
Recurrent by type of thrombosis	30	28.8%	74	71.2%	104
Recurrent by type of embolism	6	40.0%	9	60.0%	15
Recurrent by type of thromboembolism	0	0.0%	1	100.0%	1
Recurrent by type of lacunar infarction	11	39.3%	17	60.7%	28
Recurrent with hemorrhagic component	0	0.0%	0	0.0%	0
Total ischemic CVI	133	33.9%	259	66.1%	392
Intracerebral hemorrhage	3	75.0%	1	25.0%	4
Subarachnoid hemorrhage	0	0.0%	0	0.0%	0
Recurrent intracerebral hemorrhage	0	0.0%	0	0.0%	0
Total hemorrhagic CVI	3	75.0%	1	25.0%	4
Transient ischemic attack	28	43.8%	36	56.3%	64
Recurrent transient ischemic attack	4	36.4%	7	63.6%	11
Total transient ischemic attack	32	42.7%	43	57.3%	75
TOTAL STROKE	168	35.7%	303	64.3%	471

DISCUSSION

During the study period, stroke patients accounted for 39.8% of the total number of hospitalized patients. The inflow of patients for each observed year was at approximately the same level, with an increase of 78 patients in year 2014. According to the WHO, one in six people will experience CVI during their lifetime (9). Kantardžić states that ischemic CVIs accounts for over 80.0% of all insults in Western Europe, which corresponds with the results obtained by this study, while in the countries of Eastern Europe and the Far East, hemorrhagic insults accounts for as much as 35.0% of insults, which is three times more than found by this study (6). Veličković states that the number of patients in neurological clinics (and departments) ranges from 30 to 70% of all the patients (3). Comparing the results from 1956, he sees that every 16th patient shows signs of CVI (6.2%), while nowadays this is the case with almost every third hospitalized patient (33.0%), which indicates a significant increase of the

inflow of patients with stroke during the observed period of this study, when compared to 60 years ago (3).

In the United States of America (USA), about 700,000.00 people suffer a stroke each year, with 200,000.00 are the recurrent ones. The number of people with a transient ischemic attack is estimated to be significantly higher, according to Sacco et al. (10). According to Hickey and Todd, from 2003, 87.0% of all strokes are ischemic, and 13.0% are hemorrhagic CVIs (11), which is close to the results of this study. According to Lausanne, among ischemic insults, atherothrombotic insults make up for 50-60% of all insults, embolisms of cardiac origin for 15-20%, as well as lacunar infarctions, while a small portion pertains to other causes, which is similar to the results obtained in this study, with the exception of lacunar insults (12). Dimitrijević in his study states, that in the period from 1995 to 2005, at the Clinic for Neurology of the CCUS, the group of ischemic insults shows an increase in

frequency, with it being more expressed in the subgroup of atherothrombotic strokes than for the subgroup of cerebral embolism (4).

In the observed period, the number of male and female patients with stroke did not deviate over the years, and of the total number of patients, women were affected more often (51.0%). According to Gargano's study, the number of women who experience a stroke is higher, and as the cause he states the longer life expectancy of women, as well as the fact that women are more likely to seek medical help later than men would (13, 14).

In the study sample, most patients were between the age of 46 and 75 (60.0%). It is expected that the number of stroke patients increases with age, so according to the Helsinki Young Stroke Registry, the frequency of stroke increases sharply above the age of 40, given that more variable risk factors appear (15). Veličković states that the occurrence of CVB is most common in the third age of life, but in recent times the tendency of it occurring at a younger age has been shown as well (3).

The conducted study detects multiple symptoms, where motor deficit is the leading symptom with 61.0%, followed by speech disorders, disorder of consciousness, headache and vertigo.

Arterial hypertension is the most represented risk factor (80.0%), and according to study from Germany in year 2001, it is the leading risk factor with all the types of ischemic stroke (16). Most patients were with multiple risk factors for stroke: arterial hypertension, previous stroke and/or transient ischemic attack (42.0%), coronary

disease (35.4%), diabetes mellitus (29.9%), heart rhythm disorder (25.6%), dyslipidemia (20.6%), smoking (20.1%), cardiomyopathy (18.2%). In 2008, Guiraud et al., who surveyed stroke development (registry of Dijon, France, period of 20 years), found that the number of patients with stroke and hypertension remained stable for that entire period (17), which indirectly indicates that the treatment of hypertension today is better and more efficient, but that it has not been done enough for its prevention. Atrial fibrillation is one of the most significant independent risk factors for stroke, increasing the incidence of stroke by approximately five times for the first stroke (18). Schreiber and Haberl found that one third of all ischemic strokes occurs due to cardiac embolism with atrial fibrillation, emphasizing the positive correlation between atrial fibrillation and the age, as well as a further increased risk of stroke if diabetes, hypertension or congestive heart attack are present (19).

In the literature, there is no occupation singled out and stated as a potential factor for stroke, but the occurrence of CVI is significantly influenced by certain habits that a person acquires at work or that are in the description of a given job. The largest number of patients from the sample comes from urban areas, 85.1%, and according to Veličković, the occurrence of CVB becomes significantly more frequent with urbanization, which is explained by the lengthening of human life, which results in "increased wear and tear" of blood vessels. According to Savićević et al., the frequency of occurrence of the CVB was 2.14 per thousand in urban areas and 1.40 per thousand in

suburban and rural areas (3), which is similar to findings of this study.

The incidence of stroke is almost the same in all seasons, and there are no significant differences by season. According to the observations of Veličković, the occurrence of CVB has an undulating flow of occurrence for certain areas, in certain (irregular) time intervals. There were extremely rare periods of time when CVB patients were recorded in the entire specified territory. This periodicity was more expressed during autumn, but he was unable to explain the mentioned phenomenon (3).

During the hospitalization, 62.0% of the patients experienced complete recovery with discrete symptoms, 19.3% of patients died, and 18.9% of patients suffered persistent symptoms. In Serbia, the mortality ranges up to 30.0% (2), which is much higher from findings of this study, while the study by Johnston and Weimer finds that 53.7% of patients restore functional independence, 46.3% did not restore it and/or had mild residual symptoms, while 13.9% of them ended fatally, which is very similar to the findings of this study (21, 22). Lavalley et al states that in developed countries, the death rate from stroke during the 1970s and 1980s decreased by approximately half, which emphasize the treatment of risk factors as a preventive measure (23). In most developing countries and countries in transition, there is a visible increase in the incidence of stroke (4). Bosnia and Herzegovina is certainly among the transition countries, where the leading cause of death in the Federation of Bosnia and Herzegovina observed in the period from 2010 to

2016 was stroke, which is in a slight decline in terms of mortality, and reached second place only in 2016, but it is still the leading cause of death in women (18).

Ultrasound diagnostic procedures (Color Doppler and TCD) were performed for 27.8% of the total number of hospitalized patients, of whom 35.7% of them had normal results, and the rest showed atherosclerotic changes. These changes are significant because for almost 20.0% of the patients with a thrombotic process, due to the growth of the thrombus in the proximal part, the clinical course is progressive when speaking about a developing insult. According to Meljničuk et al. three quarters of brain infarctions due to the thrombotic process are localized in the area of irrigation of the middle cerebral artery (ACM) (3).

CONCLUSION

Stroke patients account for 39.8%, which is a significant incidence indicator. An ischemic stroke is the prevailing type. Women have been affected more, suffering mostly from ischemic embolic stroke, and men predominantly from ischemic thrombotic stroke. An increase is observed in the number of patients from the oldest age group observed, however the same is observed in the younger population as well. The youngest patient was 18, and the oldest was 102 of age. The motor deficit has been recorded as the most represented neurological deficit, while the arterial hypertension stands as the most common risk factor. The majority of hospitalized patients belong to the retired category, the most common

profession of the affected is a sales person. Recurrent ischemic thrombotic stroke was predominantly found in patients from urban areas, while hemorrhagic CVI (was prevalent with the ones from rural areas. Ischemic CVI is more prevalent in spring and intracerebral hemorrhage in the winter. The majority of the patients recovered completely, with remaining discrete symptoms, while the fatal outcome was recorded as the second place outcome. The most common atherosclerotic changes are those with stenosis up to 90.0% and occlusion, with decrease in values of the mean blood flow velocity, and they are most represented with ischemic embolic CVI. Primary prevention measures are of the utmost importance, especially the identification and early initiation of treatment, as well as prompt transportation of the affected to medical facility, recognition of risk factors and their timely treatment.

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UČESTALOSTI KARAKTERISTIKE MOŽDANIH UDARA KOD OSOBA HOSPITALIZIRANIH NA KLINICI ZA NEUROLOGIJU KLINIČKOG CENTRA UNIVERZITETA U SARAJEVU

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SAŽETAK

Uvod: Moždani udar je daleko najčešća i najznačajnija neurološka bolest u odrasloj dobi. U tranzicijskim zemljama poput Bosne i Hercegovine moždani udar je među najčešćim uzrocima smrtnosti, zajedno sa srčanim bolestima.

Cilj: Prikazati učestalost moždanog udara kod pacijenata hospitaliziranih na Klinici za neurologiju Kliničkog Centra Univerziteta u Sarajevu (KCUS), prezentirati njihove kliničko-epidemiološke karakteristike, ukazati na važnost dijagnostičkih metoda i prepoznavanja riziko faktora za nastanak moždanog udara.

Metode: U ovoj retrospektivnoj, deskriptivnoj i kliničko-epidemiološkoj studiji prikupljeni su podaci u razdoblju od 2013. do 2015. godine. U studiji je sudjelovalo 4258 hospitaliziranih bolesnika, od kojih je 1694 pretrpjelo moždani udar. U istraživanju su korištene i analizirane historije bolesti pacijenata.

Rezultati: Najučestaliji tip moždanog udara bio je ishemijski (prosječno 84,5%), a najzastupljeniji onaj po tipu tromboze (34,6%). Motorni deficit je vodeći simptom (61%), dok je arterijska hipertenzija (80%) najzastupljeniji riziko faktor. Najveći broj oboljelih pripada kategoriji penzionera (72,4%), dok je najčešće zanimanje pacijenata trgovac (17,1%). Kod oboljelih koji dolaze iz urbanih mjesta stanovanja zastupljeniji je ishemijski, dok je kod onih iz ruralnih naseljenih mjesta zastupljeniji hemoragijskicerebrovaskularni inzult(CVI). Najčešći ishod je potpuna samostalnost sa lakšim posljedicama kod (62%), dok je statistički značajan smrtni ishod pacijenata ishemijskog CVI sa hemoragijskom transformacijom (50%).

Zaključak: Predmetna studija pokazuje evidentno povećanje broja oboljelih od moždanog udara sa starenjem, ali ni mlađa populacija nije pošteđena. I pored toga što je prevencija najbolji pristup moždanom udaru, učestalost faktora rizika je velika.

Ključne riječi: moždani udar, učestalost, faktori rizika

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KNOWLEDGE AND ATTITUDES ON MANDATORY VACCINATION AMONG STUDENTS OF THE FACULTY OF HEALTH STUDIES OF THE UNIVERSITY OF MOSTAR

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Received on 19.03.2023.

Reviewed on 08.04.2023.

Accepted on 29.04.2023.

ABSTRACT

Introduction: Vaccination against infectious diseases is the most effective, cost-effective, often unavoidable, or the only possible way to protect individuals and the population from infectious diseases. In the last ten years, a lack of understanding and knowledge about the benefits of vaccination has led to a decline in the number of vaccinated children and the danger of the reappearance of already eradicated infectious diseases.

Objective: To examine the knowledge and attitudes about mandatory vaccination of children among students of the Faculty of Health Studies and the Faculty of Medicine of the University of Mostar.

Respondents and methods: A cross-sectional survey was conducted, which included 150 respondents in the third and fourth year of study, 50 respondents from the Faculty of Medicine, and 100 respondents from the Nursing and Sanitary Engineering study tracks at the Faculty of Health Studies. Data were collected through a self-assessment questionnaire. **Results:** Over 90% of respondents have a positive attitude towards vaccination and would vaccinate their children. The results show that respondents form their attitudes about vaccination based on academic activities. Students with a positive attitude about vaccination also showed greater knowledge about it. Nursing students have the weakest knowledge, followed by showing a greater aversion to vaccines than other respondents. More than a quarter of respondents are convinced of the connection between autism and vaccines, and this is also the case for autoimmune diseases.

Conclusion: Although students of biomedical studies have positive attitudes about vaccination, the level of knowledge was more significant among students of the Faculty of Medicine compared to the study tracks of the Faculty of Health Studies.

Keywords: knowledge, attitudes, students, vaccination, education

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INTRODUCTION

Through systematic vaccination, which began to be implemented in the second half of the 20 century, many infectious diseases worldwide and in our country have disappeared in medical practice (1). Global vaccination coverage has stalled at 86.0%. Although the world is developing day by day, around 19.5 million children are still not sufficiently vaccinated (2). Vaccine use aims to protect the non-vaccinating population, which is achieved by high vaccination coverage and the creation of collective immunity (3). The tremendous success of vaccination is the eradication of smallpox on a global scale and poliomyelitis in Western European countries. Despite this, it is necessary to continue consistently implementing vaccination programs due to the possibility of spreading infection from countries where these diseases are still present. This fact is significant in a modern and globalized world where the high mobility of the population increases the possibility of the spread of such infectious diseases (4, 5).

In recent years, the Federation of Bosnia and Herzegovina (*FBiH*) has recorded a systematic decline in vaccination coverage below 70.0%, which increases the possibility of the appearance of infectious diseases among the population (6). There are several reasons for this: parental refusal of vaccination, non-objective contraindications, media that do not promote vaccination, intimidation of parents by individual's media appearances, but also poor education of health workers. This is also visible in Herzeg-Bosnia

County, where health professionals do not recommend vaccination, and only 13.0% of the respondents attended vaccination - related education (7). Health workers have more positive attitudes about vaccination than the general population. And the results show that the abolition of mandatory vaccination would negatively impact the population's vaccination rate (8). A study conducted in Zagreb showed an unrealistic self-assessment of knowledge related to their negative attitudes about vaccination. As many as 82.0% of participants self-initiated information about vaccination, and the source of information is most often Internet portals and forums. Poor knowledge led to the conclusion that 70.0% of respondents believed that vaccines cause, for example, autism (9). Also, the vaccination rate is falling due to the increasing distrust in the pharmaceutical industry (10). Such findings are not aligned with the results of research conducted in other European countries, which showed that parents are mostly not against vaccination and have positive attitudes about its application (11). The research conducted in Varaždin gave interesting results where 62.0% of parents believed that the media and other parents' experiences did not influence their final decision on vaccination (12). Since the lack of education is the most important factor in ignorance and making wrong decisions, it is evident that an additional effort by health professionals in education is needed (13). This paper aimed to examine the knowledge and attitudes of students of the Faculty of Health Studies and the Faculty

of Medicine in Mostar about mandatory vaccination of children.

RESPONDENTS AND METHODS

Respondents

The conducted research is a cross-sectional study on a sample of 150 respondents. The sample consisted of a test group (N=100) and a control group (N=50). The test group included students in the third and fourth year of the Faculty of Health Studies in Mostar; the study tracks Nursing (N=49) and Sanitary Engineering (N=51). The control group included students of the third (N=25) and fourth year (N=25) of the Faculty of Medicine of the University of Mostar. The research was conducted in March 2018.

Methods

Respondents participated in the research voluntarily after being informed about the purpose and goals of the research. All data were collected using an anonymous survey questionnaire, which the respondents filled out independently. Data were collected through a self-assessment questionnaire. The first part of the questionnaire was sociodemographic variables (gender, age, year of study, study track). They then followed a set of seven questions that tested the students' knowledge about vaccines, vaccination calendars, contraindications, and possible side effects. And with eight questions, opinions on the safety and benefits of vaccines used in BiH, vaccination as the most important and best method of preventing infectious diseases, views on mandatory vaccination of children, and

the quality and scope of study content on vaccination were examined.

Ethical principles

Before filling out the survey, the respondents were informed about the purpose of the research, and the collected data were used exclusively for research purposes. The research on subjects - volunteers were carried out following all applicable guidelines, the aim of which was to ensure the proper implementation and safety of the people who participated in this scientific research.

Statistical processing of the data

Collected data were processed using descriptive and inferential statistics methods. The distribution of data was processed with the Kolmogorov-Smirnov test. Quantitative parametric data are presented with the arithmetic mean and standard deviation, and quantitative non-parametric data with the median and range. Categorical variables are presented with absolute and relative frequencies. Student t-test was used to compare quantitative data between two groups. In the comparison of categorical data, the Chi-square test was used. The significance level for all tests is $p < 0.05$. The software system IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, N.Y., USA) and Microsoft Excel (version 14.0, Microsoft Corporation, Redmond, WA, USA) were used for data processing and analysis.

RESULTS

In the total sample of respondents, the female gender was statistically more significant, 112 (74.7%) compared to the male gender, 38 (25.3%) (χ^2 36,507; $df=1$; $p<0.001$). In the context of study tracks, the representation of the female gender is significant among respondents from the Nursing and Sanitary Engineering tracks ($p<0.001$).

Out of a total of 50 students of Medicine, 46 of them (92.0%) and out of a total of 51 Sanitary

Engineering students, 46 of them (90.2%), supported the mandatory vaccination program in FBiH, while among Nursing students out of a total of 50 respondents, 24 of them (49.0%) supported the mandatory vaccination program ($p<0.001$) (Table 1). The least number of those who believed that the knowledge about vaccination acquired at the faculties was sufficient were students of Sanitary Engineering, that is, 24 of them (47.1%) ($p<0.001$).

Table 1. Attitudes of respondents about vaccines and vaccination shown by study tracks.

		Medicine	Nursing	Sanitary engrg.	Total		
		N (%)	N (%)	N (%)	N (%)	χ^2	P
Recommended, not mandatory vaccine	Yes	4 (8.0)	25 (51.0)	5 (9.8)	34 (22.7)	33.423	0.001
	No	46 (92.0)	24 (49.0)	46 (90.2)	116 (77.3)		
Influence on attitudes about vaccination							
- University lectures		27 (54.0)	16 (32.7)	37 (72.5)	80 (53.3)	25.390	0.001
- professional literature and scientific databases		23 (46.0)	24 (49.0)	11 (21.6)	58 (38.7)		
- TV, magazines, newspapers		- (-)	6 (12.2)	1 (2.0)	7 (4.7)		
- Internet and social networks		- (-)	3 (6.1)	2 (3.9)	5 (3.3)		
	Yes	32 (64.0)	17 (34.7)	24 (47.1)	73 (48.7)	8.588	0.014

Vaccination knowledge adequacy	No	18 (36.0)	32 (65.3)	27 (52.9)	77 (51.3)		
Addition of study tracks	Yes	46 (92.0)	44 (89.8)	49 (96.1)	139 (92.7)	1.501	0.472
	No	4 (8.0)	5 (10.2)	2 (3.9)	11 (7.3)		
Vaccine Safety in FBiH [°]	Yes	45 (90.0)	37 (75.5)	37 (72.5)	119 (79.3)	5.338	0.069
	No	5 (10.0)	12 (24.5)	14 (27.5)	31 (20.7)		
Infect. Dis. ^{°°} prevention	Yes	49 (98.0)	42 (85.7)	49 (96.1)	140 (93.3)	6.939	0.031
	No	1 (2.0)	7 (14.3)	2 (3.9)	10 (6.7)		
Vaccination of children	Yes	50 (100.0)	46 (93.9)	49 (96.1)	145 (96.7)	2.962	0.227
	No	- (-)	3 (6.1)	2 (3.9)	5 (3.3)		
Vaccine education	Yes	50 (100.0)	43 (87.8)	51 (100.0)	144 (96.0)	12.883	0.002
	No	- (-)	6 (12.2)	- (-)	6 (4.0)		

[°]Federation of Bosnia and Herzegovina; ^{°°}Infectious Diseases

Most respondents (79.3 %) consider vaccines in FBiH to be safe. All Medicine students and Sanitary Engineering students believe that by educating people about vaccination, it is possible to reduce the anti-vaccination movement. In contrast, among Nursing students, a smaller number of respondents, six of them (12.2 %), believed that education has no effect ($p < 0.002$). There is a significant difference in the answers to the question of the effect of vaccines on the occurrence of autism and autoimmune diseases. Nursing students, 22 of them (44.9 %), consider autism as a consequence of vaccination, while

only four (8.0 %) Medicine students believe that autism is a consequence of vaccination ($p < 0.001$). Similar results were recorded regarding autoimmune diseases, where 18 (36.7 %) Nursing students considered the occurrence of autoimmune diseases to be related to vaccination. In contrast, in the group of medical students, only one student (1.0 %) associated the occurrence of these diseases with vaccination ($p < 0.001$). (Table 2).

Table 2. Analysis results of the respondents' test answers on vaccines and vaccination.

		Medicine (n=50) N (%)	Nursing (n=49) N (%)	Sanitary engrg. (n=51) N (%)	Total (n=150) N (%)	χ^2	P
Vaccination against Hepatitis B is carried out with 3 doses of the vaccine (in months)	0,1,3	7 (14.0)	13 (26.5)	6 (11.8)	26 (17.3)	6.403	0.171
	0,1,6	40 (80.0)	35 (71.4)	40 (78.4)	115 (76.7)		
	0,6	3 (6.0)	1 (2.0)	5 (9.8)	9 (6.0)		
Anaphylaxis to a vaccine ingredient is an absolute and permanent contraindication to vaccination?	Yes	28 (56.0)	26 (53.1)	35 (68.6)	89 (59.3)	2.855	0.240
	No	22 (44.0)	23 (46.9)	16 (31.4)	61 (40.7)		
A vaccine that is not included in the mandatory vaccination calendar in BiH	- (-)		4 (8.2)	2 (3.9)	6 (4.0)	9.988	0.125
	P ^{ooo}	1 (2.0)	4 (8.2)	3 (5.9)	8 (5.3)		
	D ^{ooo}	- (-)	3 (6.1)	2 (3.9)	5 (3.3)		
	G ^{ooo}	49 (98.0)	38 (77.6)	44 (86.3)	131 (87.3)		
Poliomyelitis has been eradicated worldwide.	Yes	14 (28.0)	19 (38.8)	23 (45.1)	56 (37.3)	3.220	0.200
	No	36 (72.0)	30 (61.2)	28 (54.9)	94 (62.7)		
Vaccines cause autism.	Yes	4 (8.0)	22 (44.9)	13 (25.5)	39 (26.0)	17.522	0.001
	No	46 (92.0)	27 (55.1)	38 (74.5)	111 (74.0)		
Vaccination protects the	Yes	45 (90.0)	45 (91.8)	43 (84.3)	133 (88.7)		

recipient and those who cannot be vaccinated.	No	5 (10.0)	4 (8.2)	8 (15.7)	17 (11.3)	1.540	0.463
Vaccination increases the risk of the autoimmune diseases occurrence.	Yes	1 (2.0)	18 (36.7)	9 (17.6)	28 (18.7)	19.719	0.001
	No	49 (98.0)	31 (63.3)	42 (82.4)	122 (81.3)		

^oHepatitis B; ^{oo}Poliomyelitis; ^{oooo}Diphtheria; ^{oooo}Influenza

Medicine students showed the greatest knowledge about vaccines and vaccinations, 83.7 % of them, followed by Sanitary Engineering students (75.7 %) while nursing students showed the least knowledge, where 67.7 % answered the questions correctly.

DISCUSSION

This research showed uneven attitudes and knowledge among students of biomedical study tracks at the University of Mostar. Sanitary engineering and medicine students had a positive attitude about mandatory vaccination, while nursing students' opinions were divided. In a study among Polish students, attitudes about vaccination at medical and non-medical universities differed significantly (14). Through the survey, it was determined that Polish students have significant gaps in knowledge regarding vaccination, while in Croatia, all students had a positive attitude about vaccination, which is a good result considering that all study tracks are from the biomedicine field and that their education about vaccination is at a high level (15).

A cross-sectional survey conducted on a sample of 509 students of the University of Belgrade also showed positive attitudes towards vaccination. Differences in the knowledge of the Faculty of Medicine students compared to respondents from other faculties were identified. All of the above indicates that future health workers are an essential link in future public health programs (16). Nursing students showed the slightest knowledge but also the most dissatisfaction due to insufficient education at the university, which can significantly affect attitudes about vaccination and vaccination promotion. Negative attitudes and lack of knowledge regarding vaccination among nursing students have been proven in other countries (17). A significant difference concerning gender was found in the additional expansion of vaccine and vaccination education at faculties, where women support the growth of education more than men. Educating can be done as early as adolescence because vaccine experiences (e.g., pain or education) can potentially create future attitudes toward vaccination. It may influence future vaccine

behavior, including their participation in adolescent vaccine decision-making, their decisions to vaccinate as adults, and their decisions to vaccinate their children (18). Health professionals must find the necessary information about vaccination in valid and verified sources. Students' attitudes about vaccines and vaccinations in this research were influenced mainly by lectures at the college and professional literature and scientific databases, while a smaller part of Nursing and Sanitary Engineering students mentioned other sources, such as TV, magazines, newspapers, and the Internet. The views of parents and other participants who oppose vaccination are most often based on wrong, distorted information. Therefore, the role of all health professionals in this matter is immeasurable to correct the wrong attitudes of parents and lead them towards a positive attitude toward vaccination. In a representative study, Weigel et al. found a significant correlation between doctors' attitudes toward vaccination and the vaccination rate (19). Most pediatricians in Italy support vaccination; however, targeted interventions are needed to increase parents' trust in pediatricians (20). Parents of children often equate the role of pediatricians (5.4%) and information they find on the Internet (63.8%) since they can get information from various sources and not necessarily from people who have the necessary qualifications and knowledge to inform the public about such topics (7). The students assessed the acquired knowledge at the university as insufficient for their future work, and a large percentage believed that educating the

population about the benefits of vaccination would reduce the impact of the anti-vaccination movement. 92.7% of students said they favored the expansion of vaccination study content. For example, in similar surveys, 29.0% of students from the USA and 21.0% from Canada pointed out the need for additional vaccination content at faculties (19, 20). These results imply the importance of improving education at the University of Mostar and FBiH. In this research, 26.0% of nursing students stated that the use of vaccines could cause autism, and 18.07% of them have autoimmune diseases. In a Spanish study, medical and nursing students, in more than half of the responses, believed there is a link between vaccinations and autism or even allergies (23). Also, it was shown that American adults think they know as much or more than doctors (36.0%) and scientists (34.0%) about the causes of autism, and the analysis showed that overconfidence is highest among those with a low level of knowledge about the causes of autism and among those with a high degree of acceptance of misinformation (24). This fact is particularly worrisome because health professionals play a significant role in reducing misconceptions and misinformation regarding vaccines and vaccinations, and almost half of the nursing students in our research associated vaccination with autism and were in favor of the recommended vaccination program. A study conducted among medical students at a major university in Saudi Arabia indicates a significant linear relationship between vaccination knowledge and attitudes (25). We believe that this

is also a considerable number of future healthcare professionals who could cause additional damage to children's vaccination levels due to their erroneous beliefs. This especially applies to nursing students, the most numerous staff among health professionals. Vaccination has become an extremely topical topic in recent decades due to the increase in parents who oppose it, even though they do not provide adequate arguments. Future healthcare workers should be educated in a timely and accurate manner about vaccines and vaccinations to scientifically form correct attitudes and contribute to parents' safety when deciding to vaccinate their children.

CONCLUSION

The attitudes and knowledge of the Faculty of Health Studies students are not at the adequate level of future health workers who should advocate vaccination as a safe and effective measure of prevention of infectious diseases. It is a positive fact that medical and sanitary engineering students supported vaccination more than nursing students, considering the widespread impact of these study tracks on public health. The need to strengthen educational capacities regarding biomedical courses at the University of Mostar is obvious. The introduction of courses that would deal more with communication in healthcare, evidence-based medicine, and the benefits of vaccination would contribute to a better understanding of the entire issue related to the continuity of the vaccination program in FBiH.

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ZNANJE I STAVOVI O OBVEZONOM CIJEPLJENJU MEĐU STUDENATIMA FAKULTETA ZDRAVSTVENIH STUDIJA SVEUČILIŠTA U MOSTARU

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SAŽETAK

UVOD Cijepljenje protiv zaraznih bolesti najdjelotvorniji je, najisplativiji i, nerijetko, nezaobilazni ili jedini mogući način zaštite pojedinca i stanovništva od zaraznih bolesti. Nerazumijevanje i nepoznavanje dobrobiti cijepljenja zadnjih 10 godina je dovelo do pada procijepljenosti djece te opasnosti od ponovne pojave već iskorištenih zaraznih bolesti. **CILJ** Ispitati znanje i stavove o obveznom cijepljenju djece među studentima Fakulteta zdravstvenih studija i Medicinskog fakulteta Sveučilišta u Mostaru. **ISPITANICI I METODE** Provedeno je presječno istraživanje u koje je bilo uključeno 150 ispitanika treće i četvrte godine studija, 50 ispitanika s Medicinskog fakulteta i 100 ispitanika s Fakulteta zdravstvenih studija, studij sestrinstva i sanitarnog inženjerstva. Podatci su prikupljeni putem samo-ocjenjujućeg anketnog upitnika. **REZULTATI** Preko 90 % ispitanika ima pozitivan stav prema cijepljenju te bi cijepilo svoje dijete. Rezultati pokazuju da ispitanici svoje stavove o cijepljenju stvaraju na temelju akademskih aktivnosti. Studenti koji imaju pozitivan stav o cijepljenju pokazali su i veće znanje o istom. Studenti sestrinstva imaju najslabije znanje što je praćeno činjenicom da su pokazali veću averziju prema cjepivima u odnosu na druge ispitanike. Više od četvrtine ispitanika je pozitivnog stava u povezanosti autizma sa cjepivima, što prati i stav za autoimune bolesti. **ZAKLJUČAK** Iako studenti biomedicinskih studija imaju pozitivne stavove o cijepljenju, razina znanja je bila značajnija u studenata Medicinskog fakulteta u odnosu na studijske programe Fakulteta zdravstvenih studija.

Ključne riječi: znanje, stavovi, studenti, cijepljenje, edukacija

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IMPACT OF THE COVID-19 INFECTION ON THE LIFE QUALITY

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Received on 10.01.2023.

Reviewed on 27.01.2023.

Accepted on 09.02.2023.

SUMMARY

Introduction: Due to the consequences of the COVID-19 pandemic, experts have expressed concern for psychological functioning and well-being globally, with a particular reference to life quality disorder.

Aim: To determine the connectin of recovery and the degree of life quality.

Respondents and methods: A cross-sectional survey is carried out. The sample in the research consist of persons of both sexes at the age of 18, who have recovered from the infection, reviewing more than a year since the beginning of this research. The test survey was done by 384 respondents, which was carried out from October to December 2022. It was used a questionnaire survey, designed for research purpose, consisting of socio-demographich characteristics, characteristics of COVID-19 infection and consequences of COVID-19 infection.

Results: By the comparison of established frequencies of response, confirmations of agreement and disagreement of the claims examined is established that significantly higher percentage of respondents have noticed, in their functioning after COVID-19 infection, the appearance of fatigue and muscles weakness (65,9%), significant hair loss (57,8) and higher level of symptoms of depression and anxiety (43,8%).

Conclusion: The COVID-19 pandemic has markedly influenced life quality and has affected all aspects of life and health.

Keywords: Life quality, pandemic, COVID-19, disease, consequences.

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INTRODUCTION

In the city of Wuhan, China, in December 2019 was discovered Coronavirus disease, which initiated emergency interventions globally in the public health and it was declared, worldwide, as a pandemic by World Health Organisation (WHO). The pandemic has affected more than 200 countries including their economy and global health (1). The majority of infected population has experienced mild to moderate respiratory disease, excluding the need of special treatment. Elderly patients and those with more serious disease such as cancer, diabetes, chronic disease of respiratory system were developing serious symptoms and form of disease and were hospitalised (2). The life quality, according to WHO is defined as „an individual perception of own life situation, understood in a cultural context, value system and in relation to aims, expectations and standards of the certain society (3). From such a perspective, the life quality associated with health includes fields such as psychological state, physical health, level of one's self-reliance and independence (4). Due to the consequences of pandemic COVID-19, experts have expressed concern for psychological functioning and well-being globally, with a particular reference to life quality disorder (5). By the appearance of COVID-19 our everyday life is changed-life that consists of work and study, spending one's own time, social gathering and suchlike (6). From the beginning of the expansion of the virus from China, WHO has introduced a contagion as „an infodemia”. The expression

„infodemia” is used as a neologism from the words „information” and „epidemic” and it was supposed to indicate media construction of infection and to message the world that there are no excessive risk of COVID-19 (7). The most significant implemented measure was so-called quarantine that is, forcing people to stay at home by means of curfew of various lengths (8). Because of the pandemic progression the number of newly infected people was getting higher, as well as the number of the hospitalised people, people in critical conditions persons who succumbed to infection of Corona virus and standards in the world were becoming increasingly stringent. Latest and greatest state took over-complete lockdown (9). Strict compliance with preventive measures, including wearing protective masks, frequent hand washing, surface disinfection, and above all social distancing and quarantine of infected individuals have importantly influenced locking themselves inside their homes, to be able to work or to function from home, people were dependent on the internet connection (10). During the quarantine some individuals had a higher risk of increasing a wide range of negative emotions, such as fear, rage, guilt and the feeling of losing control over their own life (11). The aim of the research was to establish the link between recovery of COVID-19 and the degree of life quality.

RESPONDENTS AND METHODS

A cross-sectional survey is carried out. The research sample includes persons of both sexes at the age of ≥ 18 , who have recovered from the infection, reviewing more than a year since the beginning of this research. The survey includes male and female respondents, persons ≥ 18 years old and a certificate of a cured COVID-19 infection reviewing a previous year and more. The survey excludes persons younger than 18, persons who did not have COVID-19 and persons who have an infection in the period leading up to a year since the beginning of this research. The survey was created using software for administration survey Google Forms, a part of free internet package Google Docs Editors. Due to the nature of research organisation an ethical licence was not mandatory for this survey. Informed consent for participants had been introduced with their rights and with the possibility of abandonment of the survey at any moment. Participating in research and filling the survey shall be considered as a signed information participant's consent. The survey does not contain collection of personal data of participants (name, last name), what means that this research is absolutely anonymously. The aim and the purpose of research, as well as approximate time needed to fill survey are mentioned in introductory part of research, as well as covering note, where participants can find the link with access to survey. The survey is divided into two parts. First part contains participant's demographic characteristic (five questions; age, sex, address,

educational and work status) and a certificate of an cured COVID-19 infection (two questions; nominal character; YES/NO and an essay question; the period of a present infection. The second part of survey refers to the presence of possible difficulties after the COVID-19 infection (8 questions). The life quality and consequences of the COVID-19 infection were tested through 16 self-created questions. The sample size is established via online programme available on the page

<https://www.openepi.com/SampleSize/SSPropor.htm>. With the assumption that 50% of the participants will have impaired life quality as a result of COVID-19 infection, 95% confidence range, 5% absolute mistake the programme has calculated that are needed total of 384 participants.

Statistical analysis

The data were processed using the methods of descriptive and inferential statistics. The normality of data distribution was performed by visual inspection of the histogram. Categorical data are presented with absolute and relative frequencies, and the comparison of the obtained frequencies was tested with the Chi-square test. Quantitative data are presented with the arithmetic mean and standard deviation, and the comparison of the obtained values was tested with the Student's t-test for independent samples. The level of significance in all measurements was $p < 0.05$. Data analysis was performed using the statistical program IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk,

NY, USA). Microsoft Excel (version 14.0, Microsoft Corporation, Redmond, WA, USA) was used to display the results.

THE RESULTS

A total of 384 respondents answered the survey, women (59.9%) outnumbered men (40.1%). The

largest percentage of respondents were between the ages of 18 and 30, with secondary education (60.1%), employed (61.1%), living in a city (57.8%). Other sociodemographic characteristics of the respondents are shown in table 1.

Table 1. Sociodemographic characteristics of respondents.

Characteristics	Total Sample	
	N	%
Sex(n=384)		
Man	154	40,1
Woman	230	59,9
Age (n=381)		
18 – 30	230	60,4
31 – 40	103	27,0
41 - 50	31	8,1
51 - 60	17	4,5
Place of residence (n=382)		
Village	161	42,1
City	221	57,9
Education (n=383)		
Elementary school	6	1,6
High school	230	60,1
Undergraduate studies	110	28,7
Graduate study	33	8,6
*The rest	4	1,0
Working status (n=383)		
Disciple/student	88	23,0
Employed	234	61,1
Unemployed	56	14,6

Pensioner

5

1,3

*Not all respondents answered all statements; Other (masters of profession, doctors of science).

Almost all respondents have recovered from the COVID-19 infection, 98.2 % of them answered yes to this test question. Overcoming the COVID-19 infection was confirmed by all men, and only 1.8 % (n=7) of the women declared that they did not have a COVID-19 infection. The respondents

mainly got over the infection of COVID 19 one year (44.5 %) and two (36.7 %), and the presence of the same infection half a year ago from the beginning of the research was confirmed by 18.8 % of the respondents Figure 1.

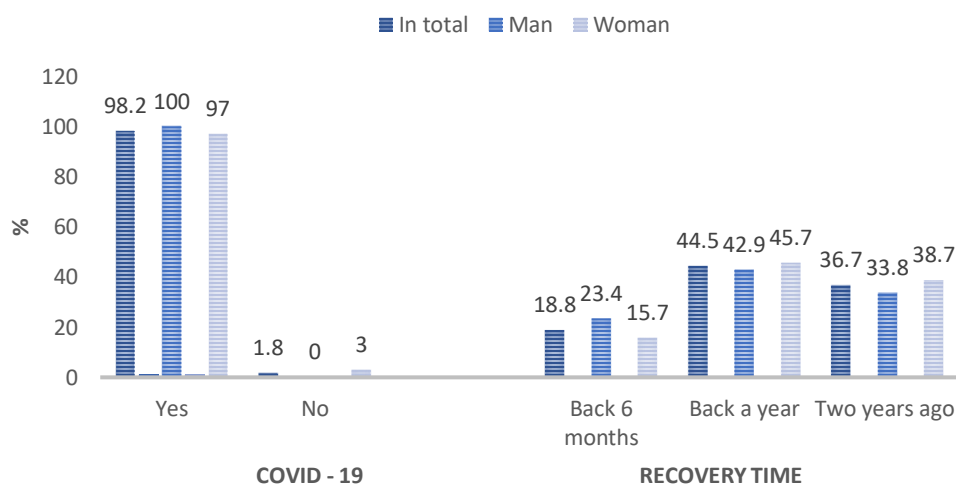


Figure 1. Representation of answers to test questions in relation to recovery from the COVID-19 infection.

The range of determined averages in the total sample in the tested claims ranged from 2.64 to 3.38; the highest average score was determined for the statement of observed more frequent occurrence of cough and headache (M=3.38, SD=1.34), and the lowest for the statement of the presence of greater fatigue and muscle weakness after COVID-19 (M=2.64, SD =1.44). On

average, women had higher scores in all examined statements compared to men. By comparing the established averages, a statistically significant difference was confirmed in most of the claims, except for the claim that they noticed increased hair loss after COVID-19 (p=0.164). The results of the Student's t-test for independent analysis are shown in Table 2.

Table 2. Average values of physical and mental quality of life assessments.

	In total	Man	Woman	t	df	p
After COVID I notice:						
1. Greater fatigue and muscle weakness	2,64±1,44	2,23±1,22	2,90±1,52	-4,54	371	<0,001
2. Sleep problems	3,05±1,40	2,73±1,33	3,22±1,40	-3,40	371	0,001
3. Increased hair loss	2,83±1,46	2,67±1,41	2,89±1,48	-1,39	371	0,164
4. Smell and taste disturbances	3,18±1,41	2,79±1,41	3,41±1,36	-4,28	371	<0,001
5. Feeling more depressed and anxious	3,21±1,33	2,92±1,33	3,39±1,30	-3,40	371	0,001
6. Problems with memory and concentration	3,04±1,36	2,64±1,34	3,25±1,32	-4,38	372	<0,001
7. Breathing difficulties (rapid breathing, shortness of breath for no reason)	3,02±1,47	2,58±1,40	3,26±1,44	-4,53	373	<0,001
8. More frequent occurrence of cough and headache	3,38±1,34	3,17±1,31	3,50±1,34	-2,36	373	0,019
t - value of the Independent Student t test; df – degrees of freedom; p – statistical significance (p<0.05)						

When we interpret the same statements on a Likert scale, it is noticeable that there are no major oscillations in the representation of affirmative and negative answers. A sufficient percentage of respondents who got over COVID-19 were reserved, that is, they neither agreed nor disagreed with the stated statements (Table 3).

Table 3. Interpretation of examined physical and mental characteristics of the subjects.

The number of respondents who confirmed that they have recovered from COVID-19 N=377					
	Totally agree	Agree	Restrained	I don't agree	Completely disagree
After COVID I notice:	N (%)	N (%)	N (%)	N (%)	N (%)
1. Greater fatigue and muscle weakness *	105 (28,2)	100 (26,8)	62 (16,6)	41 (11,0)	65 (17,4)
2. Sleep problems*	64 (17,2)	85 (22,8)	82 (22,0)	63 (16,9)	79 (21,2)
3. Increased hair loss*	97 (26,0)	78 (20,9)	70 (18,8)	59 (15,8)	69 (18,5)
4. Smell and taste disturbances*	60 (16,1)	75 (20,1)	78 (20,9)	69 (18,5)	91 (24,4)
5. Feeling more depressed and anxious *	45 (12,1)	83 (22,3)	81 (21,5)	81 (21,5)	83 (22,3)
6. problems with memory and concentration†	66 (17,6)	78 (20,9)	88 (23,5)	73 (19,5)	69 (18,4)
7. breathing difficulties (rapid breathing, shortness of breath for no reason)§	84 (22,4)	69 (18,4)	73 (19,5)	67 (17,9)	82 (21,9)
8. More frequent occurrence of cough and headaches	40 (10,7)	71 (18,9)	76 (20,3)	89 (23,7)	99 (26,4)

* 373 respondents who have recovered from COVID-19 answered the test statement;

† 374 respondents who recovered from COVID-19 answered the test statement;

§ 357 respondents who recovered from COVID-19 answered the test statement;

By comparing the established frequencies of responses confirming agreement and disagreement with the examined statements, it was determined that a significantly higher percentage of respondents in their functioning after COVID-19 noticed the appearance of greater fatigue and muscle weakness, more significant hair loss, a greater level of symptoms of depression and anxiety, and the appearance of

more frequent coughing attacks and headaches. In the other statements, there was no significant difference in the negative answers with which the respondents evaluated the observed changes in physical and mental characteristics in everyday functioning. The determined frequencies and the results of the Chi-square test analysis are shown in Table 4.

Table 4. Results of the analysis of the determined frequencies of agreement and disagreement with the presence of consequences.

After COVID I notice*:	I Agree N (%)	I don't agree N (%)	χ^2	df	p
1. Greater fatigue and muscle weakness	205 (65,9)	106 (34,1)	30,39	1	<0,001
2. Sleep problems	149 (51,2)	142 (48,8)	0,003	1	0,954
3. Increased hair loss	175 (57,8)	128 (42,2)	5,44	1	0,020
4. Smell and taste disturbances	135 (45,8)	160 (54,2)	2,98	1	0,084
5. Feeling more depressed and anxious	128 (43,8)	164 (56,2)	5,37	1	0,020
6. Problems with memory and concentration †	144 (50,3)	142 (49,7)	0,055	1	0,815
7. Breathing difficulties (rapid breathing, shortness for no reason)§	153 (50,7)	149 (49,3)	0,013	1	0,909
8. More frequent occurrence of cough and headache§	111 (37,1)	188 (62,9)	21,05	1	<0,001

* Answer Restrained excluded from the analysis

DISCUSSION

In addition to the significant impact on health systems around the world, the COVID-19 pandemic has also strongly influenced the lifestyle and habits of the population (12). In order to contain the spread of the virus, the whole world was affected by strict infection prevention measures, which included increased care for hygiene and mandatory wearing of protective masks, maintenance of social distance, then lockdown or partial closures (13). The feeling of insecurity due to the uncertainty of the pandemic situation as well as the described measures to prevent the spread of the virus had a negative impact on the mental health of the population, but also caused economic problems and further damaged the mental health and habits of the population (14). The seriousness of the disease, insecurity, unpredictability, social isolation and financial difficulties, according to Ravi Philip's research, are some of the main factors that contribute to the negative impact of the pandemic on mental health (15). Research conducted in Spain shows that approximately 43% of patients treated in an intensive care unit develop depression and post-traumatic stress (16). Previous studies have indicated that the massiveness, uncertainty and low predictability of the coronavirus, along with restrictive protection measures, in addition to threats to physical health, represent significant threats to mental health, causing negative cognitive assessments and emotions, as well as more frequent occurrence or worsening of psychopathological symptoms (17).

Measures to prevent the spread of the virus result in frequent and long-term stays in closed spaces, isolation, reduced physical activity, as well as problems with food procurement, which can affect eating habits and generally significantly change the lifestyle of the population (18). After two months of the declaration of quarantine, a descriptive survey of an average of 279 Moroccan citizens was conducted, which shows the results of the COVID-19 epidemic. The data was collected through a questionnaire distributed on the Internet, and a short-form health survey (SF-12) was used as a determinant of the quality of life, which shows the results of the COVID epidemic. – 19 (19). The participants who took part in the research conducted in Morocco provided their sociodemographic data and their knowledge regarding the COVID-19 pandemic and whether they had chronic health problems. The quality of life of all participants was moderately impaired during the COVID-19 pandemic with a mental health score of 34.49 (\pm 6.44) and a physical health score of 36.10 (\pm 5.82). Participants with chronic diseases scored lower with 29.28 (\pm 1.23) in mental health and 32.51 (\pm 7.14) in physical health (20). Through this survey, it was shown that after COVID-19, 43.8% of respondents have feelings of depression and anxiety, 50.3% of respondents have problems with attention and concentration, and greater fatigue and muscle weakness were confirmed by 65.9% of respondents. While research data from Denmark confirm that the quality of life of respondents is impaired due to the increased concern of the general population due to financial

conditions and the consequences of the pandemic on the emotional state of individuals, through this research was shown that isolation and closure from the rest of the world was confirmed by 85.6% of respondents, women expressed a higher percentage of agreement that social distance impaired the normal functioning of life compared to men ($X^2(1) = 21.10; p < 0.001$) (21). In a study conducted by the Faculty of Philosophy of the University of Zagreb, the researchers came to the conclusion that during the pandemic and lockdown, children missed friends and their peers, family and spending time in nature the most (22). Research in Italy found that among all respondents there were 67.2% non-smokers and 32.8% smokers, with 5.6% of smokers smoking more during the COVID-19 pandemic, 23.5% of smokers smoking the same before pandemic, while 3.7% of smokers smoked fewer cigarettes than before the pandemic (23). People feeling insecure and anxious during big changes in their environment. In outbreaks of infectious diseases when the cause and outcome of the disease are unclear, there is an increased level of anxiety and fear among members of society (24). An Australian study from 2020 found that social, work and financial disruptions caused by the COVID-19 epidemic are associated with significant damage to community mental health (25).

CONCLUSION

The COVID-19 pandemic has had consequences on all aspects of life and health. The consequences

that remain affect humanity both physically and psychologically. The conducted research is in support of numerous researches that have been conducted on similar topics. It was confirmed that among the respondents, the normal functioning of life was impaired, which was reflected in a number of physical and psychological consequences. Thus, we have proven difficulties with breathing, fatigue, muscle weakness, as well as difficulties with memory and concentration, symptoms of depression and anxiety. All of the above confirms the fact that the COVID-19 pandemic has significantly affected the quality of life, and has reduced it.

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UTJECAJ PANDEMIJE COVID-19 NA KVALITETU ŽIVOTA

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SAŽETAK

Uvod: Zbog posljedica pandemije COVID – 19 stručnjaci za mentalno zdravlje izrazili su zabrinutost za psihološko funkcioniranje i dobrobit zajednice u cijelom svijetu s posebnim osvrtom na poremećaj kvalitete života.

Cilj: Utvrditi povezanost preboljenja COVID-19 i stupanj kvalitete života.

Ispitanici i metode: Provedeno je presječno online istraživanje. Uzorak u istraživanju čine osobe oba spola, životne dobi ≥ 18 godina koje su preboljele COVID-19 infekciju unatrag godinu i više od početka ovog istraživanja. Na ispitnu anketu odgovorilo je 384 ispitanika, a istraživanje je provedeno od listopada do prosinca 2022. godine. Korišten je anketni upitnik osmišljen u svrhu istraživanja, koji se sastojao od sociodemografskih obilježja, obilježja COVID – 19 infekcije i posljedica COVID - 19 infekcije.

Rezultati: Usporedbom utvrđenih frekvencija odgovora potvrde suglasnosti i nesuglasnosti sa ispitivanim tvrdnjama utvrđeno je da je značajno veći postotak ispitanika u svom funkcioniranju nakon COVID - 19 opazio pojavu većeg umora i slabosti mišića (65,9 %), značajnije opadanje kose (57,8 %) i veću razinu simptoma depresivnosti i anksioznosti (43,8 %).

Zaključak: Pandemija COVID-19 izrazito je utjecala na kvalitetu života i ostavila je posljedice na sve aspekte života i zdravlja.

Ključne riječi: kvaliteta života, pandemija, COVID-19, bolest, posljedice.

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PERSISTENT PNEUMOTHORAX IN A PREMATURE INFANT

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Received on 12.03.2023.

Reviewed on 27.03.2023.

Accepted on 08.04.2023.

ABSTRACT

Introduction: Pneumothorax is a condition in which the air is present in the pleural space with a collapse of the ipsilateral lung. Spontaneous pneumothorax is divided into primary and secondary. Primary pneumothorax makes 80% of all pneumothoraxes and there are no pathological changes present in the lungs. Secondary pneumothorax is a condition in which there is a lung disease in the background. A rare cause of secondary pneumothorax in premature infants is a bronchopleural fistula, which is a pathological communication between the bronchi and the pleural space.

Objective: Indicate the need for early diagnosis and evaluation of secondary pneumothorax in order to carry out the early optimal treatment of the patient.

Case report: Male premature infant, born from a high-risk pregnancy, gestational age of 31+6/7 weeks, low birth weight, presented with respiratory failure due to the respiratory distress syndrome, and persistent pneumothorax with the accompanying ventilation difficulties. Given the relapsing nature of the disease and limited compensatory mechanisms in premature neonates, a thoracotomy was indicated and a bronchopleural fistula of the upper section of the right lung was verified. The congenital pathological communication between the bronchi and pleural space was corrected by surgical procedure. The procedure went well same as the postoperative recovery on the department.

Conclusion: Congenital bronchopleural fistulas are rare and big issue in premature neonates. Clinical sign, suggesting a bronchopleural fistula, is a persistent and relapsing pneumothorax, which - if left untreated - would lead to the obstructive shock and heart failure due to the collapse of the compensatory mechanisms. Rapid diagnostic and therapeutic approach is important for having a good outcome for our patients.

Key words: persistent pneumothorax, bronchopleural fistula, secondary pneumothorax, premature infant.

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INTRODUCTION

Spontaneous pneumothorax is divided into primary and secondary. Primary pneumothorax makes 80% of all pneumothoraxes and there are no pathological changes present here in the lungs. Secondary pneumothorax is a condition in which the etiologic causes of pneumothorax (1, 2) may be established by X-ray methods. At the neonatal age, the secondary pneumothorax most often appears as the complication of the respiratory distress syndrome, aspiration of meconium or congenital malformations, which is deteriorated by mechanical ventilation (3). Persistent pneumothorax is a rare and demanding condition in neonatology, often followed by high mortality and morbidity rate. Permanent air leak to thoracic drain suggests the existence of bronchopleural fistula. Bronchopleural fistula is a pathological connection, assuring the communication between bronchi and pleural space with permanent air leak for more than 48 hours after having the thoracic drainage placed (4). Since the persistent pneumothorax is a rare clinical event in the neonatal age, the uniform therapeutic guidelines have not been agreed and defined yet in the management and evaluation of the premature infants with bronchopleural fistula.

CASE REPORT

Male premature infant, gestational age of 31+6/7 weeks, low birth weight of 1890 grams, admitted at the Department of Intensive Paediatric Treatment immediately after the urgent birth-delivery by Caesarean section due to the

hypertensive crisis of a mother. The child was born from the third pregnancy, complicated by hypertension, pneumonia, machine ventilation and Langerhans histiocytosis of the mother. At admission, the child was breathing independently with moderate respiratory efforts and initial signs of the respiratory insufficiency. Oxygen therapy was applied via nasal prongs, but the respiratory insufficiency prograded with respiratory acidosis and hypercapnia. The X-ray images verified the changes in the lungs in terms of the respiratory distress syndrome. A surfactant was applied by endotracheal airway and a non-invasive machine ventilation was started by biphasic positive airway pressure in lungs (BiPAP). A mixed acidosis persisted in the acid-base status of blood. Dobutamine was introduced in the therapy with empirical antibiotics prophylaxis (ampicillin, amikacin, ceftazidime). The patient was given vitamin K and the parenteral feeding was started with small volumes of enteral nutrition. Ultrasound examination of brain detected the intracranial haemorrhage of the 3rd degree, which additionally aggravated the already complicated hospital course. On the second day of the child's life, the respiratory function deteriorated, the patient was analgosedated and intubated and the child started breathing via invasive machine. The X-ray diagnostics confirmed the displaced shadow of cardio mediastinum on the left side and suspected pneumomediastinum along with the previously described changes in the lung parenchyma. Laboratory tests recorded the increase of inflammatory parameters and signs of the early perinatal infection. Antibiotic therapy

was corrected based on the received microbiological test results and meropenem was included. The following days of the child's stay were characterised by difficulties with ventilation and verification of the right-side of the pneumothorax. The paediatric surgeons were consulted and the intrathoracic drain was placed in the right pleural space. Despite the aforementioned, the drainage of the pneumothorax was insufficient and aggravated and the keeping of oxygenation was aggravated as well, which led to the multiple drainage of the right chest, with no success unfortunately. It was agreed to connect the patient to the thoracic pump with negative pressure, whereupon a short-term apparent improvement occurred in clinical features. By obstruction of the drain, few days later the discomfort difficulties repeated. Computed tomography of lungs (MSCT) confirmed the existence of the pneumothorax on the right side with cystic expansion of bronchi on peripheral side in the medium and lower field of the lung. With regard to the relapsing pneumothorax and the impossibility of achieving the re-expansion of lungs, the thoracotomy was indicated in the surgery facilities of the Paediatric Surgery Clinic of the University Clinical Hospital Mostar (UCH).

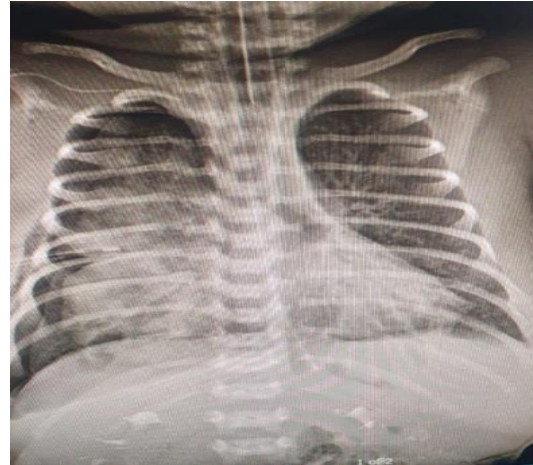


Image 1. The X-ray image shows the respiratory distress syndrome (RDS) and pneumothorax in the 2nd day of life with visible shadows of tube, intrathoracic drain and central venous catheter on the right side.

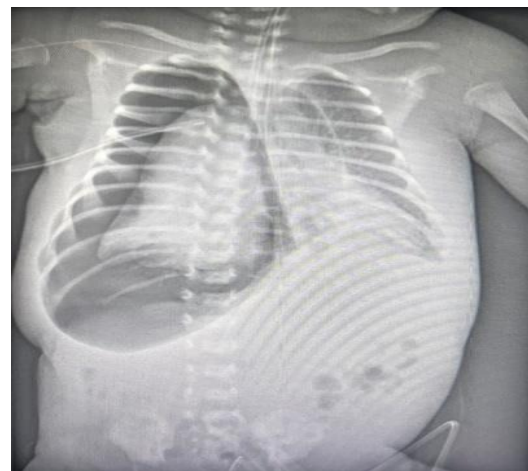


Image 2. The X-ray image shows the persistent right pneumothorax during the stay.

A surgery was carried out under general endotracheal anaesthesia. During the surgery, the decortication was carried out and major bronchopleural fistula sutured at the upper right section of the lungs. The surgery went well. An intrathoracic drain was placed and the wound was stitched up per layers. The patient was returned to

the Department of Intensive Paediatric Treatment after surgery, where a favourable post-surgical course took place with gradual separation from the machine ventilation and removing the intrathoracic drain out on the fifth day post-surgery. Further recovery went normally, the patient had a normal clinical and laboratory status and was achieving a good progress in weight. The child was discharged from hospital for home care after two months of hospital treatment.

DISCUSSION

A persisting pneumothorax represents a great challenge in therapeutic approach and according to the literature, several therapy solutions have been tried so far. The treatment with insertion of thoracic drain was most often carried out, but it was also tried with selective bronchial occlusion, pleurodesis with talc, tetracyclines and fibrin glue (4, 5). For newborn children a flexible drain of 6 - 8 French was used for drainage, and in about 25 % of premature infants the complications were recorded during the drainage in the form of the obstruction of catheter, rupture of drains, extraction and failed drainage (6). In case of the persistent pneumothorax, the clinical features of respiratory distress were developed, and in acid-base status of blood the hypoxia was always with the test result of hypercapnia, which finally led to the respiratory insufficiency and severe global hypoxia (7, 8). All modes of treatment had the same purpose and it is the re-expansion of lungs and setting up of normal ventilation. In cases, when in addition to active

suction, the pneumothorax would persist for more than 48 hours, some authors had good experience with pleurodesis. The premature infants with small birth weight are a special challenge in treatment because in this population urgent surgery was often indicated in case of a bad response to multi-drainage insertions. Our patient was one of such cases. Although such cases of treatment are described, the routine use of fibrin glue is not recommended in the treatment of bronchopleural fistula because of the side-effects, because it causes bradycardia, hypercalcemia, diaphragmatic paralysis, and counter-lateral pneumothorax. Fibrin glue was indicated only in case of absence at conventional treatment (5). Chemical pleurodesis seems to be more likely the option for treatment of this condition in adults. Our patient was treated by insertion of intrathoracic drains and light suction of pneumothorax via thoracic pump (10-15 cm H₂O). Because of the bad response to that therapy attempt and repeated development of pneumothorax, the thoracotomy was carried out as well as the saturation of bronchopleural fistula, after which the clinical condition significantly improved. Since it is about the clinical rarity at the neonatal age, especially at the premature infants, a few isolated clinical experiences are available in the literature, and the therapy solutions were mainly reduced down to the insertions of multiple thoracic drains along with a slow suction of air via thoracic pump (10-15 cm H₂O) (4).

CONCLUSION

Pneumothorax is a known entity in the neonatal age, especially in patients with machine-induced breathing. However, the congenital bronchopleural fistulae are rare and represent a great problem at this age. A clinical sign, suggesting the bronchopleural fistula, is a persistent and relapsing pneumothorax, which if not treated - leads to the obstruction shock and heart failure due to the collapse of the compensatory mechanisms. Timely determination of an accurate diagnosis and fast surgical intervention are extremely important in the treatment of these congenital malformations of the respiratory system. Thanks to the good surgical – paediatric approach, our patient had a favourable treatment outcome.

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PERZISTENTNI PNEUMOTORAKS KOD NEDONOŠČETA

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SAŽETAK

Uvod: Pneumotoraks je stanje u kojem je prisutan zrak u pleuralnom prostoru s kolapsom ipsilateralnog plućnog krila. Spontani pneumotoraks se dijeli na primarni i sekundarni. U primarni spada 80% svih pneumotoraksa i kod njih nema patoloških promjena u plućima. Sekundarni pneumotoraks je stanje u kojem se radiološkim metodama mogu utvrditi etiološki uzroci nastanka pneumotoraksa, dakle pneumotoraks u podlozi ima plućnu bolest. Rijedak uzrok sekundarnog pneumotoraksa u nedonoščadi je bronhopleuralna fistula koja označava patološku komunikaciju između bronha i pleuralnog prostora.

Cilj rada: Ukazati na potrebu za ranom dijagnozom i evaluacijom sekundarnog pneumotoraksa kako bi se što ranije proveo optimalan terapijski tretman pacijenta.

Prikaz slučaja: Radi se o muškom nedonoščetu, rođenom iz komplicirane trudnoće, gestacijske dobi 31+6/7 tjedana, niske porođajne mase koje se prezentiralo kliničkom slikom respiracijskog zatajenja uslijed respiratornog distress sindroma i perzistentnog pneumotoraksa s pratećim poteškoćama ventilacije. Obzirom na recidivirajuću prirodu bolesti i ograničene kompenzacijske mehanizme nedonoščeta indicirana je torakotomija te verificirana bronhopleuralna fistula gornjeg režnja desnog plućnog krila. Operativnim zahvatom korigirana je prirođena patološka veza između bronha i pleuralne šupljine. Tijek operacije protekao je uredno kao i daljnji postoperativni tijek na odjelu.

Zaključak: Bronhopleuralne fistule su rijetke kongenitalne malformacije i veliki problem kod nedonoščadi.

Klinički znak koji je sugerirao na istu je perzistentni i recidivirajući pneumotoraks koji bi bez liječenja rezultirao opstruktivnim šokom i srčanim zastojem uslijed sloma kompenzacijskih mehanizama. Za dobar ishod našeg pacijenta ključan je bio pravodoban dijagnostičko terapijski pristup.

Ključne riječi: perzistentni pneumotoraks, bronhopleuralna fistula, sekundarni pneumotoraks, nedonošče.

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