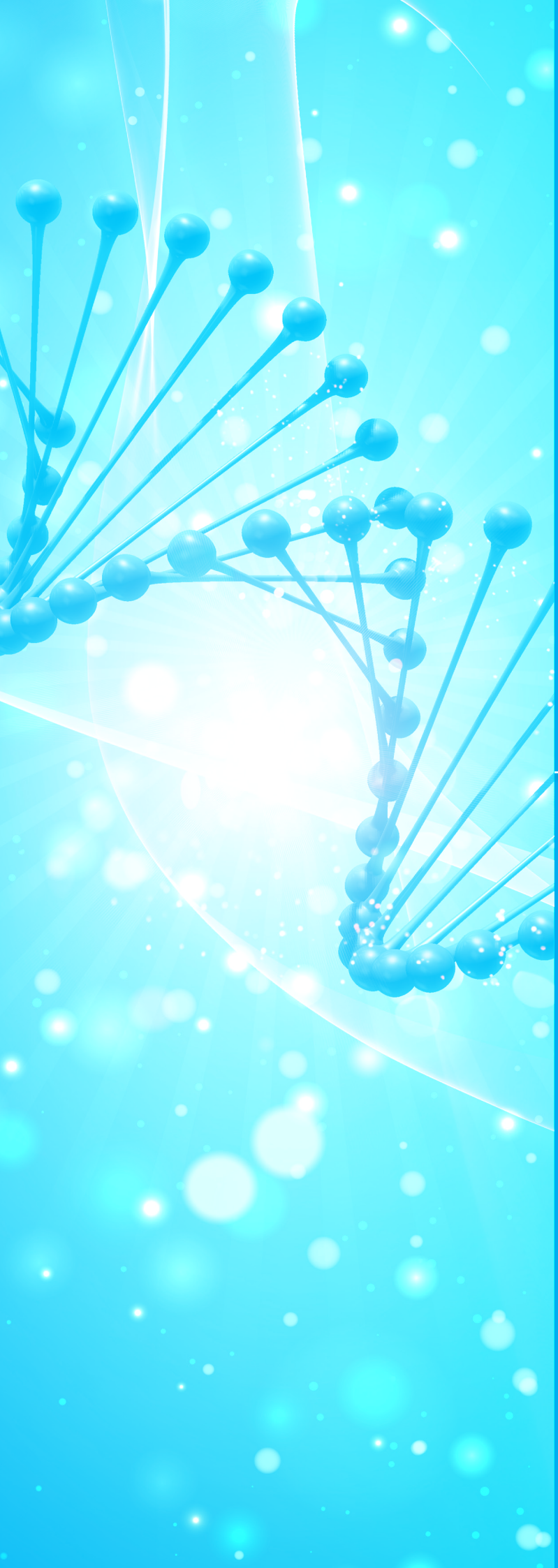

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STAVOVI SUDENATA ZDRAVSTVENE NEGE O PRAĆENJU VITALNIH ZNAKOVA PACIJENATA

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SAŽETAK

Uvod/Cilj: Podaci o stavovima studenata sestrinstva prema praćenju vitalnih znakova pacijenata su insuficijentni. Cilj ove studije je bio da se ispitaju stavovi studenata o praćenju vitalnih znakova pacijenata.
Metode: Istraživanje je sprovedeno u vidu studije preseka anketiranjem 193 studenta Osnovnih akademskih studija zdravstvene nege i Osnovnih strukovnih studija zdravstvene nege na Medicinskom fakultetu u Novom Sadu. Za prikupljanje podataka korišćen je opšti upitnik i V-skala.
Rezultati: Stav većine studenata zdravstvene nege (88,6%) o praćenju vitalnih znakova pacijenata Medicinskog fakulteta u Novom Sadu, prema ukupnom skoru V-skale, je bio ambivalentan. Najveći broj studenta (91,7%) je iskazalo pozitivan stav prema tvrdnjama vezanim za praćenje vitalnih znakova pacijenata u domenu „komunikacija“, ambivalentan u domenu „tehnologija“ (61,1%) i negativan u domenu „ključni indikatori“ (28,0%). Analiza stava studenata o praćenju vitalnih znakova pacijenata u odnosu na pol je pokazala da značajna razlika postoji samo u domenu „komunikacija“. Vrednost prosečnog skora u domenu „komunikacija“ je bila značajno niža među muškarcima (4,04±0,75) nego među ženama (4,37±0,67). Studenti koji su završili stručnu srednju školu imali su značajno više vrednosti prosečnog skora u domenu „znanje“ (3,44±0,72) nego studenti koji su prethodno završili gimnaziju ili neku drugu školu (3,13±0,86), ali značajna razlika nije dobijena za druge domene V-skale. Studenti starijih godina, u odnosu na studente prve godine, su imali značajno niže vrednosti prosečnog skora u domenu „komunikacija“ i domenu „znanje“.
Zaključak: Dobijeni rezultati našeg istraživanja, pored naučnog, imaju i stručni značaj, jer se na osnovu njih mogu kreirati pedagoške implikacije, kao osnova za unapređenje postojećih nastavnih sadržaja kliničkih vežbi na studijama zdravstvene nege.

Ključne reči: studenti sestrinstva, vitalni znaci, stavovi

Uvod

Vitalni znaci su jedan od važnih indikatora zdravstvenog stanja pacijenta koji daju informacije o funkcionisanju različitih sistema organa, kao što su respiratorni, kardiovaskularni, endokrini i nervni sistem (1).

Svaka promena vitalnih znakova je preteča promena u funkcijama organizma, gde neadekvatna procena vitalnih znakova predstavlja propuštenu priliku da se otkrije kliničko pogoršanje stanja pacijenta (2). Merenje, procena i beleženje vitalnih znakova spada u bazične kliničke veštine medicinskih sestara (1,3). S obzirom na to da se promene u opštem stanju pacijenata odražavaju na vitalne znake, odgovornost studenata zdravstvene nege je da zna i sprovede odgovarajuće postupke za novonastale promene.

Literaturni podaci ukazuju na nekoliko izazova u vezi sa vitalnim znacima i drugim metodama fizičke procene pacijenata koje su sprovodili studenti zdravstvene nege (4). Tako je studija sprovedena u Južnoj Africi (5) pokazala da studenti zdravstvene nege imaju poteškoća da identifikuju rane znake pogoršanja stanja pacijenata na osnovu procenjenih vitalnih znakova. Rezultati prethod-

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NURSING STUDENTS` ATTITUDES TOWARDS MONITORING PATIENTS' VITAL SIGNS

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SUMMARY

Introduction/Aim: Data on the attitudes of nursing students towards the monitoring of patients' vital signs are insufficient. The aim of this study was to examine the attitudes of students towards the monitoring of patients' vital signs.
Methods: The research was conducted as a cross-sectional study, by surveying 193 students of Undergraduate Academic Studies in Nursing and Undergraduate Applied Studies in Nursing at the Faculty of Medicine in Novi Sad. The data were collected using the general questionnaire and V-scale.
Results: The attitude of the majority of nursing students (88.6%) regarding the monitoring of patients' vital signs at the Faculty of Medicine in Novi Sad, according to the total score of V-scale, was ambivalent. The largest number of students (91.7%) expressed a positive attitude towards the statements in the domain of communications, ambivalent in the domain of technologies (61.1%), and negative in the domain of key indicators (28.0%). The analysis of students' attitudes towards vital signs monitoring in relation to gender showed a significant difference in the domain of communication. The value of the average score in the domain of communication was significantly lower in men (4.04±0.75) than in women (4.37±0.67). Students who had completed vocational secondary school had significantly higher values of average score in the domain of knowledge (3.44±0.72) in comparison to students who had previously completed high school or some other school (3.13±0.86), but the significant difference was not obtained for the other domains of V-scale. The students of final years in comparison to first-year students had significantly lower values of average score in the domains of communication and knowledge.
Conclusion: The obtained results of our study, in addition to the scientific one, also have professional significance, because pedagogical implications can be created based on them, as a basis for improving the existing content of clinical training in nursing studies.

Key words: nursing students, vital signs, attitudes

Introduction

Vital signs present one of the important indicators of patient's health condition, and they provide information about the functioning of various systems of organs, such as the respiratory, cardiovascular, endocrine and nervous system (1).

Every change in vital signs is a precursor of changes in the body's functions, where the inadequate assessment of vital signs represents a missed chance to detect the clinical worsening of the patient's condition (2). Measuring, assessing and recording vital signs represents a basic clinical skill of nurses (1,3). Given that changes in the general condition of patients affect vital signs, it is the responsibility of nursing students to know and implement appropriate procedures in case of new changes.

Literature data indicate several challenges in relation to vital signs and other methods of physical assessment of patients, which were conducted by nursing students (4). Thus, a study conducted in South Africa (5) showed that nursing students had difficulty identifying the early signs of deterioration in patients, based on the vital signs which they assessed. The results of the

no navedenog istraživanja pokazuju i da studenti često odlažu prijavljivanje promene u vitalnim znacima zdravstvenim radnicima. Studenti su identifikovali i više prepreka pri monitoringu vitalnih znakova. Kao prepreke naveli su da se merenje vitalnih znakova vrši samo kada se zdravstveno stanje pacijenta pogorša, nedostatak vremena, nedostatak poverenja u obavljanje procene i prekide tokom procene (6).

Prema rezultatima studije sprovedene u Australiji, studenti zdravstvene nege često nisu spremni da sprovedu osnovne zadatke u vezi sa procenom zdravstvenog stanja pacijenata uprkos adekvatnoj pripremi tokom studiranja, a izjasnili su se i da imaju poteškoće da znanje iz učionice primene u kliničkoj praksi, posebno kada je u pitanju procena kliničkog pogoršanja zdravstvenog stanja pacijenta (7).

Skoro polovina studenata zdravstvene nege uključena u istraživanje sprovedeno u Saudijskoj Arabiji (4), izjasnila se da ima neadekvatno znanje o praćenju vitalnih znakova pacijenata u kliničkom okruženju, a više od polovine njih je bilo ambivalentno ili je imalo negativan stav o svojim sposobnostima povezivanja praćenja vitalnih znakova sa bolestima pacijenata. Utvrđena je i razlika u stavovima studenata zdravstvene nege u odnosu na pol i godinu studija. Studenti zdravstvene nege muškog pola iskazali su pozitivniji stav prema domenima „tehnologija“ i „ključni indikatori“ u odnosu na studente ženskog pola. Suprotno tome, studentkinje zdravstvene nege su u domenu „komunikacija“ iskazale pozitivniji stav u odnosu na studente muškog pola. Studenti druge godine iskazali su negativniji stav prema tvrdnjama u domenu „tehnologija“ u odnosu na studente treće i četvrte godine. Suprotno tome, studenti zdravstvene nege druge godine imalu su pozitivnije stavove u domenu „komunikacija“ u odnosu na studente treće i četvrte godine. Takođe, studenti druge godine iskazali su pozitivniji stav i u domenu „radne obaveze“ u odnosu na studenata četvrte godine (4).

Smatra se da nivo znanja studenata zdravstvene nege o vitalnim znacima utiče na njihove veštine i stav. U literaturi se navodi da medicinske sestre ne mere i ne beleže dosledno vitalne znake i zanemaruju praćenje vitalnih znakova pacijenata iz različitih razloga (stava medicinskih sestara da je praćenje frekvencije disanja nešto što oduzima vreme, prisustva prekida tokom procene, male važnosti koja se pridaje proceni vitalnih znakova) (3,8). S obzirom na prethodno navedeno ističe se neophodnost razvijanja pozitivnih stavova o praćenju vitalnih znakova pacijenta kod budućih medicinskih sestara, koji imaju značajno mesto u pravilnoj upotrebi teorijskih znanja u praksi (3,8). Stavovi medicinskih sestara prema vitalnim znacima podrazumevaju način na koji prate vitalne znake u kliničkoj nezi i kako primenjuju svoje znanje u praksi (9). Pozitivan stav studenata prema značaju tumačenja vitalnih znakova omogućava studentima zdravstvene nege da pravilnom metodom mere i beleže vitalne znake pacijenata koliko god je to potrebno, procenjuju i tumače dobijene rezultate, planiraju i sprovode neophodne intervencije u abnormalnim situacijama. Stoga će unapređenje stavova studenata zdravstvene nege prema vitalnim znacima doprineti da studenti vrše tačna i blagovremena merenja, obezbeđuju bezbednost pacijenata i donose ispravne kliničke odluke u praksi (4). Cilj ove studije je bio da se ispitaju stavovi studenata zdravstvene nege o praćenju vitalnih znakova pacijenata.

Metode

Istraživanje je sprovedeno u vidu studije preseka anketiranjem 193 studenta Osnovnih akademskih studija zdravstvene nege i Osnovnih strukovnih studija zdravstvene nege na Medicinskom fakultetu u Novom Sadu u periodu od 05. 05. 2022. godine do 21. 06. 2022. godine. Podaci su prikupljeni anonimnim upitnikom, a distribucija upitnika i prikupljanje podataka, u populaciji studenata zdravstvene nege, sproveo je student-istraživač u saradnji sa mentorom. U dogovoru sa predmetnim nastavnikom, upitnici su distribuirani na kraju predavanja u papirnoj formi. U toku popunjavanja je obezbeđena fizička distanca, u cilju obezbeđivanja privatnosti studentima. Dužina trajanja popunjavanja upitnika je bila 20 minuta. Studentima je predočen sadržaj Pisane informacije za ispitanika, potom su istu dobili da pročitaju, kao i Saglasnost za ispitanika koju potpisuju ukoliko su saglasni da učestvuju u istraživanju. Distribuirano je 232 upitnika, a u celosti su vraćena 193, ukupna stopa odgovora iznosila je 83,2 %.

Kriterijum za uključivanje studenata u istraživanje su: da su odslušali nastavu iz predmeta Opšta zdravstvena nega I, gde su obrađeni nastavni sadržaji vezani za vitalne funkcije, da su dali pisanu saglasnost da žele da učestvuju u studiji i da su dali odgovor na sva pitanja u upitniku.

above mentioned study also showed that students often postponed reporting changes in vital signs to health professionals. Students also identified several obstacles in monitoring vital signs. They mentioned the following obstacles: measurement of vital signs was performed only when the patient's health condition worsened, lack of time, lack of trust in performing the assessment and interruptions during the assessment (6).

According to the results of one study, which was conducted in Australia, nursing students were often not prepared to carry out basic tasks related to the assessment of the patient's health condition, in spite of the adequate preparation during their studies, and they stated that they had difficulties applying the knowledge in clinical practice, especially when it comes to the assessment of clinical deterioration of patient's health (7).

Almost half of the nursing students included in the research conducted in Saudi Arabia (4) stated that their knowledge about monitoring patients' vital signs in the clinical environment was inadequate, while more than half of them had an ambivalent or negative attitude towards their ability to associate vital signs monitoring with patients' diseases. The difference in attitudes of nursing students was established in relation to their gender and year of studies. Male nursing students showed a more positive attitude towards the domains of technology and key indicators in comparison to female students. On the contrary, female nursing students had a more positive attitude regarding the domain of communication in comparison to male students. Second-year students had a more negative attitude towards statements in the domain of technology in comparison to students of third and fourth year. On the contrary, second-year students had more positive attitudes towards communication in comparison to third and fourth-year students. Also, second-year students showed a more positive attitude in the domain of their work duties in comparison to fourth-year students (4).

It is believed that the level of knowledge of nursing students affects their skills and attitudes. It is stated in the literature that nurses do not measure and record vital signs consistently and fail to monitor patients' vital signs due to various reasons (nurses' attitudes that monitoring the respiratory rate is time-consuming, interruptions during monitoring, little importance that is given to vital signs assessment) (3,8). Taking into consideration the above mentioned, the necessity of developing positive attitudes about monitoring the patient's vital signs in future nurses is emphasized, because they are significant in the adequate implementation of theoretical knowledge in practice (3,8). The nurses' attitudes towards vital signs include the way they monitor vital signs in clinical practice and how they apply their knowledge in practice (9). The students' positive attitude towards the importance of vital signs interpretation enables nursing students to correctly measure and record patients' vital signs as much as necessary, to assess and interpret the obtained results, plan and implement necessary interventions in abnormal situations. Therefore, improving the students' attitudes towards vital signs will contribute to students making accurate and timely measurements, ensuring patients' safety and making correct decisions in clinical practice (4). The aim of this study was to examine the attitudes of nursing students towards the monitoring of patients' vital signs.

Methods

The research was conducted as a cross-sectional study and it included 193 students of Undergraduate Academic Studies in Nursing and Undergraduate Applied Studies in Nursing at the Faculty of Medicine in Novi Sad from May 5th, 2022 to June 21st, 2022. The data were collected with the help of the anonymous questionnaire, while the student-researcher distributed and collected data in the population of nursing students in cooperation with his mentor. In agreement with the teacher, the questionnaires were distributed at the end of the lecture in the paper form. Physical distance was ensured while students were filling out the questionnaire, which was aimed at ensuring the privacy of students. The students had twenty minutes to fill out the questionnaire. They were presented with the content of the Written Information for the Respondent, and then they were given time to read it, as well as the Consent for the Respondent, which they had to sign if they agreed to participate in the study. 232 questionnaires were distributed, and 193 were returned in full, so the total response rate was 83.2%.

The inclusion criteria for the students were the following: that they attended classes of General Health Care I, where the content related to vital signs was covered, that they gave their consent to

Kriterijum za isključivanje studenata iz istraživanja su: da nisu odslušali Opštu zdravstvenu negu I, da ne žele da učestvuju u istraživanju i da nisu dali odgovore na sva pitanja u upitniku. Studentima koji ispunjavaju kriterijume za uključivanje u studiju najpre je detaljno opisan razlog, značaj i način sprovođenja istraživanja.

Protokol istraživanja kreiran je na osnovu najnovijih istraživanja i čine ga socio-demografski upitnik i V-skala (eng. V-SCALE). Socio-demografski upitnik je sadržao pitanja koja se odnose na socio-demografske karakteristike ispitanika (pol, prethodno završena srednja škola, godina studija i radno iskustvo). Stavovi studenata zdravstvene nege o praćenju vitalnih znakova pacijenata tokom kliničkih vežbi procenjivani su pomoću revidirane V-skale, koju je kreirao Mok sa saradnicima 2015. godine (9). Inicijalno V-skala je dizajnirana za procenu stavova medicinskih sestara o praćenju vitalnih znakova radi otkrivanja kliničkog pogoršanja stanja pacijenata. Revidirana V-skala je prilagođena studentima zdravstvene nege. Revizija se odnosi na tri tvrdnje. U 5. i 6. tvrdnji dodato je pored odgovorne medicinske sestre obavestiće se i nastavnici angažovani u održavanju praktične nastave, a u 16. umesto medicinska sestra/tehničar je napisano studenti zdravstvene nege. Skalu čini 16 tvrdnji podeljenih u 5 domena. Prvi domen „tehnologija“ koji čine prve četiri tvrdnje, procenjuje stavove studenta o primeni tehnologije u praćenju vitalnih znakova. Naredna dva pitanja čine domen „komunikacija“, a tvrdnje 7, 8, 9 i 10 čine domen „radne obaveze“ i ukazuju na stavove studenata zdravstvene nege o praćenju vitalnih znakova kao njihovim radnim obavezama. Domen „ključni indikatori“ čine tvrdnje 11, 12 i 13 koje ukazuju na stavove studenata zdravstvene nege o praćenju vitalnih znakova koji se smatraju ključnim pokazateljima kliničkog pogoršanja pacijenta, dok preostale tri tvrdnje čine peti domen „znanje“. Stavovi studenata se procenjuju petostepenom Likertovom skalom od 1 do 5, pri čemu je 1- uopšte se ne slažem, a 5 potpuno se slažem. Pri statističkoj obradi podataka sve tvrdnje izuzev 5, 6 i 14 su se skorovale reverzno. Skor se izračunava za celu skalu i za svaki domen ponaosob, pri čemu niže vrednosti ukazuju na negativne, a više na pozitivnije stavove studenata o praćenju vitalnih znakova pacijenata (4). Ukupni skor se može kretati od 16 do 80, pri čemu vrednost 16-37 ukazuje na negativan stav, 38-59 ambivalentan, a 60-80 na pozitivan stav studenata zdravstvene nege o praćenju vitalnih znakova pacijenata. Za svaki domen izračunava se prosečan skor, pri čemu vrednosti od 1 do 2,49 ukazuju na negativan, 2,50 do 3,49 ambivalentan i 3,50 do 5,00 na pozitivan stav studenata.

Analiza podataka je obuhvatila metode deskriptivne i inferencijalne statistike. Numeričke varijable su prikazane putem srednje vrednosti (aritmetička sredina) i mera varijabiliteta (opseg vrednosti, standardna devijacija), a atributivne varijable korišćenjem frekvencija i procenata.

Testiranje razlika u distribuciji vrednosti numeričkih varijabli se vršilo primenom parametarskog Student-ovog t-testa u slučaju dve grupe podataka i jednofaktorskom analizom varijanse (eng. *one-way analysis of variance*, *one-way ANOVA*) sa odgovarajućim naknadnim testom (*post hoc test*) za tri ili više grupa podataka.

Veličina efekta (engl. *size effect*) je korišćena kao statistički pokazatelj koji daje bolji uvid u rezulatate istraživanja, to jest koliki je učinak nezavisne promenljive, a ne samo da li on postoji ili ne. Za izračunavanje veličina uticaja za numeričke varijable je korišćen Koenov d (*Cohen's d*) i eta kvadrat (η^2), pri čemu je korišćena sledeća interpretacija: d=0,2 ili η^2=0,01 slab efekat, d=0,5 ili η^2=0,06 srednji efekat i d =0,8 ili η^2=0,14 jak efekat.

Pearson-ov koeficijent linearne korelacije (r) korišćen je za određivanje stepena povezanosti između numeričkih varijabli.

Statistički značajnom smatrala se vrednost nivoa značajnosti $p < 0,05$.

Za statističku obradu podataka korišćen je programski paket IBM SPSS (eng. S*tatistical Package for Social Sciences*) verzija 28.

Komisija za etičnost ispitivanja Medicinskog fakulteta Novi Sad Univerziteta u Novom Sadu dala je saglasnost za sprovođenje anketnog istraživanja, zavedenu pod brojem: 01-39/147/1 dana 01. 02. 2022. godine.

Rezultati

Od 193 studenta koji su učestvovali u istraživanju 82,9% je bilo ženskog pola, a 17,1% muškog pola. Dve trećine studenata je završilo stručnu, odnosno medicinsku srednju školu, dok je opštu srednju školu tj. gimnaziju završilo 20,2% studenata, a samo 2,1% studenata je srednjoškolsko obrazovanje završilo u nekoj drugoj školi. Među studentima sa završenim srednjim stručnim obrazovanjem 64,7% studenata je pohađalo obrazovni

participate in the study and that they answered all the questions from the questionnaire.

The exclusion criteria included the following: that the students did not attend General Health Care I, that they did not want to take part in the study and that they did not answer all the questions in the questionnaire. The reason, significance and method of conducting the study were described in detail to students who fulfilled the inclusion criteria.

The protocol of the study was created based on the latest research and it included the socio-demographic questionnaire and V-scale. The socio-demographic questionnaire contained questions related to the socio-demographic characteristics of respondents (gender, previously completed high school, year of studies and work experience). The attitudes of nursing students towards vital signs monitoring during practical training were assessed using the revised V-scale , which was created by Mok and associates in 2015 (9). Initially, V-scale was designed to assess nurses' attitudes to vital signs monitoring in order to detect clinical deterioration in patients. The revised V-scale was adapted for nursing students. The revision related to three statements. In the 5th and 6th statement, it was added that in addition to the nurse on duty, the teachers engaged in practical training would also be notified, while in the 16th statement, nurse/technician was replaced by nursing students. The scale included 16 statements divided into 5 domains. The first domain of technology, which included the first four statements, evaluated the students' attitudes towards the application of technology in vital signs monitoring. The next two questions related the domain of communication, while statements 7, 8, 9 and 10 were related to the domain of work duties and pointed to the nursing students' attitudes towards vital signs monitoring as their work duties. The domain of key indicators consists of statements 11, 12 and 13 which point to the attitudes of nursing students towards the monitoring of vital signs, which are considered to be the key indicators of clinical deterioration of patients, while the remaining three statements constitute the fifth domain – knowledge. Students' attitudes are evaluated on a five-point Likert scale from 1 to 5, where 1 – completely disagree, and 5 – completely agree. During the statistical analysis of data, all statements, except statements 5, 6 and 14, were scored in reverse. The score is calculated for the entire scale and for each domain separately, with lower values indicating more positive attitudes of students about vital signs monitoring (4). The total score can range from 16 to 80, while the value 16-37 indicates a negative attitude, 38-59 ambivalent, and 60-80 a positive attitude of nursing students towards monitoring patients' vital signs. The average score is calculated for each domain, while values from 1 to 2.49 indicate a negative, 2.50-3.49 ambivalent and 3.50-5.00 positive students' attitude.

The analysis of data included methods of descriptive and inferential statistics. Numerical variables are presented using the mean value (arithmetic mean) and measures of variability (value range, standard deviation), while attributive variables are presented using frequencies and percentages.

Testing of differences in the distribution of values of numerical variables was performed using the parametric Student's t-test in the case of two groups of data and one-factor analysis of variance (ANOVA) with the corresponding subsequent test (post hoc test) for three or more groups of data.

The size effect was used as a statistical indicator that gives a better insight into the results of the research, that is, what is the effect of the independent variable, and not just whether it exists or not. Cohen's d and eta square (η^2) were used to calculate the size effect, while the following interpretation was used: d=0.2 or η^2=0.01 a small effect, d=0.5 or η2=0.06 a medium effect and d=0.8 or η^2=0.14 a large effect.

Pearson's linear correlation coefficient (r) was used to determine the degree of correlation between numerical variables.

The value $p<0.05$ was considered to be statistically significant.

The program package IBM SPSS (Statistical Package for Social Sciences), version 28 was used for the statistical analysis of data.

The Ethics Committee of the Faculty of Medicine, University of Novi Sad gave consent to conduct a survey, which was registered under the number: 01-39/147/1 on February 1st, 2022.

Results

Of the 193 students who participated in the study, 82.9% were female, while 17.1% were male. Two thirds of students have completed vocational, that is, medical high school, 20.2% of students

Tabela 1. Distribucija odgovora studenata zdravstvene nege (N=193) na tvrdnje iz V - skale

Domen	Redni broj	Tvrdnje	Uopšte se ne slažem n (%)	Ne slažem se n (%)	Nisam siguran/a n (%)	Slažem se n (%)	Potpuno se slažem n (%)
Tehnologija	1.	Vrednost frekvencije disanja u toku rutinskog praćenja vitalnih znakova se uglavnom procenjuje za stabilne pacijente	49 (25,4)	61 (31,6)	41 (21,2)	23 (11,9)	19 (9,8)
	2.	Elektronsko praćenje vitalnih znakova je jednostavniji način praćenja (npr. brojanje) frekvencije disanja	0 (0,0)	6 (3,1)	17 (8,8)	82 (42,5)	88 (45,6)
	3.	Upotreba pulsnog oksimetra za praćenje saturacije kiseonika u krvi će smanjiti potrebu za praćenjem frekvencije disanja	35 (18,1)	58 (30,1)	47 (24,4)	30 (15,5)	23 (11,9)
	4.	Smatram da je frekvencija disanja u prihvatljivom opsegu, odnosno od 12 do 20 u minuti, samo ukoliko su vrednosti SpO_2 unutar normalnog opsega	7 (3,6)	25 (13,0)	56 (29,0)	59 (30,6)	46 (23,8)
Komunikacija	5.	Uveren/a sam da ću pogoršanje vitalnih znakova prijaviti na način koji će navesti odgovornu medicinsku sestru ili nastavnika vežbi da ponovo proceni stanje pacijenta*	1 (0,5)	8 (4,1)	19 (9,8)	71 (36,8)	94 (48,7)
	6.	Nastaviću sa redovnim izveštavanjem odgovorne medicinske sestre ili nastavnika vežbi o promenama u vitalnim znacima, ukoliko se nisu promptno preduzele mere*	1 (0,5)	3 (1,6)	20 (10,4)	72 (37,3)	97 (50,3)
Radne obaveze	7.	Praćenje vitalnih znakova zahteva dosta vremena	16 (8,3)	61 (31,6)	50 (25,9)	55 (28,5)	11 (5,7)
	8.	Praćenje vitalnih znakova je dosadan zadatak	65 (33,7)	67 (34,7)	37 (19,2)	16 (8,3)	8 (4,1)
	9.	Potpuno i tačno praćenje vitalnih znakova je zanemareno zbog ograničenog vremena	15 (7,8)	44 (22,8)	42 (21,8)	63 (32,6)	29 (15,0)
	10.	Osećam se preopterećeno pokušavajući da završim prikupljanje vitalnih znakova mojih pacijenata u različitoj učestalosti praćenja (na sat vremena, na 2 sata, na4 sata, itd.)	23 (11,9)	57 (29,5)	64 (33,2)	42 (21,8)	7 (3,6)
Ključni indikatori	11.	SpO_2 je pouzdaniji indikator u prepoznavanju ranih simptoma respiratorne disfunkcije od frekvencije disanja	2 (1,0)	32 (16,6)	46 (23,8)	77 (39,9)	36 (18,7)
	12.	Arterijski krvni pritisak je često prvi parametar koji ukazuje na promenu stanja kada je nastupilo pogoršanje stanja pacijenta	3 (1,6)	24 (12,4)	39 (20,2)	88 (45,6)	39 (20,2)
	13.	Vrednost frekvencije disanja je najmanje značajan znak pogoršanja stanja pacijenta	52 (26,9)	70 (36,3)	45 (23,3)	19 (9,8)	7 (3,6)
Znanje	14.	U stanju sam da povežem vrednosti vitalnih znakova sa fiziologijom i patofiziologijom postojećih bolesti*	5 (2,6)	16 (8,3)	66 (34,2)	88 (45,6)	18 (9,3)
	15.	Moje znanje u interpretaciji vitalnih znakova u cilju prepoznavanja kliničkog pogoršanja stanja pacijenta je ograničeno	14 (7,3)	72 (37,3)	47 (24,4)	50 (25,9)	10 (5,2)
	16.	Studenti zdravstvene nege nisu pravovremeno i pravilno interpretirali vitalne znake	40 (20,7)	60 (31,1)	57 (29,5)	24 (12,4)	12 (6,2)

*pozitivne tvrdnje

profil medicinska sestra/tehničar. Najveći broj studenata (42,5%) pohađao je prvu godinu studija, a zatim drugu (24,9%), treću (18,1%) i četvrtu (14,5%). Skoro svaki sedmi student (16,1%) radi ili je radio u kliničkoj praksi.

Većina studenata sestrinstva (88,1%) iskazala je pozitivan stav u odnosu na tvrdnju ,,Elektronsko praćenje vitalnih znakova je jednostavniji način praćenja (npr. brojanje) frekvencije disanja" (tabela 1). Više od polovine studenata „smatra da je frekvencija disanja u prihvatljivom opsegu, odnosno od 12 do 20 u minuti, samo ukoliko su vrednosti SpO_2 unutar normalnog opsega", da je SpO_2 pouzdaniji indikator u prepoznavanju ranih simptoma respiratorne disfunkcije od frekvencije disanja i da je arterijski krvni pritisak često prvi parametar koji ukazuje na promenu stanja kada je nastupilo pogoršanje stanja pacijenta. Međutim, većina studenata iskazala je pozitivan stav prema tvrdnjama „Uveren/a sam da ću pogoršanje vitalnih znakova prijaviti na način koji će navesti odgovornu medicinsku sestru ili nastavnika vežbi da ponovo proceni

Table 1. Distribution of nursing students' (N=193) responses to statements from the V-scale

Domain	Serial number	Statements	I do not agree at all n (%)	I do not agree n (%)	I am not sure n (%)	I agree n (%)	I totally agree n (%)
Technology	1.	The respiratory rate value during monitoring of vital signs is generaly assessed for stable patients	49 (25.4)	61 (31.6)	41 (21.2)	23 (11.9)	19 (9.8)
	2.	Electronic monitoring of vital signs is a simpler way of monitoring (i.e. counting) respiratory rate	0 (0.0)	6 (3.1)	17 (8.8)	82 (42.5)	88 (45.6)
	3.	The use of a pulse oximeter to monitor blood oxygen saturation will reduce the need for respiratory rate monitoring	35 (18.1)	58 (30.1)	47 (24.4)	30 (15.5)	23 (11.9)
	4.	I believe that the breathing rate is in the acceptable range, respectively from 12 to 20 per minute, only if the SpO_2 values are within the normal range	7 (3.6)	25 (13.0)	56 (29.0)	59 (30.6)	46 (23.8)
Comunication	5.	I am confident that I will report worsening of vital signs in a manner that will prompt the nurse on duty or clinician-educator to reevaluate the patient's condition*	1 (0.5)	8 (4.1)	19 (9.8)	71 (36.8)	94 (48.7)
	6.	I will continue to regularly report changes in vital signs to the nurse on duty or clinician-educator if prompt action is not taken*	1 (0.5)	3 (1.6)	20 (10.4)	72 (37.3)	97 (50.3)
Work duties	7.	Monitoring vital signs takes a lot of time	16 (8.3)	61 (31.6)	50 (25.9)	55 (28.5)	11 (5.7)
	8.	Monitoring vital signs is a boring task	65 (33.7)	67 (34.7)	37 (19.2)	16 (8.3)	8 (4.1)
	9.	Complete and accurate monitoring of vital signs is neglected due to limited time	15 (7.8)	44 (22.8)	42 (21.8)	63 (32.6)	29 (15.0)
	10.	I feel burdened trying to complete my patients' vital signs at different monitoring frequencies (i.e. hourly,every 2hours, 4 every hours, etc.)	23 (11.9)	57 (29.5)	64 (33.2)	42 (21.8)	7 (3.6)
Key indicators	11.	SpO2 is a more reliable indicator in recognizing early symptoms of respiratory dysfunction than respiratory rate	2 (1.0)	32 (16.6)	46 (23.8)	77 (39.9)	36 (18.7)
	12.	Arterial blood pressure is often the first parameter that indicates a change in condition when the patient's condition worsens	3 (1.6)	24 (12.4)	39 (20.2)	88 (45.6)	39 (20.2)
	13.	The value of breathing frequency is the least significant sign of deterioration of the patient's condition	52 (26.9)	70 (36.3)	45 (23.3)	19 (9.8)	7 (3.6)
Knowledge	14.	I am able to relate vital sign values to the physiology and pathophysiology of existing diseases*	5 (2.6)	16 (8.3)	66 (34.2)	88 (45.6)	18 (9.3)
	15.	My knowledge in the interpretation of vital signs in order to recognize the clinical deterioration of the patient's condition is limited	14 (7.3)	72 (37.3)	47 (24.4)	50 (25.9)	10 (5.2)
	16.	Nursing students did not interpret vital signs in a timely and correct manner	40 (20.7)	60 (31.1)	57 (29.5)	24 (12.4)	12 (6.2)

*positive statements

completed high school, and only 2.1% completed other schools. Among students with completed vocational secondary education, 64.7% of students attended the educational profile nurse/technician. The largest number of students (42.5%) attended the first year of studies, followed by the second (16.1%), third (18.1%) and fourth (14.5%) year of studies. Almost every seventh student (16.1%) works or has worked in clinical practice before.

The majority of nursing students (88.1%) expressed a positive attitude towards the statement "Electronic vital signs monitoring is a simple way of monitoring (for example, counting the respiratory rate)" (Table 1). More than half of the students "believe that the respiratory rate is within the acceptable range, that is, 12 to 20 per minute, only if SpO_2 values are within the normal range", that SpO_2 is a more reliable indicator in recognizing the early symptoms of respiratory dysfunction than respiratory rate and that arterial blood pressure is often the first parameter that indicates the change of patient's condition when patient's condition has deteriorated. However, the majority of students expressed a positive attitude

Tabela 2. Distribucija studenata zdravstvene nege (N=193) u odnosu na stavove o praćenju vitalnih znakova pacijenata i domene V-skale

Domeni	Negativan stav		Ambivalentan stav		Pozitivan stav	
	N	%	N	%	N	%
Tehnologija	46	23,8	118	61,1	29	15,0
Komunikacija	1	0,5	15	7,8	177	91,7
Radne obaveze	24	12,4	80	41,5	89	46,1
Ključni indikatori	54	28,0	117	60,6	22	11,4
Znanje	24	12,4	79	40,9	90	46,6
Prosečni skor- V skale	12	6,2	132	68,4	49	25,4
Ukupni skor- V skale	6	3,1	171	88,6	16	8,3

stanje pacijenta“ i „Nastaviću sa redovnim izveštavanjem odgovorne medicinske sestre ili nastavnika vežbi o promenama u vitalnim znacima, ukoliko se nisu promptno preduzele mere“.

Analizom stavova studenata prema prosečnom skoru V-skale uočeno je da 68,4% studenata sestrinstva ima ambivalentan stav o praćenju vitalnih znakova pacijenata prema V-skali, a prema ukupnom skoru V-skale 88,6% (tabela 2). U domenu „komunikacija“ većina studenata (91,7%) je imala pozitivan stav o praćenju vitalnih znakova pacijenata. Najveći procenat studenata (približno polovina studenata) u domenu „radne obaveze“ i domenu „znanje“ je, takođe, imao pozitivan stav o praćenju vitalnih znakova pacijenata. Međutim, u domenu „tehnologija“ (61,6%) i domenu „ključni indikatori“ (46,6%) među studentima je bio najzastupljeniji ambivalentan stav o praćenju vitalnih znakova pacijenata.

Analiza stavova studenata o praćenju vitalnih znakova pacijenata prema V-skali u odnosu na pol prikazana je na tabeli 3. Između studenata i studentkinja dobijena je jedino značajna razlika (p=0,012, $t_{(191)}$=-2,548) u stavu o praćenju vitalnih znakova pacijenata u domenu „komunikacija“. Vrednost prosečnog skora u ovom domenu bila je značajno niža za muškarce nego za žene. Uticaj pola na stav studenata o praćenju vitalnih znakova pacijenata u domenu „komunikacija“ bio je mali (*Cohen's d* =-0,49).

U stavu studenta o praćenju vitalnih znakova pacijenata u odnosu na prethodno završenu srednju školu značajna razlika (p=0,027, $t_{(191)}$=2,223) je postojala samo u domenu „znanje“ (tabela 4). Vrednost prosečnog skora u domenu „znanje“ je bila značajno viša među studentima koji su prethodno završili stručnu (sredenju medicinsku školu) u odnosu na studente koji su prethodno završili gimnaziju ili neku drugu školu.

U domenu „komunikacija“ (p=0,05, $F_{(3,189)}$=2,595) i u domenu „znanje“ (p=0,002, $F_{(3,189)}$=4,961) je postojala značajna razlika u stavu studenata o praćenju vitalnih znakova pacijenata u odnosu na godinu studija koju studenti pohađaju (tabela 5). Naknad-

Tabela 3. Prosečni skorovi domena V-skale i ukupni skor V-skale u odnosu na pol ispitanika

Domeni	Muškarci (n = 33)		Žene (n = 160)				
	SD	x̄	SD	x̄	t	p	*d*
Tehnologija	2,77	0,74	2,71	0,71	0,374	ns	--
Komunikacija	4,04	0,75	4,37	0,67	-2,548	0,012	- 0,49
Radne obaveze	3,36	0,79	3,21	0,69	1,085	ns	--
Ključni indikatori	2,95	0,58	2,79	0,63	1,378	ns	--
Znanje	3,32	0,66	3,39	0,78	-0,470	ns	--
Ukupni skor- V skale	51,39	6,45	50,98	6,56	0,330	ns	--

x̄ - srednja vrednost; SD - standardna devijacija; p vrednost za t test; ns (*non significant*) - razlika nije statistički značajna

Table 2. Distribution of nursing students in relation to attitudes about monitoring patients' vital signs (V- scale and domains)

Domains	Negative attitude		Ambivalent attitude		Positive attitude	
	N	%	N	%	N	%
Technology	46	23.8	118	61.1	29	15.0
Communication	1	0.5	15	7.8	177	91.7
Workload	24	12.4	80	41.5	89	46.1
Key indicators	54	28.0	117	60.6	22	11.4
Knowledge	24	12.4	79	40.9	90	46.6
Average score- V-scale	12	6.2	132	68.4	49	25.4
Total score – V-scale	6	3.1	171	88.6	16	8.3

towards the statements "I am sure that I will report worsening of vital signs in a way that will make the nurse on duty or the clinician-teacher to reevaluate the patient's condition" and "I will continue to report regularly to the nurse on duty or the clinician-teacher about the changes in vital signs, if measures were not promptly taken".

By analyzing students' attitudes according to the average score of V-scale, it was observed that 68.4% of nursing students had an ambivalent attitude towards vital signs monitoring according to V-scale, and according to the total score of V-scale 88.6% (Table 2). In the domain of communication, the majority of students (91.7%) had a positive attitude towards vital signs monitoring. The largest percentage of students (approximately half of them) in the domains of work duties and knowledge also had a positive attitude towards vital signs monitoring. However, in the domains of technology (61.6%) and key indicators (46.6%), the ambivalent attitude towards vital signs monitoring was most present among nursing students.

The analysis of students' attitudes towards vital signs monitoring according to the V-scale in relation to gender is shown in Table 3. The significant difference was observed between female and male students (p=0.012, $t_{(191)}$=-2.548) in the attitude towards vital signs monitoring in the domain of communication. The value of the average score in this domain was significantly lower in men than in women. The influence of gender on students' attitudes towards vital signs monitoring in the domain of communication was small (Cohen's d=-0.49).

There was a significant difference (p=0.027, $t_{(191)}$=2.223) in the students' attitude towards vital signs monitoring only in the domain of knowledge (Table 4) in relation to the previously completed high school. The value of the average score in the domain of knowledge was significantly higher among students who had previously completed vocational (medical high school) than among students who had previously completed grammar school or some other school.

Table 3. The total score of the V-scale and the average scores of its domains: differences in relation to gender

Domain	Males (n = 33)		Females (n = 160)				
	SD	x̄	SD	x̄	t	p	*d*
Technology	2.77	0.74	2.71	0.71	0.374	ns	--
Communication	4.04	0.75	4.37	0.67	-2.548	0.012	- 0.49
Workload	3.36	0.79	3.21	0.69	1.085	ns	--
Key indicators	2.95	0.58	2.79	0.63	1.378	ns	--
Knowledge	3.32	0.66	3.39	0.78	-0.470	ns	--
Ukupni skor- V skale	51.39	6.45	50.98	6.56	0.330	ns	--

x̄ - mean; SD –standard deviation; p - for the value of the t test; ns - non significant

Tabela 4. Prosečni skorovi domena V-skale i ukupni skor V-skale u odnosu na prethodno završeno obrazovanje ispitanika

Domeni	Medicinska škola (n = 150)		Gimnazija ili druga škola (n = 43)				
	SD	x̄	SD	x̄	t	p	*d*
Tehnologija	2,74	0,71	2,67	0,73	0,497	ns	--
Komunikacija	4,33	0,66	4,27	0,81	0,402	ns	--
Radne obaveze	3,24	0,71	3,23	0,69	0,081	ns	--
Ključni indikatori	2,84	0,61	2,73	0,68	1,010	ns	--
Znanje	3,44	0,72	3,13	0,86	2,223	0,027	0,40
Ukupni skor- V skale	51,41	6,38	49,81	6,94	1,397	ns	--

x̄ - srednja vrednost; SD - standardna devijacija; p vrednost za t test; ns (*non significant*) - razlika nije statistički značajna

na poređenja pomoću LSD (*post hoc*) testa pokazuju da se prosečni skor na skali stavova studenata I godine studija zdravstvene nege o praćenju vitalnih znakova pacijenata u domenu „komunikacija“ značajno razlikuje (p=0,034) od prosečnog skora studenata II godine studija, kao i (p=0,019) od prosečnog skora studenata IV godine studija. Naknadna poređenja razlika u stavovima studenta zdravstvene nege o praćenju vitalnih znakova pacijenata u odnosu na godinu studija, koja su takođe izvršena pomoću LSD (*post hoc*) testa, pokazuju da su prosečni skorovi u domenu „znanje“ studenata II godine studija (p=0,021) i studenata III godine (p=0,024) studija značajno viši od prosečnog skora studenata IV godine studija.

Diskusija

Stav većine studenata u našoj studiji o praćenju vitalnih znakova pacijenata Integrisanih akademskih studija zdravstvene nege i Osnovnih strukovnih studija zdravstvene nege na Medicinskom fakultetu Novi Sad Univerziteta u Novom Sadu može se protumačiti kao ambivalentni, što pokazuje rezultat na V-skali. Navedeni rezultat je alarmantan, jer je praćenje vitalnih znakova pacijenata fundamentalni aspekt zdravstvene nege, a takođe studenti zdravstvene nege su konstantno izloženi nastavnim sadržajima u vezi sa praćenjem vitalnih znakova pacijenata. Vitalni znaci su osnovni deo procene zdravstvenog stanja pacijenta i krucijalni su za uočavanje pogoršanja zdravstvenog stanja pacijenta (10). U studiji *Alshehry* i sar. (4) sprovedenoj u Saudijskoj Arabiji među 529 studenata zdravstvene nege ukupan skor V-skale je 2,95 i ukazuje da je stav studenata o praćenju vitalnih znakova pacijenata ambivalentan, što je slično rezultatima našeg istraživanja. Studenti sestrinstva tokom studiranja ne treba da steknu samo znanja i veštine za praćenje vitalnih znakova, već treba da razviju pozitivne stavove o praćenju vitalnih

Tabela 5. Prosečni skorovi domena V-skale i ukupni skor V-skale u odnosu na prethodno završeno obrazovanje ispitanika

Domeni	I godina (n = 82)		II godina (n = 48)		III godina (n = 35)		IV godina (n = 28)				
	SD	x̄	SD	x̄	SD	x̄	SD	x̄	*F*	*p*	η^2
Tehnologija	2,79	0,70	2,66	0,81	2,79	0,61	2,56	0,70			
Komunikacija	4,18	0,76	4,45	0,56	4,30	0,73	4,53	0,56	2,595	0,05	0,04
Radne obaveze	3,16	0,77	3,34	0,67	3,21	0,60	3,28	0,71	0,727	ns	--
Ključni indikatori	2,90	0,60	2,64	0,63	2,88	0,53	2,77	0,74	1,838	ns	--
Znanje	3,18	0,79	3,69	0,67	3,39	0,79	3,42	0,58	4,961	0,002	0,07
Ukupni skor- V skale	50,39	6,67	51,92	5,91	51,43	6,73	51,03	6,53	0,858	ns	--

x̄ - srednja vrednost; SD - standardna devijacija; p vrednost za t test; ns (*non significant*) - razlika nije statistički značajna

Table 4. The total score of the V scale and the average scores of its domains: differences in relation to previously completed education

Domains	Medical school (n = 150)		Grammar school or other school (n = 43)				
	SD	x̄	SD	x̄	t	p	*d*
Technology	2,74	0,71	2,67	0,73	0,497	ns	--
Communication	4,33	0,66	4,27	0,81	0,402	ns	--
Workload	3,24	0,71	3,23	0,69	0,081	ns	--
Key indicators	2,84	0,61	2,73	0,68	1,010	ns	--
Knowledge	3,44	0,72	3,13	0,86	2,223	0,027	0,40
Total score – V scale	51,41	6,38	49,81	6,94	1,397	ns	--

x̄ - mean; SD - standard devijation; p value for the t test; ns - non significant

There was a significant difference in the students' attitude towards vital signs monitoring in relation to the year of studies in the domains of communication (p=0.05, $F_{(3.189)}$=2.595) and knowledge (p=0.002, $F_{(3.189)}$=4.961) (Table 5). Subsequent comparisons using the LSD (post hoc) test show that the average score on the scale of attitudes of first-year students towards vital signs monitoring in the domain of communication is significantly different (p=0.034) from the average score of second-year students, as well as (p=0.019) from the average score of fourth-year students. The subsequent comparisons of differences in attitudes of nursing students towards vital signs monitoring in relation to the year of studies, which were also carried out with the help of LSD (post hoc) test, show that the average scores in the domain of knowledge among second-year students (p=0.021) and third-year students (p=0.024) are significantly higher than the average score of fourth-year students.

Discussion

The attitude of the majority of students of the Integrated Academic Studies in Nursing and Undergraduate Applied Studies in Nursing at the Faculty of Medicine in Novi Sad, University of Novi Sad towards vital signs monitoring in our study may be interpreted as ambivalent, as shown by the result on the V-scale. The above mentioned result is alarming, because monitoring patients' vital signs is a fundamental aspect of health care, and also because nursing students are constantly exposed to contents related to vital signs monitoring. Vital signs are a basic part of the evaluation of patient's health condition, and they are crucial for noticing the deterioration of patient's health condition (10). In the study

Table 5. The total score of the V scale and the average scores of its domains: differences in relation to the year of study

Domains	I year (n = 82)		II year (n = 48)		III year (n = 35)		IV year (n = 28)				
	SD	x̄	SD	x̄	SD	x̄	SD	x̄	*F*	*p*	η^2
Technology	2.79	0.70	2.66	0.81	2.79	0.61	2.56	0.70			
Communication	4.18	0.76	4.45	0.56	4.30	0.73	4.53	0.56	2.595	0.05	0.04
Workload	3.16	0.77	3.34	0.67	3.21	0.60	3.28	0.71	0.727	ns	--
Key indicators	2.90	0.60	2.64	0.63	2.88	0.53	2.77	0.74	1.838	ns	--
Knowledge	3.18	0.79	3.69	0.67	3.39	0.79	3.42	0.58	4.961	0.002	0.07
Total score – V scale	50.39	6.67	51.92	5.91	51.43	6.73	51.03	6.53	0.858	ns	--

x̄ - mean; SD - standard devijation; p value for the t test; ns - non significant

znakova pacijenta. Kao što se sugeriše u literaturi, stavovi studenata prema praćenju vitalnih znakova pacijenata su ključna komponenta u promovisanju budućeg ponašanja (11).

U našem istraživanju većina studenata zdravstvene nege imala je pozitivan stav prema tvrdnjama o praćenju vitalnih znakova pacijenata u domenu „komunikacija". U skladu sa našim rezultatima su i rezultati *Alshehry* i sar. (4) sprovedeni u Saudijskoj Arabiji među studentima zdravstvene nege i *Mok* i sar. (9) sprovedeni u Singapuru među medicinskim sestrama, gde su ispitanici iskazali pozitivan stav prema tvrdnjama u domenu „komunikacija". Studija *Gawronski* i sar. (12) sprovedena u deset bolnica u Italiji, takođe ukazuje na pozitivan stav pedijatrijskih medicinskih sestara prema komunikaciji. Komunikacija je bitan element u svim oblastima sestrinstva, uključujući prevenciju, lečenje, rehabilitaciju, obrazovanje i promociju zdravlja, a neki autori je smatraju srcem zdravstvene nege (13). Veština kliničke komunikacije se definiše kao komunikacija medicinskog radnika sa pacijentima, članovima njihovih porodica i drugim članovima medicinskog tima (14). Ukoliko medicinske sestre žele da pruže kvalitetnu zdravstvenu negu moraju da poseduju dobre komunikacione veštine, kako bi na adekvatan način komunicirale sa pacijentima i njihovom porodicom, lekarima, drugim medicinskim sestrama i ostalim članovima medicinskog tima (15). *Xie* i sar. (14) su sproveli studiju koja ukazuje da većina medicinskih grešaka nije posledica nedostatka tehnologije ili nemara zdravstvenih radnika, nego da je povezana sa neefikasnom komunikacijom. S obzirom na sve prethodno navedeno, sticanje stručnih kompentecija komunikacije kod studenata zdravstvene nege treba da bude jedna od osnovnih kompetencija koje će usvojiti tokom školovanja. Ta izuzetno dinamična, kontinuirana i značajna aktivnost neophodna je radi obezbeđivanja kvaliteta i kontinuiteta u nezi. Komunikacija u sestrinstvu ima profesionalni karakter i treba da bude stručno prepoznatljiva, posebno za mlade medicinske sestre i studente sestrinstva zbog nedostatka iskustva. Komunikacija se uči i uvežbava tokom stručne prakse i ta vrsta učenja nikada se ne može smatrati dovršenom (16).

Naše istraživanje pokazuje da je u domenu „znanje" najveći procenat studenata zdravstvene nege imao pozitivan stav o praćenju vitalnih znakova pacijenata. Rezultati studije koju su sproveli *Alshehry* i sar. (4) ukazuju da se skoro polovina studenata slaže da im je znanje u interpretaciji vitalnih znakova u cilju prepoznavanja kliničkog pogoršavanja stanja pacijenata ograničeno, a četvrtina se slaže da studenti sestrinstva nisu pravovremeno i pravilno interpretirali vitalne znake (4). Istraživanje koje su sproveli *Leonard* i *Kyriacos* (5) u Južnoj Africi, pokazuje da studenti završne godine sestrinstva imaju poteškoća u prepoznavanju ranih znakova pogoršanja stanja pacijenta, koje mogu predvideti pomoću abnormalnih vitalnih znakova pacijenata. Istraživači ističu da sva saznanja dobijena istraživanjima u vezi sa ranim znakovima pogoršanja zdravstvenog stanja pacijenata moraju da budu inkorporirana u nastavne sadržaje pre nego što studenti počnu da pohađaju kliničku praktičnu nastavu (5).

Pored toga, studija sprovedena u Velikoj Britaniji ukazuje da većina bolnica koje pripadaju Nacionalnom zdravstvenom sistemu (engl. *National Health Service*, NHS) sada koristi rano upozoravajući skor za praćenje pacijenta (engl. *Early Warning Score*, EWS), kao i da zdravstveni radnici ponekad izražavaju zabrinutost i pokazuju nepoverenje prema rezultatima EWS i načina na koji treba reagovati (17). Istraživanje sprovedeno u Južnoj Africi beleži da je 44% ispitanih medicinskih sestara pogrešno identifikovalo abnormalnosti vitalnih znakova, što može negativno da utiče na prepoznavanje ranih znakova pogoršanja stanja pacijenta (18). *Padilla* i *Mayo* (19) ukazuju da je prepreka u detektovanju i reagovanju na kliničko pogoršanje posledica nepostojanja jedinstvenog koncepta kliničkog pogoršanja stanja pacijenta i razlika u praksi, što stvara jaz u znanju. Razjašnjenje ovog koncepta je vitalno za sestrinsku praksu i istraživanje (19). Prethodno navedeni rezultati upućuju na potrebu za jedinstvenim i kontinuiranim obrazovanjem tokom studiranja, a u vezi sa praćenjem i merenjem vitalnih znakova pacijenata u cilju ranog, pravovremenog detektovanja kliničkog pogoršanja stanja pacijenta (4). Međutim, formalno obrazovanje ne može da pruži sva potrebna znanja za praksu. S obzirom da stečeni nivo znanja čini osnovu za dalje permanentno usavršavanje, prelazak sa obaveznog školovanja na obavezno učenje i na sve veće i šire intelektualizovanje profesije i rada je imperativ za lični razvoj, razvoj prakse i profesije (16).

Više od polovine saudijskih studenata slaže se sa tvrdnjama da je elektronsko praćenje vitalnih znakova jednostavniji način praćenja (npr. bro-

of Alshehry et al. (4), which was conducted in Saudi Arabia among 529 medical students, the total score of V-scale was 2.95 and it pointed to the ambivalent attitude of students towards vital signs monitoring, which is similar to the results of our study. During their studies, nursing students should not only acquire the knowledge and skills necessary for vital signs monitoring, but should also develop positive attitudes towards vital signs monitoring. As suggested in the literature, students' attitudes towards vital signs monitoring are a key component in promoting future behavior (11).

In our study, the majority of nursing students had a positive attitude towards the statements about vital signs monitoring in the domain of communication. The results of the study of Alshehry et al. (4), which was conducted in Saudi Arabia among nursing students, as well as the study of Mok et al. (9), which was conducted in Singapore among nurses, where participants expressed a positive attitude towards statements in the domain of communication, are in accordance with the results of our study. The study of Gawronski et al. (12), which was conducted in ten hospitals in Italy, also pointed to the positive attitude of pediatric nurses towards communication. Communication is an important element in all fields of nursing, including prevention, treatment, rehabilitation, education and health promotion, while some authors consider it to be the heart of health care (13). The skill of clinical communication is defined as the communication between medical professionals and patients, members of their families and other members of the medical team (14). If nurses want to provide quality health care, they must have good communication skills in order to communicate in an adequate way with patients and their families, doctors, other nurses and other members of the medical team (15). Xie at el. (14) conducted a study, which shows that the majority of medical errors are not caused by the lack of technology or negligence of healthcare workers, but are related to inefficient communication. Considering all of the above mentioned, the acquisition of professional communication competences by healthcare students should be one of the basic competences that they will acquire during their studies. This extremely dynamic, continuous and significant activity is necessary to ensure quality and continuity in care. Communication in nursing has a professional character and should be professionally recognizable especially for young nurses and nursing students due to their lack of experience. Communication is learned and practiced during professional practice and that kind of learning can never be considered complete (16).

Our study shows that the largest percentage of nursing students has a positive attitude towards vital signs monitoring in the domain of knowledge. The results of the study conducted by Alshehry et al. (4) indicate that almost half of the students agree that their knowledge in the interpretation of vital signs aimed at recognizing the clinical deterioration of patient's condition is limited, and a quarter of them agree that nursing students did not interpret vital signs in a timely and correct manner (4). A study conducted by Leonard and Kyriacos (5) in South Africa shows that final year nursing students have difficulty in recognizing the early signs of deterioration of patient's condition, which can be predicted by abnormal vital signs. The researchers indicate that all findings obtained from the research on the early signs of deterioration of patient's condition must be incorporated into the curriculum before students start attending practical clinical training (5).

In addition, a study conducted in Great Britain indicates that the majority of hospitals that belong to the National Health Service (NHS) used the early warning score (EWS) to monitor their patients, as well as that the healthcare workers sometimes expressed concerns and distrusted the EWS results and the ways in which one should react (17). A study conducted in South Africa found that 44% of nurses misidentified the abnormalities of vital signs, which can negatively affect the recognition of early signs of deterioration of patient's condition (18). Padilla and Mayo (19) indicate that there is an obstacle in detecting and responding to clinical deterioration due to the lack of a single concept of clinical deterioration and differences in practice, which creates a gap in knowledge. The clarification of this concept is vital for nursing practice and research, as well (19). The aforementioned results point to the need for the unique and continuous education during studies related to the monitoring and measuring of patients' vital signs, aimed at the early and timely detecting of clinical deterioration of patients' condition (4). However, formal education cannot provide all the necessary knowledge important for practice. Given that the

janje) frekvencije disanja i da je frekvencija disanja u prihvatljivom opsegu, odnosno od 12 do 20 u minuti, samo ukoliko su vrednosti SpO_2 unutar normalnog opsega, što je u skladu sa rezultatima dobijenim u našem radu (5). Slične rezultate našim rezultatima imali su *Gawronsk* i sar. za tvrdnje u domenu Tehnologija (12). Nasuprot tome, medicinske sestre u studiji *Mok* i sar. (9), pokazale su pozitivnije stavove prema tvrdnjama u ovom domenu V-skale.

Prethodno navedeni rezultati ukazuju na nedostatak potrebnog znanja i ispravnog stava kod studenata u vezi sa važnošću adekvatne procene frekvencije disanja i adekvatne upotrebe tehnologije (npr. pulsnog oksimetra) u proceni vitalnih znakova pacijenata. Sa ovakvim tvrdnjama koreliraju podaci u preglednom radu *Mok* i sar. (20), koji pokazuju da, iako se zna da je frekvencija disanja važan prediktor ranog pogoršanja zdravstvenog stanja pacijenta, medicinske sestre neretko propuste da je procene. Šta više, frekvencija disanja je najređe beležen vitalni znak u medicinskoj dokumentaciji pacijenata (20). Takođe, frekvencija disanja je najpotcenjeniji vitalni znak (21). U nekoliko studija autori su pokušali da obrazlože zašto medicinske sestre zanemaruju procenu frekvencije disanja pacijenata. Tako studija *Ansell* i sar. (8) pokazuju da su propuštene procene frekvencije disanja od strane medicinskih sestara posledica njihovog stava da je praćenja frekvencije disanja nešto što oduzima vreme, prekida medicinske sestre tokom procene, i malo im se pridaje važnost. Rezultati studije *Philip* i sar. (22) ukazuju da su nemarnost i nizak nivo obrazovanja razlozi zbog kojih medicinske sestre zanemaruju praćenja frekvencije disanja kod pacijenata.

Literaturni podaci, takođe, sugerišu da preveliko oslanjanje studenata na tehnologiju pri proceni vitalnih znakova može dovesti do neadekvatne procene pacijentovog stanja zbog izostanka procene disanja. *Mok* i sar. (20) u preglednom radu su sugerisali da je upotreba pulsne oksimetrije verovatan uzrok lošeg praćenja frekvencije disanja, jer ga neke medicinske sestre mogu smatrati zamenom za praćenje vitalnog znaka disanja. Slično tome, *Flenady* i sar. (23) navode da medicinske sestre neretko ne procenjuju frekvenciju disanja pacijenta kada procenjuju ostale vitalne znake. Iako upotreba elektronskog monitoringa vitalnih znakova jeste predložena u cilju efikasnije detekcije fizioloških znakova pogoršanja kliničke slike pacijenta, ova strategija ima nekoliko ograničenja, uključujući smanjenu zastupljenost fizičke interakcije medicinskih sestara sa pacijentima, što smanjuje mogućnost da medicinske sestre direktno primete rane znakove pogoršanja kliničke slike pacijenta i zanemare procenu disanja kada ona nije uključena u elektronski nadzor (20).

Više od polovine studenata u našoj studiji iskazalo je ambivalentan stav prema tvrdnjama iz domena „ključni indikatori“ i „tehnologija“, što ukazuje da studenti možda nemaju adekvatnu sposobnost da prepoznaju glavne indikatore pogoršanja i smatraju da im je praćenje vitalnih znakova dodatna obaveza na njihov obim posla. Do sličnih zaključaka došli su *Mok* i sar. (9) u studiji sprovedenoj među sestrama i *Alshehry* i sar. (4) u studiji sprovedenoj među studentima zdravstvene nege.

Slično rezultatima našeg istraživanja, rezultati studije *Alshehry* i sar. (4) i *Mok* i sar. (9) sprovedenim među medicinskim sestrama ukazuju da više od polovine (57,5% i 56,9%, respektivno) ispitanika smatra promene u arterijskom krvnom pritisku prvim parametrom pogoršanja stanja pacijenta. Pregledni rad *Brekke* i sar. (24) ukazuje da je frekvencija disanja, a ne visina krvnog pritiska ili nivo saturacije krvi kiseonikom, najprecizniji prediktor pogoršanja stanja pacijenta. Arterijski krvni pritisak definiše se kao kasni indikator pogoršanja, a ne kao rani znak kliničkog pogoršanja stanja pacijenta (25). Prethodno navedene zablude u vezi sa ključnim indikatorima kliničkog pogoršanja stanja pacijenta naglašavaju da je znanje iz ove oblasti potrebno dovesti na viši nivo.

Skoro polovina studenata u našoj studiji izrazila je pozitivan stav prema tvrdnjama o praćenju vitalnih znakova pacijenata u domenu „radne obaveze“. Četvrtina studenata smatra da su preopterećeni pokušavajući da završe prikupljanje vitalnih znakova svojih pacijenata u različitoj učestalosti praćenja (na sat vremena, na 2 sata, na 4 sata, itd.), dok se približno polovina studenata slaže da je potpuno i tačno praćenje vitalnih znakova zanemareno zbog ograničenog vremena pri praćenju. Međutim, studenti sestrinstva u Saudijskoj Arabiji izrazili su ambivalentan stav prema ovom domenu u V-skali. Ista studija pokazuje da čak polovina studenata smatra da su preopterećeni ukoliko prate vitalne znake pacijenata u različitim vremenskim intervalima (4). Ranije studije identifikovale su opterećenje obimom posla kao kritični faktor koji utiče na kvalitet praćenja vitalnih znakova pacijenata od

acquired level of knowledge makes only the basis for further continuous education, the transition from compulsory education to compulsory learning and wider profession and work is an imperative for the personal development, as well as for the development of profession and practice (16).

More than a half of students from Saudi Arabia agree with the statement that electronic monitoring of vital signs is a simpler way of monitoring (e.g. counting) the respiratory rate and that the respiratory rate is within the acceptable range , that is 12 to 20 per minute, only if the values of SpO_2 are within the normal range, which is consistent with the results of our study (5). The results of Gawronsk et al. were similar to the results of our study regarding the statements in the domain of Technologies (12). On the contrary, nurses in the study of Mok et al. (9) showed more positive attitudes towards these statements in this domain of V-scale.

The aforementioned results point to the lack of necessary knowledge and correct attitude among students regarding the importance of adequate estimation of respiratory rate and adequate use of technology (e.g. a pulse oximeter) in the assessment of patients' vital signs. Data from the review article of Mok et al. (20) correlate with these claims, which show that, although it is known that the respiratory rate is an important predictor of the early deterioration of patient's condition, nurses often fail to assess it. Moreover, the respiratory rate is the most rarely recorded vital sign in patients' medical history (20). Also, the respiratory rate is the most underestimated vital sign (21). In several studies, the authors tried to explain why nurses fail to assess patients' respiratory rates. Also, the study of Ansell et al. (8) shows that missed assessments of respiratory rate is the result of nurses' attitude that monitoring the respiratory rate is time-consuming, interrupts nurses during the assessment and is given little importance. The results of the study by Philip et al. (22) show that the carelessness and low level of education are the reasons why nurses neglect to monitor the respiratory rate in patients.

The literature data also suggest that students' excessive reliance on technology when assessing vital signs can lead to the inadequate assessment of patient's condition due to the absence of respiratory assessment. Mok et al. (20) in a review article suggested that the use of pulse oximetry may be the possible cause of poor monitoring of respiratory rate, because some nurses may consider it to be the replacement for monitoring the vital sign of breathing. Similarly, Flenady et al. (23) state that nurses often do not assess the patient's respiratory rate when assessing other vital signs. Although the use of electronic monitoring of vital signs has been proposed with the aim of detecting more efficiently the physiological signs of deterioration of patient's condition, this strategy has a few limitations, including the reduced physical interaction between nurses and patients, which reduces the possibility that nurses directly notice the early signs of deterioration of patient's clinical condition and neglect the assessment of breathing when it is not included in electronic monitoring (20).

More than half of the students in our study expressed an ambivalent attitude towards the claims from the domains of key indicators and technologies, which indicates that students may not have the adequate ability to recognize the main indicators of worsening and consider the vital signs monitoring to be the extra workload. Similar conclusions were reached by Mok et al. (4) in a study conducted among nursing students.

Similar to the results of our research, the results of the studies of Alshehry et al. (4) and Mok et al. (9) conducted among nurses indicate that more than half (57.5% and 56.9%, respectively) of the respondents consider the change in arterial blood pressure to be the first parameter of the deterioration of patient's condition. A review article of Brekke and associates (24) indicates that the respiratory rate is the most accurate indicator if the clinical deterioration of patient's condition, and not blood pressure or blood oxygen saturation level. Arterial blood pressure is defined as the late indicator of deterioration, and not as an early sign of clinical deterioration of patient's condition (25). The above mentioned misconceptions related to the key indicators of clinical deterioration of patient's condition emphasize that the knowledge in this field should necessarily be brought to a higher level.

Almost half of the students in our study expressed a positive attitude towards the statements about vital signs monitoring in the domain of work duties. One fourth of students claimed they were burdened trying to complete the collection of vital signs of all patients at different monitoring frequencies (hourly, every

strane medicinskih sestara (20). Učestalost praćenja vitalnih znakova treba da bude određena na osnovu pristupa nezi usredsređenoj na pacijenta (26).

Hogan (27) kao i *Mok* i sar. (20) ukazuju da preopterećenje poslom medicinskih sestara utiče na kvalitet njihovog praćenja vitalnih znakova pacijenata. Navedeni rezultat studija koje su sproveli *Hogan* (27) i *Mok* i sar. (20) može da se odnosi i na studente. Studenti možda vide praćenje vitalnih znakova kao dodatno opterećenje povrh drugih zahteva koje moraju da ispune, a koji su im dodeljeni u kliničkoj praksi. Pored svih zahteva i obaveza tokom kliničkih vežbi, studenti se susreću i sa psihološkim i emotivnim opterećenjima (npr. stres, anksioznost).

U našoj studiji, indetifikovano je nekoliko faktora u predviđanju studentskog stava prema praćenju vitalnih znakova pacijenata. Različiti stavovi dobijeni su kada su studenti grupisani prema polu, godini studija, prethodno završenom školom i u odnosu, da li imaju kliničkog iskustva.

Rezultat našeg istraživanja pokazuje da je značajna razlika u stavu studenta o praćenju vitalnih znakova pacijenata između muškaraca i žena postojala samo u domenu „komunikacija“. Vrednost prosečnog skora u domenu „komunikacija“ je bila značajno niža među muškarcima nego među ženama. Saglasno našim rezultatima, rezultati studije *Alshehry* i sar. (4) sprovedene među studentima zdravstvene nege u Saudijskoj Arabiji ukazuju da muškarci imaju negativniji stav prema domenu „komunikacija“ u odnosu na žene. Istraživanje *Alshehry* i sar. (4) takođe pokazuje da postoji značajna razlika u stavovima studenata zdravstvene nege u odnosu na pol i u domenima „ključni indikatori“ i „tehnologija“, pri čemu muškarci imaju pozitivniji stav nego žene.

Naše istraživanje ukazuje da je samo u domenu „znanje“ postojala značajna razlika u stavovima studenata o praćenju vitalnih znakova pacijenata u odnosu na prethodno završenu srednju školu. Studenti koji su završili stručnu srednju (medicinsku) školu imali su značajno više vrednosti prosečnog skora u domenu „znanje“ nego studenti koji su prethodno završili gimnaziju ili neku drugu školu. Studenti koji su završili srednju medicinsku školu su o vitalnim znacima pacijenata upoznati od samog početka srednjoškolskog obrazovanja, odnosno od prvog razreda srednje škole, u okviru nastavnog gradiva koje je obrađivano na stručnim nastavnim predmetima tokom njihovog školovanja. Stručne kompentencije za praćenje i merenje vitalnih znakova stiču u drugom razredu srednje medicinske škole u okviru nastavnog predmeta „zdravstvena nega“ (na teorijskoj nastavi: znanja o vitalnim znacima; na praktičnoj nastavi započinje se sticanje veština).

Dobijeni rezultati istraživanja pored naučnog, imaju i stručni značaj, jer se na osnovu njih mogu kreirati pedagoške implikacije, kao osnova za unapređenje postojećih nastavnih sadržaja kliničkih vežbi na studijama zdravstvene nege.

Zaključak

U cilju poboljšanja stava studenata zdravstvene nege prema praćenju vitalnih znakova pacijenta, neophodno je kontinuirano sticanje praktičnih i teorijskih znanja u vezi sa praćenjem vitalnih znakova pacijenta zarad detektovanja kliničkog pogoršanja zdravstvenog stanja pacijenta. Takođe, neophodno je inkorporirati u nastavni plan sadržaje vezane za pravilnu upotrebu tehnologije u praćenju vitalnih znakova pacijenata i razvijati svest kod studenata zdravstvene nege za potrebom celoživotnog učenja, intelektualizovana profesije i rada.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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2 hours, every 4 hours, etc.), while half of the students agreed that accurate and complete vital signs monitoring was neglected due to the limited time. However, nursing students in Saudi Arabia expressed an ambivalent attitude towards this domain on the V-scale. The same study showed that half of the students considered themselves to be overloaded if they monitored vital signs at different time intervals (4). Earlier studies identified the work overload as the critical factor that influences vital signs monitoring performed by nurses (20). The frequency of vital signs monitoring should be determined based on the approach to patient-centered care (26).

Hogan (27), as well as Mok and associates (20) point to the fact that the work overload of nurses affects the quality of vital signs monitoring. The above mentioned result of studies carried out by Hogan (27) and Mok et al. (20) may also refer to students. Students may see vital signs monitoring as an additional burden in addition to other tasks that have to be fulfilled, and which have been assigned to them in clinical practice. In addition to all requirements and obligations during clinical training, students also encounter the psychological and emotional burdens (e.g. stress, anxiety).

In our study, several factors were identified in predicting students' attitudes towards vital signs monitoring. Different attitudes were obtained when students were grouped according to gender, year of studies, previously completed school, and whether they had clinical experience.

The results of our study show that there is a significant difference between male and female students regarding their attitude towards vital signs monitoring, but only in the domain of communication, The value of average score in the domain of communication was significantly lower in men than in women. In accordance with the results of our study, the results of the study of Alshehry et al. (4) conducted among nursing students in Saudi Arabia show that men have a more negative attitude towards the domain of communication than women. The study of Alshehry (4) also shows that there is a significant difference in attitudes of nursing students in relation to their gender in the domains of Key Indicators and Technology, with men having more positive attitudes than women.

Our study indicates that only in the domain of Knowledge, there is a significant difference in the students' attitudes to vital signs monitoring in relation to the previously completed secondary school. Students who had graduated from vocational secondary (medical) schools had significantly higher values of average score in domain of knowledge than students who had previously graduated from high school or some other school. Students who graduated from secondary medical schools were familiar with patents' vital signs from the very beginning of secondary education, that is, from the first grade of secondary school, within the curriculum, which was covered as part of medical school classes during their secondary education. Professional competences for monitoring and measuring vital signs are acquired in the second year of secondary medical school within the curriculum of the subject Health Care (theoretical part of the course: knowledge about vital signs; practical part of the course: the acquisition of skills).

The obtained results of our study, apart from the scientific, have the professional significance, because pedagogical implications can be based on them, as a basis for the improvement of curriculum of practical clinical training within the nursing studies.

Conclusion

In order to improve the attitude of nursing students towards vital signs monitoring, it is necessary to continuously acquire practical and theoretical knowledge related to vital signs monitoring, so that the clinical deterioration of patient's health condition could be detected. Also, it is necessary to incorporate the contents related to the proper use of technology in vital signs monitoring into the Curriculum, and to develop the awareness among nursing students of the need for lifelong education, intellectualization of profession and work.

Competing interests

The authors declared no competing interests.

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PROCENA UTICAJA VITAMINA D NA INTEZITET SIMPTOMA DONJEG URINARNOG TRAKTA I KVALITET ŽIVOTA OSOBA SA BENIGNOM HIPERPLAZIJOM PROSTATE

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SAŽETAK

Uvod/Cilj: Veća je verovatnoća da stariji muškarci sa benignom hiperplazijom prostate (BHP) imaju lošiji kvalitet život. Cilj ovog istraživanja je bio da se ispita uticaj serumskog vitamina D na intenzitet simptoma donjeg urinarnog trakta i kvalitet života osoba sa benignom hiperplazijom prostate.
Metode: Istraživanje je sprovedeno kao studija preseka. U studiju je uključeno 117 osoba sa benignom hiperplazijom prostate (BHP) lečenih u Kliničkom Centru Crne Gore u Podgorici u periodu od 10.05.2022. do 15.08.2022. godine. Podaci su prikupljeni opštim upitnikom, iz elektronskih zdravstvenih evidencija, kao i upitnikom Međunarodni skor simptoma prostate (engl. *International Prostate Simptom Score* - IPSS). U cilju statističke analize podataka korišćen je Spirmanov koeficijent korelacije.
Rezultati: Prosečna starost ispitanika iznosila je 62,97±11,57 godina. Prosečna vrednost intenziteta simptoma kod ispitanika sa BHP prema ISPP upitniku iznosila je 8,54. Od 117 ispitanika sa BHP, 57 (48,7%) je imalo umerene simptome, 56 (47,9%) lake, a 4 (3,4%) teške. Značajna negativna korelacija (r= - 0,316; p= 0,010) je dobijena između vrednosti nivoa vitamina D i prosečno ocenjenih vrednosti simptoma prema ISPP upitniku. Takođe, značajna negativna korelacija je dobijena između vrednosti serumskog vitamina D i svih pojedinačno ocenjenih vrednosti simptoma BHP prema IPSS upitniku (osećaj nepotpunog pražnjenja mokraćne bešike prilikom mokrenja – p=0,040; ponavljanje mokrenja u okviru dva sata od prethodnog mokrenja p<0,001; isprekidano mokrenje – p=0,005; nemogućnost odlaganja potrebe za mokrenjem – p=0,036; tanak i slab mlaz mokraće – p=0,001; naprezanje za početak mokrenja uz osećaj potrebe za mokrenjem – p=0,046 i noćno mokrenje – p=0,011). Na osnovu serumske vrednosti nivoa vitamina D ispitanici su u 52,1% slučajeva imali optimalne vrednosti ovog vitamina, u 29,1% nedovoljne, a u 18,8% deficit. Uočena je inverzna veza između prosečnih vrednosti serumskog vitamina D i kvaliteta života prema ISPP upitniku, ali veza nije bila značajna (r = - 0,365; p= 0,160).
Zaključak: Rezultati istraživanja pokazuju da sa većim vrednostima serumskog vitamina D dolazi do značajne redukcije uroloških simptoma kod osoba sa BHP, što ukazuje na neophodnost prevencije deficita vitamina D. Neophodna su dalja istraživanja u ovoj oblasti u cilju donošenja detaljnijih preporuka.

Ključne reči: benigna hiperplazija prostate, kvalitet života, vitamin D, simptomi

Uvod

Benigna hiperplazija prostate (BHP) je bolest koja ce često dijagnostikuje kod starijih muškaraca (1). Prevalencija BPH se povećava sa 25% među muškarcima od 40 do 49 godina na više od 80% među muškarcima od 70 do 79 godina (2). Veća je verovatnoća da stariji muškarci sa benignom hiperplazijom prostate imaju lošiji kvalitet života (1).

BHP se odnosi na promenu veličine prostate, a ne na potencijalne simptome koje može izazvati, a koji se obično nazivaju simptomima donjeg urinarnog trakta (engl. *low urinary tract symptoms* – LUTS). Iako mnogi muškarci sa histološkim nalazom BHP, pa čak i anatomski uvećane prostate, nemaju simptome, više od 50% muškaraca u šezdesetim godinama do čak 90% u osamdesetm ima simptome donjeg urinarnog trakta (2,3). BHP je rezultat hiperplazije i epitelnog i stromalnog tkiva i pretežno zahvata prelaznu zonu prostate (4). Kod paci-

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THE ASSESSMENT OF THE IMPACT OF VITAMIN D ON THE INTENSITY OF LOWER URINARY TRACT SYMPTOMS AND THE QUALITY OF LIFE OF PERSONS WITH BENIGN PROSTATIC HYPERPLASIA

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SUMMARY

Introduction/Aaim: Older men with benign prostatic hyperplasia (BPH) are more likely to have a poor quality of life. The aim of this study was to examine the influence of serum vitamin D on the intensity of lower urinary tract symptoms and the quality of life of persons with benign prostatic hyperplasia.
Methods: The study was conducted as a cross-sectional study. The study included 117 persons with benign prostatic hyperplasia (BPH) treated at the Clinical Center of Montenegro in Podgorica from May 10th, 2022 to August 15th, 2022. Data were collected with the help of the general questionnaire from electronic medical records, as well as with the International Prostate Symptom Score (IPSS) questionnaire. Spearman's correlation coefficient was used for the statistical analysis of data.
Results: The average age of participants was 62.97±11,57. The average value of the intensity of symptoms in patients with BPH according to the IPSS questionnaire was 8.54. Of the 117 participants with BPH, 57 (48.7%) had moderate symptoms, 56 (47.9%) mild, and 4 (3.4%) severe. A significant negative correlation (r=-0.316; p=0.010) was obtained between vitamin D levels and average values of symptoms according to the IPSS questionnaire. Also, a significant negative correlation was obtained between serum vitamin D values and all individually assessed values of BPH symptoms according to the IPSS questionnaire (sensation of incomplete emptying of the bladder during urination – p=0.040; repeated urination within two hours from the previous urination – p<0.001; intermittent urination – p=0.005; inability to postpone urination – p=0.036; a thin and weak urinary stream – p=0.001; straining to begin urinating with the sensation of the need to urinate – p=0.046 and nocturia – p=0.011). Based on the serum level of vitamin D, the participants had optimal levels of vitamin D in 52.1% of cases, insufficient levels in 29.1% of cases and deficit in 18,8%. An inverse relationship between the average values of serum vitamin D and quality of life according to ISPP questionnaire was observed, but this relationship was not significant (r =-0.365; p=0.160).
Conclusion: The results of the study show that higher levels of vitamin D lead to the significant reduction in urological symptoms in patients with BPH, which points to the need to prevent vitamin D deficiency. Further research in this field is necessary aimed at making more detailed recommendations.

Key words: benign prostatic hyperplasia, quality of life, vitamin D, symptoms

Introduction

Benign prostatic hyperplasia (BPH) is a disease that is often diagnosed in older men (1). The prevalence of BPH increases from 25% in men aged 40 to 49 years to more than 80% in men aged 70 to 79 (2). Older men with benign prostatic hyperplasia are more likely to have a poor quality of life (1).

BPH refers to the change in the size of the prostate, but not to the potential symptoms that can be caused by it, which are usually called lower urinary tract symptoms (LUTS). Although many men with the histological findings of BPH, and even anatomically enlarged prostate, have no symptoms, more than 50% of men in their

jenta sa BPH može da se javi često mokrenje, pritisak u stomaku tokom mokrenja, poremećaj sna, prisustvo rezidualnog urina i drugo. Ovo dovodi do problema mentalnog zdravlja i izaziva neprijatnosti u svakodnevnom životu, što dovodi do pogoršanja zdravlja i narušavanja kvaliteta života. Kvalitet života vezan za zdravlje predstavlja subjektivnu procenu i zadovoljstvo pojedinca ukupnim situacijama, životom i životnim iskustvom, to je koncept koji uključuje elemente potrebne za razumevanje zadovoljstva u životu pojedinca (5). BHP može se povezati sa raznim drugim zdravstvenim problemima koji mogu imati značajne negativne reperkusije na kvalitet života (6). Kod pacijenata sa benignom hiperplazijom prostate, medicinski troškovi rastu sa povećanjem starosti i dužine lečenja. Shodno tome, da bi se smanjili troškovi, važno je imati strateški pristup BHP (5).

Sve je više dokaza da nedostatak vitamina D može biti važan faktor rizika za nastanak različitih poremećaja zdravlja. *In vitro* studije i studije na životinjama pokazuju da vitamin D smanjuje ćelijsku proliferaciju i diferencijaciju prostate delujući preko receptora za vitamin D (VDR) (7). Takođe, niske vrednosti vitamina D, posebno aktivni 25-hidroksivitamin D (25-OH D), prisutne su kod pacijenata sa BPH što može biti osnov za razvoj bolesti. Nedavno randomizovano kontrolisano istraživanje je pokazalo da je suplementacija vitaminom D efikasna u smanjenju zapremine prostate i nivoa PSA, kao i poboljšanju simptoma BHP (8). Osim dobro poznate funkcije u metabolizmu kalcijuma, vitamin D takođe pomaže u sprečavanju pojave i razvoja mnogih hroničnih bolesti, uključujući kardiovaskularne bolesti, dijabetes i maligne tumore (8).

Zdravstveno stanje pojedinca može uticati na njegov svakodnevni život, što utiče i na njegovo zadovoljstvo životom. Pored toga, kako su aktivnosti svakodnevnog života povezane sa kvalitetom života, a fizičke aktivnosti mogu poboljšati mentalno i psihofizičko zdravlje, izgleda da ograničenja svakodnevnih aktivnosti kod pacijenata sa BHP utiču na kvalitet života (5).

Cilj ovog istraživanja je ispitati uticaj nivoa vitamina D na intenzitet simptoma donjeg urinarnog trakta i kvalitet života pacijenata sa benignom hiperplazijom prostate.

Metode

Istraživanjem je obuhvaćeno 117 ispitanika sa potvrđenom dijagnozom benigne hiperplazije prostate koji su lečeni u Kliničkom Centru Crne Gore (KCCG) u Podgorici u periodu od 10.05.2022. do 15.08.2022. godine. Etički komitet KCCG je dao saglasnost za sprovođenje istraživanja (br. 03/01-1070/1).

U okviru ove studije preseka od svih ispitanika prikupljeni su podaci opštim upitnikom, iz dostupnih elektronskih zdravstvenih evidencija i upitnikom Međunarodni skor simptoma prostate - MSSP (engl. *International Prostate Simptom Score* - IPSS). Iz zdravstvenog kartona pacijenata sa BHP preuzeti su podaci o vrednostima serumskog PSA izražene u ng/ml (referentne vrednosti za opštu populaciju su 0-4 ng/ml), serumskom vitaminu D (optimalnim vrednost > 50 nmol/l), urei (referentne vrednosti 2,5 do 7,1 mmol/l) i kreatininu (referentne vrednosti 62 do 106 µmol/l), bakterijskom nalazu urina, postojanju retencije urina i kalkuloze mokraćne bešike.

Ispitanici su na osnovu referentnih vrednosti PSA podeljeni u dve grupe: ispitanici sa vrednostima PSA ≤ 4 ng/ml (referentne vrednosti) i ispitanici sa vrednostima PSA > 4 ng/ml (patološke vrednosti). U odnosu na referentne vrednosti serumskog vitamina D ispitanici su podeljeni u tri grupe: osobe sa deficitom vitamina D (< 30 nmol/l), osobe sa nedovoljnim vrednostima vitamina D (od 30 do 50 nmol/l) i osobe sa optimalnim vrednosti vitamina D (> 50 nmol/l). Za procenu intenziteta simptoma donjeg urinarnog trakta pacijenata sa BHP korišćen je Međunarodni skor simptoma prostate (MSSP) upitnik. Ovaj upitnik se sastoji od osam pitanja. Sedam pitanja iz upitnika odnose se na tegobe vezane za mokrenje poslednjih meseci, od kojih se četiri pitanja odnose na simptome mokrenja (osećaj nepotpunog pražnjenja mokraćne bešike, isprekidanost mlaza pri mokrenju, slab mlaz pri mokrenju, naprezanje pri mokrenju), a tri na simptome retencije urina (učestalost mokrenja, urgencija - nemogućnost odgađanja mokrenja, nokturija). Sedam pitanja iz upitnika boduje se na skali od 0 do 5, gde 0 označava nedostatak simptoma, a 5 najveći intenzitet simptoma. Ukupan MSSP rezultat se računa kao zbir svih odgovora na sedam pitanja vezanih za tegobe sa mokrenjem. Maksimalni skor ovog upitnika je 35 i njegove vrednosti se koriste za procenu intenziteta simptoma. Ispitanici sa BHP su prema ukupnom skoru MSSP upitnika podeljeni u tri grupe: osobe sa blagim (do 7 bodova), srednjim (od 8 do 19 bodova) i teškim (20 i više bodova) simptomima. U okviru istog upitni-

sixties and even 90% in their eighties have lower urinary tract symptoms (2,3). BPH is the result of hyperplasia of both epithelial and stromal tissue and it mainly affects the transition zone of the prostate (4). In patients with BPH, frequent urination, abdominal pressure during urination, sleep disturbance, presence of residual urine may appear. This leads to mental health problems and causes inconvenience in daily life, thus leading to the worsening of health and quality of life, as well. The quality of life related to health represents the subjective assessment and satisfaction with overall situations, life and life experience. It is a concept that includes the elements necessary to understand the satisfaction in the life of an individual (5). BPH may be associated with other health problems which can have significant negative repercussions on the quality of life (6). In patients with benign prostatic hyperplasia, medical costs increase with the increase in age and length of treatment. Therefore, in order to reduce the costs, it is important to have a strategic approach to BPH (5).

There is more and more evidence that vitamin D deficiency may be an important risk factor for the occurrence of various health disorders. In vitro studies, as well as studies carried out on animals have shown that vitamin D reduces cell proliferation and differentiation of the prostate through the vitamin D receptor (VDR) (7). Also, low levels of vitamin D, especially active 25-hydroxyvitamin D (25-OH D), are present in patients with BPH, which can be the basis for the development of the disease. A recent randomized controlled study has shown that vitamin D supplementation is efficient in reducing the volume of the prostate and PSA level, and improving the symptoms of BPH (8). In addition to the well-known function in calcium metabolism, vitamin D also helps to prevent the occurrence and development of many chronic diseases, including cardiovascular diseases, diabetes and malign tumors (8).

An individual's health condition can affect his daily life, which also influences his satisfaction with life. In addition, since activities of daily life are connected with the quality of life, and physical activity can improve mental and psychophysical health, it seems that limitations in daily activities in patients with BPH affect the quality of life (5).

The aim of this study is to examine the influence of vitamin D levels on the intensity of symptoms of the lower urinary tract and the quality of life of patients with benign prostatic hyperplasia.

Methods

The study included 117 participants with the confirmed diagnosis of benign prostatic hyperplasia, who were treated at the Clinical Center of Montenegro in Podgorica from May 10th, 2022 until August 15th, 2022. The study was approved by the Ethics Committee of the Clinical Center of Montenegro (no. 03/01-1070/1).

Within this cross-sectional study, data were collected from all participants using the general questionnaire, from available electronic health records, and the International Prostate Symptom Score (IPSS). Data about serum PSA values expressed in ng/ml (reference values for the general population are 0-4 ng/ml), serum vitamin D (optimal value > 50 nmol/l), urea (reference values 2.5-7.1 mmol/l), creatinine (reference values 62-106 µmol/l), bacterial findings in urine, the presence of urine retention and bladder calculus were taken from health records of patients with BPH.

The participants were divided into two groups according to PSA reference values: participants with PSA values < 4 ng/ml (reference values) and participants with PSA values > 4 ng/ml (pathological values). The participants were divided into three groups according to the values of serum vitamin D: persons with vitamin D deficiency (< 30 nmol/l), persons with insufficient values of vitamin D (from 30 to 50 nmol/l) and persons with optimal vitamin D values (> 50 nmol/l). The International Prostate Symptom Score (IPSS) was used to assess the intensity of lower urinary tract symptoms in patients with BPH. This questionnaire consists of eight questions. Seven questions refer to the symptoms related to urination in the past months, of which four questions refer to the symptoms of urination (sensation of incomplete emptying of the bladder, intermittency of urinary stream, weak urinary stream, strain during urination), while three questions refer to the symptoms of urine retention (frequency of urination, urgency – inability to postpone urination, nocturia). Seven questions from the questionnaire are scored on the scale from 0 to 5, where 0 signifies the absence of symptoms, and 5 the greatest intensity of symptoms. The total IPSS score is calculated as the sum of all responses to seven questions related to urinary symptoms. The maximum score

ka, dodatno, osmo pitanje odnosilo se na ličnu procenu ispitanika o kvalitetu života prema stepenu subjektivnog doživljaja tegoba. Na osnovu ovog pitanja, ispitanici su procenjivali kvalitet života birajući jedan od šest odgovora, pri čemu se ocena kvaliteta kretala od 0 (što podrazumeva jako dobar kvalitet života) do 6 (što podrazumeva ogorčenje). Ispitanici su klasifikovani u tri grupe prema kvalitetu života: dobar (oni koji su naveli da imaju jako dobro ili dobro zadovoljstvo životom), indiferentan (podjednako zadovoljni i nezadovoljni) i loš (oni koji su naveli da su nezadovoljni ili nesrećni životom). Na osnovu dobijene vrednosti Kronbahovog alfa koeficijenta koji iznosi 0,798, vidljivo je da ovaj upitnik ima visok stepen pouzdanosti i unutrašnje konzistentnosti u okviru ovog istraživanja, te kao takav može poslužiti kao vredan alat za procenu inteziteta simptoma i kvaliteta života.

Statistička analiza podataka sprovedena je korišćenjem SPSS 16 programa. Podaci su prikazani kroz frekvencije i procente. U statističkoj analizi korišćeni su Spirmanov koeficijent korelacije za merenje jačine i smera odnosa između dve varijable, odnosno za utvrđivanje povezanosti i jačine povezanosti varijabli. Kao mera statističke značajnosti korišćena je p vrednost manja od 0,05. Vrednost Spirmanovog koeficijenta korelacije (r) blizu +1 ili -1, ukazuje na jak linearni odnos između varijabli, dok ako je blizu 0, to ukazuje na nedostatak bilo kakve veze.

Rezultati

U istraživanju koje je sprovedeno u Kliničkom Centru Crne Gore u Podgorici učestvovalo je ukupno 117 ispitanika sa potvrđenom dijagnozom BHP. Prosečna starost ispitanika iznosila je 62,97±11,57 godina. Najmlađi pacijent imao je 30 godina, a najstari 86 godina. Najveći broj ispitanika 38 (32,5%) je bio uzrasta 60-70 godina, 36 (30,8%) uzrasta 70 i više godina, 27 (23,1%) 50-60 godina i 16 (13,6%) mlađe od 50 godina.

Prosečna vrednost PSA kod ispitanika iznosila je 3,36±2,27 ng/ml. Najmanja zabeležena vrednost je bila 0,1 ng/ml, a najviša 100,0 ng/ml. Od 117 ispitanika sa BHP, 85,5% je imalo vrednost PSA ≤ 4, a 14,5% veće od 4 ng/ml. Kod većine ispitanika nalaz uree (111 tj. 94,9%) i kreatinina (112 tj. 95,7%) su bili uredni. Patološki nalaz bakteriološkog pregleda urina je imalo 17 (14,5%) ispitanika, a kalkulozu bešike dva (1,7%) ispitanika. Retencija urina je bila prisutna kod 12 (10,3%) ispitanika.

Prosečna vrednost vitamina D je iznosila 51,47±22,21 nmol/l i kretala se u rasponu od 8,60 nmol/l do 117,00 nmol/l. Ispitanika sa deficitarnim vrednostima vitamina D (< 30 nmol/l) je bilo 22 (18,8%), sa nedovoljnim vrednostima vitamina D (od 30 do 50 nmol/l) 34 (29,1%) i sa optimalnim (> 50 nmol/l) 61 (52,1%).

Prosečna vrednost intenziteta simptoma kod ispitanika sa BHP prema MSSP upitniku iznosila

Tabela 1. Distribucija ispitanika sa benignom hiperplazijom prostate prema učestalosti simptoma mokrenja i otežanog pražnjenja mokraćne bešike (prema IPSS upitniku) poslednjih meseci

Simptomi mokrenja i otežanog pražnjenja mokraće	Nisam imao osećaj		Manje od 1 u 5 mokrenja		Manje od polovine broja mokrenja		Približno polovini mokrenja		Više od polovine broja mokrenja		Gotovo uvek		Ukupno	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Osećaj nepotpunog pražnjena mokraćne bešike prilikom mokrenja	8	6,8	47	40,2	37	31,6	22	18,8	3	2,6	0	0	117	100
Ponavljanje mokrenja u okviru dva sata od prethodnog	22	18,8	41	35,0	38	32,5	13	11,1	2	1,7	1	0,9	117	100
Isprekidano mokrenje (mlaz krene pa stane)	47	40,1	38	32,5	20	17,1	7	6	1	0,9	4	3,4	117	100
Nemogućnost odlaganja potrebe za mokrenjem	102	87,2	13	11,1	2	1,7	0	0	0	0	0	0	117	100
Tanak i oslabljen mlaz mokraće	43	36,8	40	34,2	16	13,6	9	7,7	7	6	2	1,7	117	100
Naprezanje za početak mokrenja uz osjećaj potrebe za mokrenjem	34	29,1	55	47	21	17,8	5	4,3	1	0,9	1	0,9	117	100

of this questionnaire is 35, and its values are used for the assessment of the intensity of symptoms. According to the total score of IPSS, the participants with BPH were divided into three groups: persons with mild (up to 7 points), moderate (from 8 t 19 points), and severe (20 or more than 20 points) symptoms. Within the same questionnaire, the additional eighth question referred to the participant's personal assessment of the quality of life according to the subjective experience of symptoms. Within this question, the participants assessed the quality of life, by choosing one of six answers, where the assessment of quality ranged from 0 (which signifies a very good quality of life) to 6 (which indicates bitterness). The participants were classified into three groups according to the quality of life: good (those who stated that they had very good or good satisfaction with life), indifferent (equally satisfied and dissatisfied), and poor quality of life (those who stated they were dissatisfied or unhappy). Based on the obtained value of the Cronbach's alpha coefficient, which was 0.798, it is evident that this questionnaire has a high degree of reliability and internal consistency within this study, and therefore, it can be a valuable tool for the assessment of the intensity of symptoms and quality of life.

The statistical analysis was carried out with the help of the SPSS 16 program. Data were presented through frequencies and percentages. Spearman's correlation was used in the statistical analysis to measure the intensity and direction of relationship between two variables, that is, to establish the connectedness and intensity of connectedness between the variables. P value of less than 0.05 was used as a measure of statistical significance. The value of Spearman's correlation coefficient (r) near +1 or -1 indicates a strong linear relationship between the variables, and if it is close to 0, it indicates the lack of any relationship.

Results

The study, which was carried out at the Clinical Center of Montenegro in Podgorica, included 117 participants with the confirmed diagnosis of BPH. The average age of participants was 62.97±11.57. The youngest patient was 30 years old, while the oldest was 86. The largest number of participants , that is, 38 of them (32.5%) were in the age group 60-70 years, 36 (30.8%) were in the age group 70 and older, 27 (23.1%) were in the age group 50-60 years and 16 (13.6%) were younger than 50.

The average value of PSA in participants was 3.36±2.27 ng/ml. The smallest registered value was 0.1 ng/ml, while the highest was 100.0 ng/ml. Of the 117 participants with BPH, 85.5% had a PSA value < 4, while 14.5% > 4 ng/ml. In the majority of participants, the findings of urea (111, that is, 94.9%) and creatinine (1112, that is, 95.7%) were within normal ranges. 17 (14.5%) participants had the pathological findings of the bacteriological examination of urine, and two of them (1.7%)

Table 1. Distribution of participants with benign prostatic hyperplasia according to the frequency of symptoms and difficulties related to urination (based on IPSS questionnaire) in the past months

Urinary symptoms and difficulties related to urination	I did not have the sensation		Less than once in 5 times		Less than half the time		About half the time		More than half the time		Almost always		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Sensation of incomplete emptying of the bladder	8	6.8	47	40.2	37	31.6	22	18.8	3	2.6	0	0	117	100
Had to urinate again less than two hours after you finished urinating	22	18.8	41	35.0	38	32.5	13	11.1	2	1.7	1	0.9	117	100
Intermittency (stop and start again)	47	40.1	38	32.5	20	17.1	7	6	1	0.9	4	3.4	117	100
Inability to postpone urination	102	87.2	13	11.1	2	1.7	0	0	0	0	0	0	117	100
A thin and weak urinary stream	43	36.8	40	34.2	16	13.6	9	7.7	7	6	2	1.7	117	100
Strain to begin urination with the feeling of need to urinate	34	29.1	55	47	21	17.8	5	4.3	1	0.9	1	0.9	117	100

Tabela 2. Distribucija ispitanika sa benignom hiperplazijom prostate prema broju uriniranja tokom noći tokom posljednjih nekoliko meseci

Broj uriniranja tokom noći tokom poslednjih nekoliko meseci	Br. (%)
0	5 (4,3)
1	44 (37,6)
2	35 (29,8)
3	23 (19,7)
4	5 (4,3)
5+	5 (4,3)
Ukupno	117 (100,0)

je 8,54 i kretala se od 0,00 do 27,00. Od 117 ispitanika sa BHP, 57 (48,7%) je imalo umerene, 56 (47,9%) lake, a 4 (3,4%) teške simptome donjeg urinarnog trakta.

Prema podacima MSSP upitnika, najveći broj ispitanika 47 (40,2%) odgovorilo je da je tokom poslednjih meseci manje od jednom u pet mokrenja imalo osećaj da nije potpuno ispražnjena mokraćna bešika, 37 (31,6%) u manje od polovine broja mokrenja, 22 (18,8%) kod svakog drugog mokrenja, 3 (2,6%) kod više od polovine broja mokrenja, dok 8 (6,8%) ispitanika nije imalo ovaj problem (Tabela 1). Tokom poslednjih meseci najveći broj ispitanika (41 tj. 35,0%) navodi da su manje od jednom u pet mokrenja morali ponovo mokriti unutar dva sata od prethodnog mokrenja, 38 (32,5%) kod manje od polovine broja mokrenja, 22 (18,8%) nije imalo taj osećaj, 13 (11,1%) kod svakog drugog mokrenja, 2 (1,7%) u više od polovine broja mokrenja, dok 1 (0,9%) nije imao ovaj problem. Najveći broj ispitanika (72,5%), tokom poslednjih meseci, nije imao isprekidano mokrenje ili se ono javljalo manje od jednom u pet mokrenja, a 3,4% je skoro uvek imalo ove tegobe. Nemogućnost odlaganja potrebe za mokrenjem nije imalo čak 102 (87,2%) ispitanika, a 13 (11,1%) navodi ovaj problem ređe od jednom na pet mokrenja i 2 (1,7%) kod svakog drugog mokrenja. Tanak i oslabljen mlaz nije imalo 36,8% ispitanika tokom poslednjih meseci, a 1,7% gotovo uvek pri mokrenju. Naprezanje da

Tabela 3. Analiza korelacije između vrednosti serumskog vitamina D i prosečne ocene simptoma mokrenja i otežanog pražnjenja mokraćne bešike u poslednjih meseci kod ispitanika sa benignom hiperplazijom prostate

Simptomi mokrenja i otežanog pražnjenja mokraćne bešike	Korelacija sa nivoom serumskog vitamina D	
Osećaj nepotpunog pražnjenja mokraćne bešike prilikom mokrenja	Spirmanov koeficijent korelacije (r)	-0,190*
	Koeficijent značajnosti (p)	0,040
	N	117
Ponavljanje mokrenja u okviru dva sata od prethodnog	Spiearmanov koeficijent korelacije (r)	-0,349**
	Koeficijent značajnosti (p)	0,000
	N	117
Isprekidano mokrenje (mlaz krene pa stane)	Spiearmanov koeficijent korelacije (r)	-0,260**
	Koeficijent značajnosti (p)	0,005
	N	117
Nemogućnost odlaganja potrebe za mokrenjem	Spiearmanov koeficijent korelacije (r)	0,019*
	Koeficijent značajnosti (p)	0,036
	N	117
Tanki i oslabljeni mlaz mokraće	Spiearmanov koeficijent korelacije (r)	-0,303**
	Koeficijent značajnosti (p)	0,001
	N	117
Naprezanje za početak mokrenja uz osjećaj potrebe za mokrenjem	Spiearmanov koeficijent korelacije (r)	-0,177*
	Koeficijent značajnosti (p)	0,046
	N	117
Učestalost noćnog ustajanja zbog mokrenja	Spiearmanov koeficijent korelacije (r)	-0,235*
	Koeficijent značajnosti (p)	0,011
	N	117

Table 2. Distribution of participants with benign prostatic hyperplasia according to the number of urinations during night in the past months

Number of urinations during night in the past month	N (%)
0	5 (4.3)
1	44 (37.6)
2	35 (29.8)
3	23 (19.7)
4	5 (4.3)
5+	5 (4.3)
Total	117 (100.0)

had calculosis of the bladder. Urine retention was present in 12 (10.3%) participants.

The average value of vitamin D was 51.47±22.21 nmol/l and it ranged from 8.60 nmol/l to 117.0 nmol/l. There were 22 (18.8%) participants with vitamin D deficiency (< 30 nmol/l), 34 (29.1%) with the insufficient values of vitamin D (from 30 to 50 nmol/l) and 61 (52.1%) with optimal vitamin D levels (> 50 nmol/l).

The average value of the intensity of symptoms in patients with BPH according to the ISPP questionnaire was 8.54 and it ranged from 0.00 to 27.00. Of the 117 participants with BPH, 57 (48.7%) had moderate symptoms, 56 (47.9%) mild, and 4 (3.4%) had severe symptoms.

According to the ISPP questionnaire, the largest number of participants, that is, 47 of them (40.2%) answered that less than once in five urinations they had the feeling that the bladder was not completely emptied, 37 (31.6%) in less than half of the number of urinations, 22 (18.8%) in every second urination, 3 (2.6%) in more than half of the number of urinations, while 8 (6.8%) participants did not have this problem (Table 1). During the past months, the largest number of participants (41, that is, 35.0%) stated that less than once in five times they had to urinate once again less than two hours after they finished urinating, 38

Table 3. Analysis of correlation between serum vitamin D levels and average assessment of urinary symptoms and difficulties related to urination in the past months in participants with benign prostatic hyperplasia

Urinary symptoms and difficulties in urinating	Correlation with serum vitamin D level	
Sensation of incomplete emptying of the bladder during urination	Spearman's correlation coefficient (r)	-0.190*
	Coefficient of significance (p)	0.040
	N	117
Repeated urination less than two hours after you finished urinating	Spearman's correlation coefficient (r)	-0.349**
	Coefficient of significance (p)	0.000
	N	117
Intermittency (strain stops and starts again)	Spearman's correlation coefficient (r)	-0.260**
	Coefficient of significance (p)	0.005
	N	117
Inability to postpone the urination	Spearman's correlation coefficient (r)	0.019*
	Coefficient of significance (p)	0.036
	N	117
A thin and weak urinary stream	Spearman's correlation coefficient (r)	-0.303**
	Coefficient of significance (p)	0.001
	N	117
Straining to begin urination with the sensation of the need	Spearman's correlation coefficient (r)	-0.177*
	Coefficient of significance (p)	0.046
	N	117
Frequent nocturia	Spearman's correlation coefficient (r)	-0.235*
	Coefficient of significance (p)	0.011
	N	117

Tabela 4. Distribucija ispitanika sa benignom hiperplazijom prostate (BHP) prema kategoriji simptoma bolesti (prema MSSP upitniku) i vrednosatima serumskog vitamina D u poslednjih nekoliko meseci

Kategorije simptoma BHP (prema IPSS upitniku)	Vrednosti serumskog vitamina D			Ukupno (N=117) Br (%)
	Deficit (N=22) Br (%)	Nedovoljno (N=34) Br (%)	Optimalno (N=61) Br (%)	
Laki	5 (22,7)	14 (41,2)	37 (60,7)	56 (47,9)
Srednji	15 (68,2)	18 (52,9)	24 (39,3)	57 (48,7)
Teški	2 (9,1)	2 (5,9)	0 (0,0)	4 (3,4)

r= - 0,316; p= 0,010

bi započeli mokrenje tokom poslednjih meseci nije imalo 29,1% ispitanika, a 0,9% skoro uvek.

Osmo pitanje iz MSSP upitnika odnosilo se na učestalost noćnog mokrenja tokom poslednjih meseci (Tabela 2). Samo 4,3% ispitanika nije mokrilo noću, a 37,6% je mokrilo tokom noći bar jednom, 29,8% dva puta, 19,7% tri puta, a 8,6% četiri i više puta.

Značajna negativna korelacija, dobijena prema Spirmanovom koeficijentu korelacije, je uočena između serumskih vrednosti vitamina D i svih pojedinačno ocenjenih vrednosti simptoma donjeg urinarnog trakta (osećaj nepotpunog pražnjenja mokraćne bešike prilikom mokrenja, ponavljanje mokrenja u okviru dva sata od prethodnog mokrenja, isprekidano mokrenje, nemogućnost odlaganja potrebe za mokrenjem, tank i slab mlaz mokraće, naprezanje za početak mokrenja uz osećaj potrebe za mokrenjem i noćno mokrenje) procenjenih prema MSSP upitniku (Tabela 3).

Prema urološkim simptomima donjeg urinarnog trakta od 117 ispitanika sa BHP, teške simptome imalo je 4 (3,4%) ispitanika, srednje teške 57 (48,7%), a lake 56 (47,9%) (Tabela 4). Od 22 ispitanika sa deficitom vitamina D, srednje i teške simptome BHP je imalo 77,3% ispitanika, a od 34 ispitanika sa nedovoljnim vrednostima vitamina D, 58,8% ispitanika. Među ispitanicima sa optimalnim vrednostima vitamina D, 60,7% je imalo lake, 39,3% srednje, a ni jedan ispitanik teške siptome BHP. Značajna negativna korelacija, dobijena prema Spirmanovom koeficijentu korelacije, je uočena kod osoba sa BHP između serumskih vrednosti vitamina D i ukupno ocenjene vrednosti simptoma donjeg urinarnog trakta prema IPSS upitniku.

Na osnovu simptoma donjeg urinarnog trakta 72 (61,5%) ispitanika je bilo zadovoljno kvalitetom života, 28 (23,9%) je bilo indiferentno, a 17 (14,5%) je ukazalo da ima loš kvalitet života (Tabela 5). Među 22 osobe sa deficitom vitamina D čak 59,1% je iskazalo da ima loš ili indiferentan kvalitet života, a od 34 ispitanika sa nedevoljnom količinom vitamina D 41,2%. Dobar kvalitet života je bio kod najvećeg broja ispitanika sa optimalnim vrednostima vitamina D i to kod njih 70,5%. Na osnovu Spirmanovog koeficijenta korelacije postoji inverzna veza između prosečnih vrednosti vitamina D i kvaliteta života prema MSSP upitniku, ali korelacija nije bila značajna.

Tabela 5. Distribucija ispitanika prema vrednostima serumskog vitamina D i kvalitetu života

Kvalitet života*	Vrednosti serumskog vitamina D			Ukupno (N=117) Br (%)
	Deficit (N=22) Br (%)	Nedovoljno (N=34) Br (%)	Optimalno (N=61) Br (%)	
Dobar	9 (40,9)	20 (58,8)	43 (70.5)	72 (61,5)
Indiferentan	5 (22,7)	10 (29,4)	13 (21,3)	28 (23,9)
Loš	8 (36,4)	4 (11,8)	5 (8,2)	17 (14,5)

*Kvalitet života procenjen na osnovu MSSP upitnika; r = - 0,365; p= 0,160

Table 4. Distribution of participants with benign prostatic hyperplasia (BPH) according to the category of symptoms (according to the IPSS questionnaire) and values of serum vitamin D in the past months

Categories of BHP symptoms (according to IPSS questionnaire)	Values of serum vitamin D			Total (N=117) Br (%)
	Deficit (N=22) Br (%)	Insufficient (N=34) Br (%)	Optimal (N=61) Br (%)	
Mild	5 (22.7)	14 (41.2)	37 (60.7)	56 (47.9)
Moderate	15 (68.2)	18 (52.9)	24 (39.3)	57 (48.7)
Severe	2 (9.1)	2 (5.9)	0 (0.0)	4 (3.4)

r= - 0,316; p= 0,010

(32.5%) less than half the time, 22 (18.8%) did not have that sensation at all, 13 (11.1%) about half the time, 2 (1.7%) more than half the time, while 1 (0.9%) did not have this problem. The largest number of participants (72.5%), during the last months, did not have the intermittency or it occurred less than once in five times, while 3.4% almost always had these symptoms. The inability to postpone urination was not felt by 102 (87.2%) participants, while 13 (11.1%) stated this problem less than once in five times and 2 (1.7%) in every other urination. A thin and weak urinary stream was not present in 36.8% of participants in the last months, while 1.7% almost always had it during urination. 29.1% of respondents did not strain to begin urination, while 0.9% strained almost often.

The eighth question from the IPSS questionnaire referred to the frequency of nocturia during the past months (Table 2). Only 4.3% of participants did not urinate at night, while 37.6% urinated during the night at least once, 29.8% twice, 19.7% three times and 8.6% four or more times.

A significant negative correlation, which was obtained according to the Spearman's correlation coefficient, was observed between serum levels of vitamin D and all individually assessed values of symptoms of lower urinary tract (sensation of incomplete emptying of the bladder during urination, repeated urination less than two hours after they finished urinating, intermittency, inability to postpone urination, a thin and weak urinary stream, straining to urinate with the sensation of the need to urinate and nocturia), which were assessed according to the IPSS questionnaire (Table 3).

According to the urinary symptoms of lower urinary tract, of the 117 participants with BPH, 4 (3.4%) participants had severe symptoms, 57 (48.7%) had moderately severe symptoms, and 56 (47.9%) had mild symptoms (Table 4). Of the 22 participants with vitamin D deficiency, 77.3% had moderate and severe symptoms of BPH, and of the 34 participants with insufficient levels of vitamin D, 58.8% participants. Among the participants with optimal levels of vitamin D, 60.7% had mild, 39.3% moderate, and none of the participants had severe symptoms of BPH. A significant negative correlation, obtained according to Spearman's correlation coefficient, was observed in people with BPH between serum vitamin D values and

Table 5. Distribution of participants according to the values of serum vitamin D and the quality of life

Quality of life*	Values of serum vitamin D			Total (N=117) Br (%)
	Deficit (N=22) Br (%)	Insufficient (N=34) Br (%)	Optimal (N=61) Br (%)	
Good	9 (40.9)	20 (58.8)	43 (70.5)	72 (61.5)
Indifferent	5 (22.7)	10 (29.4)	13 (21.3)	28 (23.9)
Poor	8 (36.4)	4 (11.8)	5 (8.2)	17 (14.5)

*Quality of life assessed according to the IPSS questionnaire; r = - 0,365; p= 0,160

Diskusija

U našem istraživanju učestvovalo je 117 ispitanika sa postavljenom dijagnozom BHP. Uzrast ispitanika se kretao od 30 do86 godina. Najviše ispitanika sa BHP je bilo u starasnoj dobi od 60 do 70 godina (32,5%), a zatim od 70 i više godina (30,8%). Poznato je da prevalencija BHP raste sa starenjem. Autopsijske studije su pokazale histološku prevalenciju BPH od 8%, 50% i 80% u 30-im, 50-im i 80-im godinama života (9). Zanimljivi su rezultati multinacionalne studije prevalencije (MSAM-7) u kojoj je anketirano 12.815 muškaraca dobi od 50 do 80 godina u Ujedinjenom Kraljevstvu, SAD-u, Francuskoj, Nemačkoj, Holandiji, Italiji i Španiji. U svim zemljama prevalencija je rasla sa 22% kod muškaraca starih 50 do 59 godina na 45% kod muškaraca starih 70 do 80 godina (10). U studiji koja je sprovedena u Hrvatskoj 78,4% bolesnika sa BHP je bilo starije od 60 godina, a prosečna dob bolesnika je iznosila 67 godina (11).

Prosečna vrednost PSA kod naših ispitanika iznosila je 3,36 ng/ml. Najveći procenat ispitanika 85,5% imao je vrednost PSA ≤ 4 ng/ml dok je kod 14,5% ispitanika vrednost PSA iznosila > 4 ng/ml. U retrospektivnom istraživanju u kojem su korišćeni klinički biohemijski podaci 169 pacijenata lečenih na odelenju za urologiju KBC Kosovska Mitrovica, prosečna vrednost serumskog PSA kod pacijenata sa BHP iznosila je 17,0 ng/ml (12).

Studija *Tóth* i saradnika, je otkrila da se nivo PSA povećavao sa godinama, dok nije pronađena razlika u nivoima PSA u različitim podgrupama vitamina D (13). Studuija *Grammatikopoulou* i saradnika, koji su ispitivali populaciju muškaraca sa BHP davajući im suplemente vitamina D, pokazala je da je efikasnost vitamina D i većine prehrambenih faktora neadekvatna da bi se preporučila njihova upotreba (14).

Velika studija *Kristal* i saradnika je ispitivala ishranu kao faktor rizika za pojavu BHP, kod 4770 učesnika u periodu 1994-2003. godine koji su bili u placebo grupi i nisu imali BHP na početku (15). Uočeno je da ishrana sa malo masti i crvenog mesa, umerenim sadržajem alkohola, kao i sa dosta povrća i proteina doprinosi sprečavanju nastanka simptoma BHP. Međutim, nije utvrđeno da antioksidansi iz hrane/suplemenata smanjuju rizik za BHP. Takođe, rizik nije manji većom potrošnjom cinka, kalcijuma i omega-3 masnih kiselina. Neophodno je dalje ispitivati značaj ishrane u prevenciji razvoja BHP i za regulisanje simptomima ove bolesti.

U našoj studiji, prosečna vrednost vitamina D iznosila je 51,47 nmol/l. Kod 52,1% ispitanika sa BPH zabeležena je optimalna vrednost vitamina D, a nedovoljna kod 29,1% i deficit kod 18,8% ispitanika. Prema našim podacima, prosečna vrednost skora uroloških simptoma prema MSSP upitniku kod osoba sa BHP je iznosila 8,54. Pored toga, većina ispitanika 57 (48,7%) je imala srednji stepen tegoba (umereni simptomi), nešto manje 56 (47,9%) laki stepen tegoba, a 4 (3,4%) teške simptome. Ispitanici s većim nivoom vitamina D su imali značajno manje izražene simptome BHP, dok su ispitanici s manjim nioom vitamina D imali više izražene simptome BHP. Utvrđena je i negativna korelacija između nivoa vitamina D i svih simptoma povezanih s mokrenjem kod muškaraca sa BHP, što ukazuje na važnost adekvatnog nivoa vitamina D u prevenciji i lečenju ovih simptoma.

U našoj studiji, postojala je inverzna veza između nivoa vitamina D i kvaliteta života, ali veza nije bila značajna. U Hrvatskoj je 2012. godine sprovedeno istraživanje o kvalitetu života bolesnika sa BHP u kojoj je bilo uključeno 1364 bolesnika iz cele države (11). Većina bolesnika je, prema MSSP upitniku, opisala kvalitet života kao zadovoljavajući (20%), čudan osećaj (20%) i kao nezadovoljavajući (21,8%). Bolesnici koji su bili aktivno praćeni imali su napredak u kvalitetu života u odnosu na ostatak bolesnika. Bolesnici koji su aktivno praćeni ocenili su kvalitet života kao jako dobar (15%), dobar (25,2%) i kao zadovoljavajući (17,8%) (11). U studiji koja je sprovedena u Hrvatskoj, simptomi koje su bolesnici naveli kao one koji izazivaju najveće nezadovoljstvo, odnosno one koje im najviše narušavaju kvalitet života, bili su simptomi povećane učestalosti mokrenja, nokturija, urgencija i urgentna inkontinencija (11). U istraživanju po tipu studije preseka u kojem su bile uključene 4 države Evrope (Francuska, Španija, Portugalija i Nemačka) bilo je uključeno 480 muškaraca starijih od 50 godina sa simptomima BHP te su rezultati pokazali veliki uticaj simptomima donjeg urinarnog trakta na kvalitet života bolesnika (16). Kvalitet života najmanje je bio narušen kod bolesnika iz Nemačke (3,52 boda) u odnosu na ostale zemlje gde je prosečan broj bodova bio 4,27 – 4,55. Samo 10% bolesnika navelo je da bi bili zadovoljni ako bi proveli ostatak života sa trenutnim simptomima (16).

Osnovna prednost ovog istraživanja može se posmatrati kroz relativno ujednačen uzorak po pojedinim medicinskim /zdravstvenim parametrima,

the total value of lower urinary tract symptoms, according to the IPSS questionnaire.

Based on the symptoms of lower urinary tract, 72 (61.5%) participants were satisfied with the quality of life, 28 (23.9%) were indifferent, and 17 (14.5%) stated that they had the poor quality of life (Table 5). Among the 22 persons with vitamin D deficiency, 59.1% of them stated that they had poor or indifferent quality of life, and of the 34 participants with the insufficient amount of vitamin D 41.2%. A good quality of life was found in the largest number of participants with optimal levels of vitamin D, 70,5%. Based on the Spearman's correlation coefficient, there is an inverse relationship between average vitamin D values and quality of life according to the ISPP questionnaire, but this correlation was not significant.

Discussion

The study included 117 participants with BPH diagnosis. The results of the study indicated that the average age of participants was 62.97 and it ranged from 30 to 86. The majority of participants with BPH were in the age group 60-70 years (32.5%), and then in the age group 70 and older (30.8%). It is known that the prevalence of BPH increases with age. Autopsy studies have shown the histological prevalence of BPH of 8%, 50% and 80% in the thirties, fifties and eighties, respectively (9). The results of the multinational study of prevalence (MSAM-7), which included 12,815 men aged 50 to 80 in the United Kingdom, the USA, France, Germany, the Netherlands, Italy and Spain, are interesting. In all countries, the prevalence increased from 22% in men aged 50-59 years to 45% in men aged 70-80 (10). In a study, which was carried out in Croatia, 78.4% of patients with BPH were older than 60, while the average age of patients was 67 years (11).

The average value of PSA in our participants was 3.36 ng/ml. The largest percentage of participants, 85.5% had a PSA value ≤ 4 ng/ml, while in 14.5% of participants, the value of PSA was > 4 ng/ml. In a retrospective study, in which clinical biochemical data of 169 patients treated at the Department of Urology of the Clinical Center "Kosovska Mitrovica" were used, the average value of serum PSA in patients with BPH was 17.0 ng/ml. In one study, which was conducted in Iran, researchers found that the average value of PSA in patients with BPH was 5.64 ng/ml (12).

A study by Tóth et al. found that PSA levels increased with age, while no difference was found in PSA levels in different vitamin D subgroups (13). A study by Grammatikopoulou et al., who examined a population of men with benign prostatic hyperplasia by supplementing them with vitamin D, showed that the effectiveness of vitamin D and most dietary factors was inadequate to recommend their use (14).

A large study by Crystal et al. examined dietary risk factors for BPH in 4770 participants in the Prostate Cancer Prevention Trial (1994-2003) who were in the placebo group and did not have BPH at baseline (15). It has been observed that a diet with little fat and red meat, moderate alcohol content, as well as plenty of vegetables and protein contributes to the prevention of BHP symptoms. However, antioxidants from foods/supplements have not been found to reduce the risk of BPH. Also, the risk is not lower with higher consumption of zinc, calcium and omega-3 fatty acids. It is necessary to further examine the importance of nutrition in preventing the development of BPH and managing the symptoms of this disease.

In our study, the average value of vitamin D was 51.47 nmol/l. In 52.1% of the subjects with BPH, the optimal value of vitamin D was recorded, and in 29.1%, it was insufficient and 18.8% of the subjects had a deficit. According to our data, the average score of urological symptoms according to the IPSS questionnaire in people with BPH was 8.54. In addition, the majority of respondents 57 (48.7%) had a medium level of symptoms (moderate symptoms), a little less 56 (47.9%) had a mild level of symptoms, and 4 (3.4%) had severe symptoms. Subjects with higher levels of vitamin D had significantly less pronounced BHP symptoms, while subjects with lower levels of vitamin D had more pronounced BHP symptoms.

Our research also found a negative correlation between the level of vitamin D and all symptoms related to urination in men with BPH, which indicates the importance of an adequate level of vitamin D in the prevention and treatment of these symptoms. In our study, there was an inverse relationship between vitamin D levels and quality of life, but the relationship was not significant. In 2012, a study on the quality of life of patients with BPH was conducted in Croatia, and it included 1364 patients from the whole country (11). The majority of patients, according to the IPSS questionnaire,

te standardizovan merni instrument i dovoljan broj ispitanika za sprovođenje istraživanja. Glavnim nedostatkom istraživanja možemo smatrati to što je istraživanje sprovedeno na malom broju ispitanika i što kod studije preseka ne možemo definisati šta je uzrok, a šta posledica poremećaja zdravlja. Ispitivanje je sprovedeno od maja do avgusta meseca, dakle u mesecima kada je najveća izloženost suncu te to može uticati na nivo vitamina D. Sledeći nedostatak studije bi bio vezan takođe za termin ispitivanja jer u tim mesecima zbog visoke dnevne temperature su obično najmanje izražene iritativne tegobe donjeg urinarnog trakta.

Preporuke za dalja istraživanja bi išle u smeru uključivanja više varijabli različitog karaktera, koje bi produbile ispitivane odnose i dovele do relevantnijih zaključaka višestrukih razmera. Njavažnija preporuka bi bila da se ovakvo istraživanje sprovede u dizajnu prospektivne studije gde bi se i nivo vitamina D i učestalost javljanja urinarnih simptoma pratili kod ispitanika u funkciji vremena.

Zaključak

Značajna negativna korelacija je dobijena između vrednosti nivoa vitamina D i svih pojedinačno ocenjenih vrednosti uroloških simptoma procenjenih prema IPSS upitniku, kao i sa ukupno ocenjenim vrednostima simptoma. Međutim, postoji inverzna veza između prosečnih vrednosti vitamina D i kvaliteta života prema ISPP upitniku, ali veza nije značajna. Neophodna su dalja istraživanja u ovoj oblasti u cilju davanja preporuka za korišćenje vitamina D.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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described the quality of life as satisfactory (20%), a strange feeling (20%) and as unsatisfactory (21.8%). The quality of life of patients who were actively monitored improved in comparison to other patients. The patients who were actively monitored assessed the quality of life as very good (15%), good (25.2%) and satisfactory (17.8%) (11). In a study conducted in Croatia, the symptoms that the patients stated as those that cause the greatest dissatisfaction, that is, those that most impair their quality of life, were the symptoms of increased frequency of urination, nocturia, urgency and urge incontinence (11). A cross-sectional study, which involved four European countries (France, Spain, Portugal and Germany) included 480 men older than 50 with BPH symptoms of lower urinary tract, and the results showed a great influence of symptoms of lower urinary tract, on the patients' quality of life (16). The quality of life was the least impaired in patients from Germany (3.52 points) compared to other countries where the average number of points was 4.27 - 4.55. Only 10% of patients stated that they would be satisfied if they spent the rest of their lives with current symptoms (16).

The main advantage of this study can be a relatively uniform sample in terms of certain medical/health parameters, as well as a standardized measuring instrument and a sufficient number of participants necessary to conduct the study. The main limitation of the study may be the small number of participants, as well as the fact that in a cross-sectional study, one cannot define the cause and the consequence of health disorder. The study was conducted from May to August, when exposure to the sun is the greatest, so it can affect the level of vitamin D. The other limitation of the study is also related to the time of examination, because in these months the irritating symptoms of lower urinary tract are usually least pronounced, due to high daily temperatures.

Recommendations for future research would go in the direction of including more variables that are different in character and that would deepen the examined relationships and lead to more relevant conclusions. The most important recommendation would be that this kind of research should be designed as a prospective study, where both the level of vitamin D and frequency of urinary symptoms would be monitored in subjects in the function of time.

Conclusion

A significant negative correlation was obtained between vitamin D levels and all individually assessed values of urological symptoms, which were evaluated according to the IPSS questionnaire, as well as with the overall assessment of symptoms. However, there is an inverse relationship between average vitamin D values and quality of life according to IPSS questionnaire, but the relationship is not significant. Further research in this field is necessary, aimed at giving recommendations for the use of vitamin D.

Competing interests

The authors declared no competing interests.

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SKRINING RAZVOJNIH POREMEĆAJA KOD DECE UPOTREBOM STANDARDIZOVANIH UPITNIKA „UZRASTI I RAZVOJ DETETA"(URD)

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SAŽETAK

Uvod/Cilj: Uvođenjem upitnika za rano otkrivanje (skrining) smetnji u razvoju u ranom detinjstvu, blagovremeno bi se otkrilo kašnjenje u razvoju i doprinelo brzoj intervenciji. Standardizovan upitnik *Ages and Stages Questionnaire* (ASQ-3) se primenjuje više od 30 godina širom sveta, a u Srbiji je standardizovan pod nazivom Uzrasti i razvoj deteta (URD). Cilj našeg istraživanja je bio da upotrebom standardizovanog URD upitnika u primarnoj pedijatrijskoj praksi blagovremeno identifikujemo decu sa smetnjama u razvoju u ranom detinjstvu da bi se pravovremeno započeo odgovarajući tretman.
Metode: U ispitivanju je učestvovalo 31 dete uzrasta između 9 i 36 meseci. Ispitivana deca su bila podeljena u uzrasne grupe i za svako dete je korišćen standardizovan URD upitnik za uzrast. Dobijeni podaci obrađeni su kompjuterskim programom za statističku analizu podataka (SPSS, verzija 20), a korišćene su metode deskriptivne statistike.
Rezultati: Dobijeni rezultati su pokazali da je kod 71,0% ispitivane dece prepoznato odstupanje od normativnog razvoja što je zahtevalo dodatne aktivnosti učenja ili dalju dijagnostiku. Kod 45,2% ispitanika, bar u jednoj od pet ispitivanih oblasti, otkriveno je odstupanje od normativnog razvoja koje je zahtevalo dodatnu aktivnost učenja i dalje praćenje razvoja dece (tj. imali su rezultate u sivoj zoni), a kod 25,8% odstupanja su zahtevala konsultacije sa određenim stručnjacima radi dalje procene i lečenja (tj. imali su rezultate u crnoj zoni).
Zaključak: Uvođenjem standardizovanih URD upitnika kao obaveznog skrininga u primarnu pedijatrijsku praksu omogućilo bi se rano prepoznavanje dece sa odstupanjem od normativnog razvoja, započela bi se rana stimulacija razvoja, utvrdile bi se potrebe za ponovnom procenom, dopunskom dijagnostikom i podrškom rane intervencije.

Ključne reči: razvojni poremećaji, rana identifikacija, rana intervencija, URD upitnik

Uvod

Rana identifikacija smetnji u razvoju u ranom detinjstvu je od suštinskog značaja za blagovremenu korektivnu intervenciju i rano lečenje dece sa neurorazvojnim poremećajima (1). Prema literaturnim podacima u svetu oko 17% dece ima neke razvojne teškoće, a tek kod 50% njih one se otkriju pre polaska u školu (2). Deca koja imaju niže kognitivne sposobnosti kasnije tokom života susreću se sa poteškoćama u obrazovanju u vidu lošijih školskih postignuća, zatim se suočavaju sa ozbiljnim problemima mentalnog i fizičkog zdravlja i lošijim socijalno-ekonomskim statusom (3). Uvođenjem upitnika za skrining smetnji u razvoju u ranom detinjstvu, blagovremeno bi se otkrilo kašnjenje u razvoju i intervenisalo.

U primarnoj pedijatrijskoj praksi u Srbiji se u prvim godinama života svakog deteta obavi desetak sistematskih pregleda, ali je standardni klinički pregled ograničenog dometa i na taj način se otkrije tek trećina dece sa teškoćama ili odstupanjima u razvoju i mnoga deca sa teškoćama ostaju neprepoznata. Korišćenjem dodatnog instrumenta *Ages and Stages Questionnaire* (ASQ -3) za procenu razvoja deteta u svakodnevnoj praksi bi se prepoznalo

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ORIGINAL ARTICLE

SKRINING OF DEVELOPMENTAL DISORDERS IN CHILDREN BY USING THE STANDARDIZED QUESTIONNAIRES "AGES & STAGES QUESTIONNAIRES" (ASQ-3)

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SUMMARY

Introduction/Aim: By introducing a questionnaire for screening developmental disabilities in early childhood, developmental delay would be detected in time thus enabling prompt intervention. The standardized questionnaire "Ages and Stages Questionnaire" (ASQ-3) has been used for more than 30 years all over the world, and in Serbia it was standardized under the name "*Uzrasti i razvoj deteta*" (URD). The aim of our study was to identify children with developmental disabilities in early childhood using the standardized ASQ-3 questionnaire in primary pediatric practice, so that the appropriate treatment would be started on time.
Methods: This study included 31 subjects aged 9-36 months. The subjects were divided into age groups and the standardized ASQ-3 questionnaire was used for each child. The obtained data were analyzed with the help of a computer program for statistical analysis of data (SPSS, version 20), and the methods of descriptive statistics were used.
Results: The obtained results showed that 71% of the subjects suffered from developmental disorders, which demanded additional learning activities or further diagnostics. In 45.2% of the subjects, deviations from normal development were discovered in at least one of the examined areas, which demanded additional learning activities and further monitoring of children (that is, they had results in the grey zone), and in 25.8% of the subjects, deviations demanded consultations with experts for further assessment and treatment (that is, they had results in the black zone).
Conclusion: The introduction of standardized ASQ-3 questionnaires as a mandatory clinical instrument in primary pediatric practice would enable early recognition of children with deviations from normative development, when early stimulation of development would begin, and the need for re-evaluation, supplementary diagnostics and early intervention support would be established.

Key words: developmental disorders, early identification, early intervention, ASQ-3 questionnaire

Introduction

Early identification of developmental disabilities in early childhood is essential for the timely corrective intervention and early treatment of children with neurodevelopmental disorders (1). According to the literature data, about 17% of children worldwide have some developmental difficulties, and only in 50% of them, these difficulties are diagnosed before they start school (2). Children who have lower cognitive abilities face difficulties later in life during their education in terms of poorer school results, and then face serious problems related to mental and physical health and poorer socio-economic status (3). The introduction of the questionnaire for screening developmental disabilities in early childhood would help to detect developmental delay on time and intervene.

In the primary pediatric practice in Serbia, about ten systematic examinations are performed in the first years of life of every child, however, the standard clinical examination has its limitations and therefore, only one third of children with developmental difficulties or deviations are detected and many children with difficulties

70-80% dece sa odstupanjem od normativnog razvoja, započela bi se rana stimulacija razvoja, utvrdile potrebe za ponovnom procenom, dopunskom dijagnostikom i podrškom rane intervencije. To nam je zalog za budućnost, jer ekonomske analize pokazuju da ulaganje u razvoj u ranom detinjstvu donosi veće rezultate nego ulaganje u bilo koji drugi period razvoja i da je to najbolja investicija za koju zemlja može da se opredeli (4).

Nizom projekata u ovoj oblasti, edukacijom pedijatara i saradnika, primenom u praksi, testiran je i adaptiran, a u 2019. godini i standardizovan, upitnik *Ages and Stages Questionnaire* (ASQ-3) pod nazivom „Uzrasti i razvoj deteta" (URD). Posle standardizacije i unosa naših graničnih vrednosti, srpska verzija odobrena je od autora originalnog ASQ-3, i nalazi se na portalu izdavača (https://brookespublishing.com/product/asq-3/)(5). URD je instrument koji se preporučuje za obavezni skrining razvoja dece od rođenja do 5,5 godina u pet ključnih oblasti razvoja: 1. komunikacija; 2. fina motorika; 3. rešavanje problema; 4. lično/društveno; 5. opšte. U standardizaciji upitnika, radi njegove sistematske primene kod dece u Srbiji, pokazalo se da je ovaj upitnik pouzdan i valjan instrument koji omogućava identifikovanje dece kojoj je potrebno dalje praćenje ili upućivanje na detaljniju procenu. Uz standardizovani upitnik pripremljeno je i detaljno Stručno-metodološko uputstvo za njegovo korišćenje. Učešće roditelja u korišćenju URD upitnika omogućava njihov partnerski odnos sa profesionalcima uključenim u ranu procenu, kao i pružanje podrške deci sa identifikovanim kašnjenjima u razvoju. Važna razlika između upitnika URD i drugih alata za skrining je u tome što su ovi upitnici usmereni na ono što dete može da uradi, a ne na ono što dete ne može da uradi (6).

URD se primenjuje više od 30 godina širom sveta, a u Srbiji je kao pilot projekat uveden 2019. godine u sedam izabranih domova zdravlja. Cilj ovog istraživanja je bio da se blagovremeno identifikuju deca sa smetnjama u razvoju u ranom detinjstvu u Koceljevi i da se pravovremeno započne odgovarajući tretman.

Metode

Ispitivanje je sprovedeno, kao studija preseka, u Službi za zdravstvenu zaštitu dece Doma zdravlja „Dr Darinka Lukić" u Koceljevi tokom januara i februara meseca 2023. godine. U ispitivanju je učestvovalo 31 dete uzrasta između 9 i 36 meseci (prosek 23,00±9,70 meseci). Ispitano je 17 (54,8%) dečaka i 14 (45,2%) devojčica. Roditelji svih ispitanika su bili saglasni da se dobijeni rezultati njihove dece iskoriste u istraživačke svrhe. Kriterijumi za učestvovanje u ispitivanju su bili sledeći: uzrast ≤ 36 meseci, da ne boluju od hroničnih bolesti i da im do trenutka testiranja nisu registrovane smetnje u razvoju. Uzrasne grupe definisali smo na osnovu rasporeda redovnih preventivnih pregleda kod izabranog pedijatra i za svaku grupu smo koristili standardizovan URD upitnik (Tabela 1). Upitnike su popunjavali roditelji, a za svako postavljeno pitanje iz pet ključnih oblasti razvoja (komunikacija, fina motorika, rešavanje problema, lično/društveno, opšte) mogli su odgovoriti sa „da", „ponekad" i „još ne". Svaki odgovor „da" bodovao se sa 10 poena, „ponekad" sa 5 poena i „još ne" sa 0 poena. Edukovane osobe (pedijatar i medicinska sestra) su bodovale svako dete za svaku oblast po prethodno objašnjenom sistemu, sabirali osvojene bodove i ukupan skor upisivali u za to predviđenu tabelu u kojoj se na osnovu ostvarenog rezultata pacijenti svrstavaju u svetlu, sivu i crnu zonu. Kako bismo odredili dalji odgovarajući postupak za svako dete pojedinačno, pristupili smo sledećem: 1. ako je dete u svim ispitivanim oblastima ostvarilo rezultate u svetloj zoni ukazuje na to da se dete dobro razvija i da mu nije potreban dodatni tretman; 2. ako je dete bar u jednoj od ispitivanih oblasti ostvarilo rezultat u sivoj zoni planirali smo dodatne aktivnosti učenja i dalje praćenje razvoja deteta; 3. ako je dete bar u jednoj od ispitivanih oblasti ostvarilo rezultat u crnoj zoni planirali smo konsultaciju određenih stručnjaka radi dalje procene i lečenja. Dobijeni podaci obrađeni su kompjuterskim programom za statističku analizu podataka (SPSS, verzija 20), a korišćene su metode deskriptivne statistike.

Rezultati

Dobijeni rezultati pokazali su da se kod 71,0% ispitivane dece prepoznalo odstupanje od normativnog razvoja koje je zahtevalo dodatne aktivnosti učenja ili dalju dijagnostiku. Od ukupnog broja ispitanika samo 9 (29,0%) dece je u svim ispitivanim oblastima ostvarilo rezultate u svetloj oblasti (odnosno dete je u svih 5 ispitivanih oblasti ostvarilo rezultate koji ukazuju na to da se dete dobro razvija i da mu nije potreban dodatni tretman) (grafikon 1). Najveći broj ispitanika, njih 14 (45,2%) bar u jednoj od ispitivanih oblasti os-

remain unrecognized. By using the additional instrument for the assessment of children's development Ages and Stages Questionnaire (ASQ-3) in everyday practice, 70-80% of children with deviations from normative development would be recognized, the early stimulation of development would begin, while the need for re-evaluation, additional diagnostics and early intervention would be determined. This is a pledge for the future, because economic analyses show that investing in early childhood development brings greater results than investing in any other period of development and that is the best investment, which a country can opt for (4).

Ages and Stages Questionnaire (ASQ-3) was tested, adapted and standardized in 2019 under the name Age and Child Development (in Serbian: Uzrast i razvoj deteta – URD) through several projects in this field, education of pediatricians and associates, and implementation in practice. The Serbian version was approved by the author of the original ASQ-3 after standardization and entry of our threshold values and it is available on the publisher's portal (https://brookespublishing.com/product/asq-3/) (5). ASQ-3 is an instrument, which is recommended for the mandatory screening of development of children aged 0-5.5 years in five key areas of development: 1. Communication; 2. Fine motor skills; 3. Problem solving; 4. Personal/social; 5. General. In the standardization of the questionnaire, for its systematic application among children in Serbia, it was shown that this questionnaire is a reliable and valid instrument that enables the identification of children who need further monitoring or referral to a more detailed examination. In addition to the standardized questionnaire, a detailed professional-methodological instruction for its use was also prepared. The participation of parents in the use of the ASQ-3 questionnaire enables their partnership with the professionals involved in the early assessment, as well as providing support to children with identified developmental delays. An important difference between the ASQ-3 questionnaire and other screening tools is that these questionnaires focus on what a child can do, not on what the child cannot do (6).

The ASQ-3 has been applied for more than 30 years all around the world, while in Serbia, it was introduced as a pilot project in seven selected health centers in 2019. The aim of this study was to identify on time children with developmental disorders in their early childhood in Koceljeva and to start the appropriate treatment on time.

Methods

The study was conducted as a cross-sectional study in the Children's Health Care Service of the Health Center "Dr Darinka Lukic" in Koceljeva in January and February, 2023. The study included 31 children aged 9 to 36 months (average 23.00+9.70 months). 17 boys (54.8%) and 14 girls (45.2%) were examined. The parents of all participants gave their consent that the obtained results of their children could be used for research purposes. The inclusion criteria were the following: age < 36 months, children who did not suffer from chronic diseases and developmental disabilities had not been registered before the time of testing. Age groups were defined based on the schedule of regular preventive examinations performed by the chosen pediatrician and for each group, the standardized ASQ-3 questionnaire was used (Table 1). The questionnaires were filled in by parents, and they could answer each question from five areas of development (communication, fine motor skills, problem solving, personal/social, general) with "yes", "sometimes" and "not yet". Each answer "yes" was scored with 10 points, "sometimes" with 5 points and "not yet" with 0 points. Educated persons (pediatrician and nurse) scored each child for each area according to the previously explained system, added up the points, and entered the total score in the table prepared for that, in which patients were classified into white, grey and black zone based on the achieved results. In order to determine the further appropriate procedure for each child individually, the following was done: 1. if a child achieved results in the white zone in all examined areas, it meant that the child developed well and did not need additional treatment; 2. if the child's results were in the grey zone in at least one of the examined areas, additional learning activities were planned, as well as the further monitoring of the child's development; 3. If the child's results were in the black zone in at least one of the examined areas, we planned consultations with certain experts for further assessment and treatment. The obtained data were analyzed with the help of the computer program for the statistical analysis of data (SPSS, version 20), and the methods of descriptive statistics were used.

Tabela 1. Distribucija ispitanika prema uzrastu, polu i postignutom retultatu

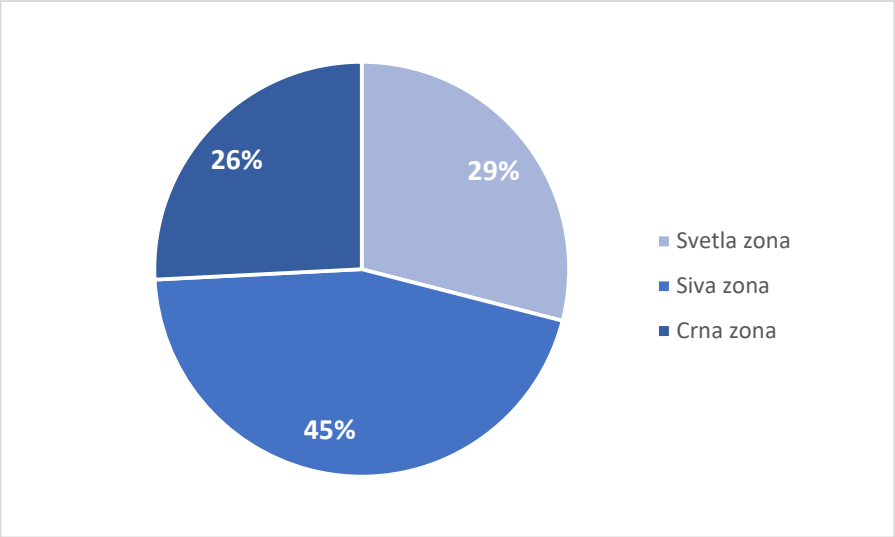
Uzrast	Pol		Svetla zona		Siva zona		Crna zona	
	Muški Br. (%)	Ženski Br. (%)	Muški Br. (%)	Ženski Br. (%)	Muški Br. (%)	Ženski Br. (%)	Muški Br. (%)	Ženski Br. (%)
9 meseci	3 (17,6)	1 (7,1)	2 (22,2)	0	1 (14,3)	1 (14,3)	0	0
12 meseci	3 (17,6)	2 (14,3)	1(11,1)	0	1 (14,3)	0	1 (25,0)	2 (50,0)
18 meseci	3 (17,6)	3 (21,4)	1 (11,1)	1 (33,3)	2 (28,6)	2 (28,6)	0	0
24 meseca	2 (11,8)	2 (14,3)	0	1 (33,3)	1 (14,3)	0	1 (25,0)	1 (25,0)
30 meseci	2 (11,8)	4 (28,6)	0	1 (33,3)	1 (14,3)	3 (42,9)	1 (25,0)	0
36 meseci	4 (23,5)	2 (14,3)	2 (22,2)	0	1 (14,3)	1 (14,3)	1 (25,0)	1 (25,0)
Ukupno	17 (54,8)	14 (45,2)	6 (66,7)	3(33,3)	7 (50,0)	7 (50,0)	4 (50,0)	4 (50,0)
	31 (100,0)		9 (29,0)		14 (45,2)		8 (25,8)	

tvarilo je rezultat u sivoj zoni (što podrazumeva odstupanje od normativnog bar u jednoj od ispitivanih pet oblasti što zahteva dodatne aktivnosti učenja i dalje praćenje razvoja deteta), a 8 (25,8%) dece je bar u jednoj od ispitivanih oblasti ostvarilo rezultat u crnoj zoni (što podrazumeva odstupanje bar u jednoj od ispitivanih pet oblasti što zahteva konsultaciju određenih stručnjaka radi dalje procene i lečenja).

Diskusija

Rezultati našeg istraživanja pokazali su da preko 70% ispitivane dece u prvoj godini ima odstupanje od normativnog psihomotornog razvoja. Imajući u vidu da deca koja imaju teškoće u razvoju kasnije tokom života mogu da se sretnu sa poteškoćama u obrazovanju u vidu lošijih školskih postignuća, zatim da se suoče sa ozbiljnim problemima mentalnog i fizičkog zdravlja, kao i lošijim socijalno-ekonomskim statusom, smatramo da su rana identifikacija i pravovremeno reagovanje i stimulacija razvoja neophodni na nivou primarne pedijatrijske prakse, a da je primena URD upitnika kao kliničkog instrumenta jednostavna i lako dostupna.

„Rana identifikacija razvojnih poremećaja je ključna za dobrobit dece i njihovih porodica", naglašava Američka akademija za pedijatriju (AAP)



Grafikon 1. Distribucija ispitanika prema postignutim rezultatima upitnika Uzrast i razvoj deteta

Legenda: svetla zona - ako je dete u svim ispitivanim oblastima ostvarilo rezultate, odnosno dete se dobro razvija i nije mu potreban dodatni tretman; siva zona - ako je dete bar u jednoj od ispitivanih oblasti pokazalo da nema dobar razvoj i da je neophodna dodatna aktivnost učenja i dalje praćenje razvoja deteta; crna zona - ako je dete bar u jednoj od ispitivanih oblasti nema dobar razvoj i dalje se planira konsultacija određenih stručnjaka radi dalje procene i lečenja.

Table 1. Distribution of the subjects according to age, sex and achieved results

Age	Sex		White zone		Grey zone		Black zone	
	Males N (%)	Females N (%)	Males N (%)	Females N (%)	Males N (%)	Females N (%)	Males N (%)	Females N (%)
9 months	3 (17.6)	1 (7.1)	2 (22.2)	0	1 (14.3)	1 (14.3)	0	0
12 months	3 (17.6)	2 (14.3)	1(11.1)	0	1 (14.3)	0	1 (25.0)	2 (50.0)
18 months	3 (17.6)	3 (21.4)	1 (11.1)	1 (33.3)	2 (28.6)	2 (28.6)	0	0
24 months	2 (11.8)	2 (14.3)	0	1 (33.3)	1 (14.3)	0	1 (25.0)	1 (25.0)
30 months	2 (11.8)	4 (28.6)	0	1 (33.3)	1 (14.3)	3 (42.9)	1 (25.0)	0
36 months	4 (23.5)	2 (14.3)	2 (22.2)	0	1 (14.3)	1 (14.3)	1 (25.0)	1 (25.0)
Total	17 (54.8)	14 (45.2)	6 (66.7)	3(33.3)	7 (50.0)	7 (50.0)	4 (50.0)	4 (50.0)
	31 (100.0)		9 (29.0)		14 (45.2)		8 (25.8)	

Results

The obtained results showed that in 71% of the examined children, a deviation from normative development was recognized, which required additional learning activities or further diagnostics. Of the total number of participants, only 9 (29.0%) children achieved results in the white zone in all examined areas (that is, in all 5 examined areas, a child achieved results that indicated that the child developed well and did not need additional treatment) (Figure 1). The largest number of participants, that is, 14 of them (45.2%) achieved results in the grey zone in at least one of the examined areas (which implies a deviation from the norm in at least one of the five examined areas, which demands additional learning activities and further monitoring of child's development), while 8 of them (25.8%) achieved results in the black zone in at least one of the examined areas (which means a deviation in at least one of the five examined areas, which requires consultations with certain experts for further assessment and treatment).

Discussion

The results of our research showed that over 70% of the examined children in the first year had a deviation from normative psychomotor

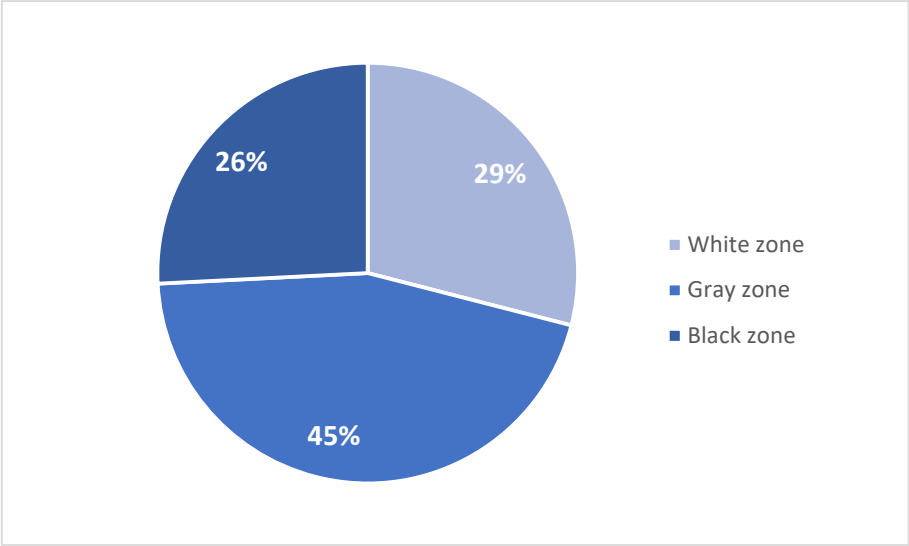


Figure 1. Percentage distribution of the subjects according to achieved ASQ-3 results
Legend: white zone – if a child achieved results in all examined areas, that is, if the child was developing well and did not need additional treatment; grey zone – if a child was not developing well in at least one of the examined areas and that additional learning activities and further monitoring of development were necessary; black zone – if a child was not developing well in at least one of the examined areas, and consultations with certain experts were planned for further assessment and treatment.

(7). Takođe, britanska zajednička radna grupa za dečije zdravstvene usluge preporučuje razvojni nadzor za identifikaciju dece sa zaostajanjem u razvoju (8). Kanadsko pedijatrijsko društvo savetuje razvojni skrining dece do 18. meseca života koristeći odgovarajući instrument, odnosno upitnik (9). Svi se slažu u jednom, da efikasan alat za skrining treba da bude jeftin, jednostavan, tačan, važeći, pouzdan, kulturološki adaptiran, lak i brz za administriranje (10). Upravo takav alat za rani razvojni skrining koji se preko 30 godina koristi širom sveta predstavlja upitnik URD. Međunarodna istraživanja sprovedena u prethodnih 25 godina pokazala su da je URD veoma koristan za ranu identifikaciju rizične populacije, adekvatno i pravovremeno reagovanje i najzad, poboljšanje ishoda (11). Da bi demonstrirali korisnost razvojnog skrininga širom sveta, *Sing* i saradnici su uporedili rezultate ASQ-3 studija u Severnoj Americi (SAD), Južnoj Americi (Ekvador), Evropi (Norveška, Španija) i Aziji (Koreja, Tajvan), a ukupna osetljivost URD upitnika u otkrivanju kašnjenja u razvoju bila je 75,4% kod ispitivane dece uzrasta do 5 godina (12).

Izuzetno smo ponosni što smo se i mi našim istraživanjem priključili velikoj porodici korisnika URD upitnika kao instrumenta za rano otkrivanje razvojnih poremećaja u najranijem uzrastu. Naš dom zdravlja u Koceljevi nije bio učesnik pilot-projekta iz 2019. godine, tako da ovo istraživanje sigurno predstavlja korak dalje u primarnoj pedijatrijskoj praksi u Srbiji. Korišćenjem URD upitnika, prepoznali smo kod 70% ispitivane dece odstupanje od normativnog razvoja i na taj način demonstrirali korisnost ranog razvojnog skriniga. Kao ograničavajuću okolnost našeg istraživanja ističemo mali broj ispitanika i kratak vremenski period trajanja ispitivanja, ali smo želeli da kroz pilot-studiju pokažemo značaj upotrebe URD upitnika kao alata za rano otkrivanje razvojnih poremećaja u primarnoj pedijatrijskoj praksi.

Zaključak

Rana identifikacija razvojnih poremećaja kod dece je veoma važna za blagovremenu korektivnu intervenciju i lečenje. Uvođenjem URD upitnika kao obaveznog kliničkog instrumenta u primarnu pedijatrijsku praksu omogućilo bi rano prepoznavanje dece sa odstupanjem od normativnog razvoja, započela bi se rana stimulacija razvoja, utvrdile bi se potrebe za ponovnom procenom, dopunskom dijagnostikom i podrškom rane intervencije. Rezultati našeg istraživanja ukazuju na efikasnost i isplativost skrining programa za razvojne poremećaje koji bi se mogao sprovesti u rutinskoj pedijatrijskoj praksi, a bio bi dobro prihvaćen i od roditelja i od zdravstvenog osoblja.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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development. Having in mind that children who have difficulties in development can later in life face difficulties in terms of poorer school achievements, then face serious mental and physical health problems, as well as poorer socio-economic status, we believe that early identification and timely reaction and stimulation of development are necessary at the level of primary pediatric practice, and that the application of ASQ-3 questionnaire as a clinical instrument is simple and easily accessible.

As the American Academy of Pediatrics emphasizes "early identification of developmental disorders is crucial for the well-being of children and their families"(7). Also, the British Joint Working Group for Children's Health Services recommends developmental surveillance to identify children with developmental delays (8). The Canadian Pediatric Society advises developmental screening of children up to 18 months of age using an appropriate instrument, that is, the questionnaire (9). All of them agree that an efficient screening tool should be inexpensive, simple, accurate, valid, reliable, culturally adapted, easy and quick to administer (10). Precisely such a tool for early developmental screening, which has been used for more than 30 years all around the world, is the ASQ-3. The international studies, which have been conducted over the past 25 years, have shown that the ASQ-3 is very useful for the early identification of the population at risk, adequate and timely reaction and, finally, improvement of outcomes (11). In order to demonstrate the usefulness of developmental screening worldwide, Sing and associates compared the results of ASQ-3 studies in North America (USA), South America (Ecuador), Europe (Norway, Spain), and Asia (Korea, Taiwan), and the total sensitivity of the ASQ-3 questionnaire in detecting developmental delays was 75.4% among the examined children aged up to 5 years (12).

We are very proud that with our research, we have joined the large family of users of the ASQ-3 questionnaire as an instrument for early detection of developmental disorders at the earliest age. Our Health Center in Koceljeva did not participate in the pilot project in 2019, and therefore, this research certainly presents a step forward in primary pediatric practice in Serbia. By using the ASQ-3 questionnaire, we recognized deviations from normative development in 70% of the examined children, and thus demonstrated the usefulness of early developmental screening. As a limiting circumstance of our research, we point out the small number of participants and the short period of the examination. However, we wanted to show, through a pilot study, the importance of ASQ-3 questionnaire as a tool for the early detection of developmental disorders in primary pediatric practice.

Conclusion

Early identification of developmental disorders in children is very important for timely corrective intervention and treatment. The introduction of the ASQ-3 questionnaire as a compulsory clinical instrument in primary pediatric practice would enable early recognition of children with deviations from normative development, early stimulation of development would begin, and the needs for the re-evaluation, additional diagnostics and early intervention support would be determined. The results of our study suggest the efficiency and cost-effectiveness of screening programs for developmental disorders that could be implemented in routine pediatric practice and would be well received by both the parents and healthcare professionals, as well.

Competing interests

The authors declared no competing interests.

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PREGLEDNI RAD

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PROMENE NIVOA POLNIH HORMONA SA STARENJEM I NJIHOV UTICAJ NA GLAS

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SAŽETAK

Cilj ovog preglednog rada je da pruži uvid u savremena istraživanja etiologije, patofiziologije i simptomatologije promena u nivou hormona povezanih sa starenjem i njihovoj uzročno-posledičnoj vezi sa kvalitetom glasa, sa posebnim osvrtom na analizu različitih vrsta mutacija (*mutatio precox* i *mutatio perversa*), menstrualnih i klimakteričnih disfonija. Glas se smatra važnom sekundarnom seksualnom osobinom koja daje samostalan pečat karakteru i ličnosti pojedinca. Poremećaji endokrinog sistema u mnogim slučajevima utiču na kvalitet glasa i mogu da dovedu do brojnih patologija glasa. U poređenju sa muškim glasom, ženski glas ne prolazi kroz drastične promene u toku puberteta. Kod muškaraca, povećani nivoi testosterona i dihidrotestosterona tokom puberteta odgovorni su za povećanje hrskavice larinksa što prouzrokuje smanjenje bazalnog tona za trećinu oktave. Ukoliko dete prevremeno uđe u pubertet ova neravnoteža hormona dovešće do pojave patologije glasa - *mutation precox*. *Mutatio perversa* se javlja iznenada kod osoba ženskog pola i karakteriše je dubok muški glas i drugi znaci virilizacije. Pojava submukoznog krvarenja u periodu pre menstruacije i povećano lučenje estrogena koje dovodi do pojave edema prouzrokovaće *disfoniju premenstrualis*. Kvalitet glasa u ovom periodu karakteriše vokalni zamor, smanjen opseg glasa sa gubitkom visokih tonova, gubitak vokalne snage i pojava hrapavosti glasa. Menopauzni vokalni sindrom karakteriše se smanjenom fleksibilnošću i smanjenim opsegom vibracione amplitude. Može se zaključiti da su glasnice ciljani organ, osetljiv na fluktuaciju u nivou polnih hormona usled fiziološkog procesa starenja i nastalih endokrinih poremećaja tokom života.

Ključne reči: polni hormoni, poremećaji glasa, glas i starenje

Uvod

Glas se smatra važnom sekundarnom polnom osobinom koja daje samostalan pečat karakteru i ličnosti pojedinca. U dubokom uticaju polnih hormona na karakteristike glasa posreduju hormonski receptori prisutni u glasovnom aparatu (1). Laringealne strukture su izložene spoljašnjem okruženju, što stalno dovodi do glasovnih promena (2).

Nivo hormona u ljudskom telu se menja sa godinama. Promene u nivou hormona koje se javljaju tokom starenja tela razlikuju se kod muškaraca i žena. Iako u telu postoji mnogo hormona, postoje dokazi koji ukazuju na to da promene u nivou polnih hormona, hormona štitne žlezde i hipofize imaju direktan uticaj na glas (3).

Ljudski glas je usko povezan sa endokrinim sistemom pojedinca. Gonadni i tiroidni hormoni igraju glavnu ulogu u promenama glasa, a sve druge hormonske osovine igraju manju ulogu u proizvodnji glasa. Hormonski uticaj na glas traje tokom čitavog života pojedinca i različit je kod muškaraca i žena. Ove promene su posebno važne kod vokalnih profesionalaca kao što su nastavnici i pevači. U tom smislu, kliničari treba da imaju visok indeks sumnje da identifikuju endokrinu abnormalnost sa neobjašnjivom promenom glasa (4).

Kada endokrine žlezde odstupe od normalnog funkcionisanja, mnoge funkcije u telu osećaju posledice. Poremećaji endokrinog sistema u mnogim slučajevima utiču na kvalitet glasa i mogu dovesti do brojnih patologija. Najčešći poremećaji glasa uzrokovani poremećajima u lučenju polnih hormona su: različite vrste mutacija (*mutatio precox* i

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REVIEW ARTICLE

CHANGES IN THE LEVEL OF SEX HORMONES WITH AGING AND THEIR INFLUENCE ON THE VOICE

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SUMMARY

The aim of this study is to review modern literature to provide an insight into contemporary research into the etiology, pathophysiology and symptomatology of changes in hormone levels associated with aging and their pattern-consequential relationship with voice quality, with special reference to the analysis of different types of mutations (*mutatio precox* and *mutatio perversa*), menstrual and climacteric dysphonia. The criteria for inclusion of works obtained from the search were: works published during the last 15 years, published in English. Compared to the male voice, the female voice does not go through drastic changes during puberty. In males, the increased levels of testosterone and dihydrotestosterone during puberty are responsible for the enlargement of the laryngeal cartilage, which causes the basal tone to decrease by a third of an octave. If the child enters puberty prematurely, this hormone imbalance will lead to the appearance of voice pathology - mutation precox. *Mutatio perversa* occurs suddenly in females and is characterized by a deep male voice and other signs of virilization. The appearance of submucosal bleeding in the period before menstruation and the increased secretion of estrogen that leads to the appearance of edema will cause premenstrual dysphonia. Voice quality in this period is characterized by vocal fatigue, reduced voice range with loss of high tones, loss of vocal power and hoarseness of voice. Menopausal vocal syndrome is characterized by reduced flexibility and a reduced range of vibrational amplitude. It can be concluded that the vocal cords are a target organ, sensitive to fluctuations in the level of sex hormones due to the physiological aging process and the resulting endocrine disorders during life.

Key words: sex hormones, voice disorders, voice and aging

Introduction

The voice is considered an important secondary sexual trait that gives an independent seal to the character and personality of the individual. The profound influence of sex hormones on voice characteristics is mediated by hormone receptors present in the vocal apparatus (1). Laryngeal structures are exposed to the external environment, which constantly leads to voice changes (2).

The level of hormones in the human body changes with age. Changes in the level of hormones that occur during the aging of the body differ between men and women. Although there are many hormones in the body, there is evidence to suggest that changes in the levels of sex hormones, thyroid and pituitary hormones have direct effects on the voice (3).

The human voice is closely related to the endocrine system of the individual. Gonadal and thyroid hormones play a major role in voice changes, and all other hormonal axes play a minor role in voice production. The hormonal influence on the voice lasts throughout an individual's lifetime and is different for men and women. These changes are especially important in vocal professionals such as teachers and singers. In this regard, clinicians should have a high index of suspicion to identify an endocrine abnormality with an unexplained voice change (4).

mutatio perversa), menstrualna disfonija i klimakterijska disfonija (5).

Cilj ove studije je pregled savremene literature kako bi se pružio uvid u najnovija istraživanja etiologije, patofiziologije i simptomatologije promena nivoa hormona povezanih sa starenjem i njihovog uzročno-posledičnog odnosa sa kvalitetom glasa, sa posebnim osvrtom na analizu različitih vrsta mutacija (*mutatio precox* i *mutatio perversa*), menstrualnu i klimakterijsku disfoniju.

Metode

U ovom preglednom radu pretražene su elektronske baze podataka *Google Scholar* napredne pretrage i Konzorcijuma biblioteka Srbije za objedinjenu nabavku - KoBSON. U pretrazi su korišćene sledeće ključne reči i fraze: endokrini poremećaji, polni hormoni, polni hormoni i poremećaji glasa, *mutatio falsa*, *mutation precox*, *mutation perversa*, menstrualni disfonični poremećaj, klimakterijska disfonija, starenje i poremećaji glasa. Kriterijumi za uključivanje radova dobijenih pretraživanjem su bili: radovi objavljeni tokom poslednjih 15 godina, objavljeni na srpskom ili engleskom jeziku. Uključeni su u studiju svi radovi koji predstavljaju savremena istraživanja etiologije, patofiziologije i simptomatologije promena nivoa hormona povezanih sa starenjem i njihovog uzročno-posledičnog odnosa sa kvalitetom glasa, sa posebnim osvrtom na analizu različitih tipova mutacija (*mutatio precox* i *mutatio perversa*), menstrualni disfonični poremećaj i klimakterijska disfonija.

Mutacija glasa tokom puberteta - rane mutacije glasa (lat. *mutatio precox*)

Pre puberteta, devojčice i dečaci imaju približno isti raspon glasa. Tokom puberteta, larinks se diferencira i glas prolazi kroz promene koje se obično dešavaju u ovoj fazi. Glasovne promene kod devojčica se javljaju u dve vremenske faze. Između 7. i 8. godine kada glas opada za nekoliko oktava i između 16. i 17. godine kada glas postaje definitivan (6).

Prevremeni pubertet se definiše kao pojava prvih znakova puberteta kod devojčica pre sedme godine, a kod dečaka pre devete godine. Promene koje prate početak puberteta javljaju se znatno ranije, a uzrokovane su povećanim lučenjem hormona estrogena kod devojčica i progesterona kod dečaka, što je posledica povećane aktivnosti gonada stimulisanih gonadotropinima hipofize (7).

Kod muškaraca, povećani nivoi testosterona i dihidrotestosterona tokom puberteta su odgovorni za povećanje hrskavice larinksa. Polni hormoni omogućavaju smanjenje bazalnog tona za trećinu oktave. Ovo povećanje je praćeno povećanom mišićnom masom laringealnih ligamenata, što dovodi do pada visine glasa za oko jednu oktavu. Kako se larinks menja kod muškaraca u seksualnom razvoju, povremeno se lomi i glas (8,9). Tokom puberteta, promene u glasu žene su manje očigledne. Ženski glas ne prolazi kroz tako drastične promene u odnosu na muški (9).

Ova vrsta mutacije se javlja kao deo sindroma preranog puberteta, koji se može javiti kod oba pola. Glas dece sa preranim pubertetom dobija karakteristike glasa odrasle osobe, što izaziva iznenađenje kod slušalaca. Razni su uzroci ovih pojava i endokrinolozi se prvenstveno bave njima. Fonopedska rehabilitacija se sprovodi po potrebi i u dogovoru sa drugim specijalistima (5).

Perverzna mutacija glasa (lat. *mutatio perversa*)

Ovaj oblik mutacije nastaje kada se kod žene iznenada pojavi dubok muški glas i drugi znaci virilizacije. Ovaj simptom se često smatra prvim ranim znakom ozbiljne endokrine bolesti. Ukoliko je moguće lečiti osnovnu bolest i lečenje započeti na vreme, moguća je uspešna rehabilitacija glasa, ali ako je osnovna bolest dugotrajna i promene na larinksu stabilne, nemoguće je izvršiti rehabilitaciju glasa (5).

Menstrualni disfonični poremećaj

U životnom ciklusu svake žene postoje tri faze, a to su: predmenstrualna, menstrualna i postmenstrualna faza. U svakoj od ovih faza, fiziološki je normalno da dođe do promene u glasu svake žene, ali u nekim slučajevima može doći do patoloških promena glasa kao posledica hormonske neravnoteže (10).

Predmenstrualni period karakterišu brojni simptomi povezani sa promenama u kvalitetu glasa, od kojih je najčešći smanjenje tona. Usled povećanog nivoa estrogena u predmenstrualnom periodu javlja se predmenstrualni sindrom (PMS), koji se karakteriše epizodama razdražljivosti, osetljivosti dojki, pojačanog refluksa, anksioznosti i pojave edema. U sklopu ovih simptoma, kod

When endocrine glands deviate from normal functioning, many functions in the body feel the consequences. Disorders of the endocrine system in many cases affect the quality of the voice and can lead to numerous pathologies. The most common voice disorders caused by disorders in the secretion of sex hormones are: different types of mutations (*mutatio precox* and *mutatio perversa*), menstrual dysphonia and climacteric dysphonia (5). The aim of this study is to review modern literature to provide an insight into contemporary research into the etiology, pathophysiology and symptomatology of changes in hormone levels associated with aging and their pattern-consequential relationship with voice quality, with special reference to the analysis of different types of mutations (*mutatio precox* and *mutatio perversa*), menstrual and climacteric dysphonia.

Methods

In this review study, the electronic databases of Google Scholar Advanced Search and the Consortium of Serbian Libraries for Unified Procurement - KoBSON were searched. The following keywords and phrases were used in the search: endocrine disorders, sex hormones, sex hormones and voice disorders, *mutatio falsa*, *mutation precox*, *mutation perversa*, menstrual dysphonia, climacteric dysphonia, aging and voice disorders. The criteria for inclusion of works obtained from the search were: works published during the last 15 years, published in Serbian or English. Papers have been collected that present contemporary research into the etiology, pathophysiology and symptomatology of changes in hormone levels associated with aging and their pattern-consequential relationship with voice quality, with special reference to the analysis of different types of mutations (*mutatio precox* and *mutatio perversa*), menstrual and climacteric dysphonia.

Voice mutation during puberty - Early voice mutations (lat. *mutatio precox*)

Before puberty, girls and boys have about the same range of voice. During puberty, the larynx differentiates and the voice undergoes changes that normally occur at this stage. Voice changes in girls occur in two time phases. Between the ages of 7 and 8 when the voice drops a few octaves and between the ages of 16 and 17 when the voice becomes definitive (6).

Premature puberty is defined as the appearance of the first signs of puberty in girls before the age of seven, and in boys before the age of nine. The changes that accompany the onset of puberty appear much earlier, and are caused by the increased secretion of estrogen hormones in girls and progesterone hormones in boys, which is a consequence of the increased activity of the gonads stimulated by pituitary gonadotropins (7).

In males, increased levels of testosterone and dihydrotestosterone during puberty are responsible for the enlargement of the laryngeal cartilage. Sex hormones make it possible to reduce the basal tone by a third of an octave. This increase is accompanied by an increased muscle mass of the laryngeal ligaments, which leads to a drop in voice pitch by about one octave. As the larynx changes in sexually developing males, the voice occasionally breaks (8,9). During puberty, the changes in a woman's voice are less obvious. The female voice does not go through such drastic changes compared to the male voice (9).

This type of mutation occurs as part of the syndrome of precocious puberty, which can occur in both sexes. The voice of children with precocious puberty acquires the characteristics of an adult's voice, which causes surprise in listeners. There are various causes of these phenomena and endocrinologists primarily deal with them. Phonopedic rehabilitation is carried out as needed and in agreement with other specialists (5).

Perverse voice mutation (lat. *mutation perversa*)

This form of mutation occurs when a deep male voice and other signs of virilization suddenly appear in a female. This symptom is often considered the first early sign of a serious endocrine disease. If it is possible to treat the underlying disease and the treatment starts on time, successful voice rehabilitation is possible, but if the underlying disease is long-lasting and the changes in the larynx are stable, it is impossible to perform voice rehabilitation (5).

Menstrual dysphonic disorder

There are three phases in the life cycle of every woman, namely: the premenstrual phase, the menstrual phase and the postmenstrual phase. In each of these phases, it is physiologically normal

predmenstrualnog sindroma mogu se javiti brojne promene u kvalitetu glasa, koje označavamo pojmom predmenstrualni glasovni sindrom ili premenstrualna disfonija (11). Postoji nekoliko uzroka koji mogu dovesti do ovog stanja, a neki od njih su pojava submukoznog krvarenja u periodu pre menstruacije i pojačano lučenje estrogena što dovodi do pojave edema. Ove pojave izazivaju kretanje tečnosti iz unutrašnjosti ćelija i kapilara ka spolja. Vremenski period pre pojave prve menstruacije takođe je praćen značajnim promenama u glasu. Jedna od najuočljivijih promena je nemogućnost proizvodnje visokih tonova (6). Sam tok predmenstrualne faze praćen je raznim promenama kao što su suve glasne žice, povećan nivo kiselosti povezan sa refluksom jednjaka, smanjen tonus mišića larinksa, edem glasnih žica i proširenje vena. Neke od karakteristika glasa su: zamor glasa, smanjen opseg glasa sa gubitkom visokih tonova, gubitak vokalne snage, promukao glas. Osim toga, mogu se javiti: nervoza, bol u stomaku, nadimanje, kratkotrajna depresija, promena apetita i slično (12).

Ženski glas prolazi kroz ciklične promene tokom menstrualnog ciklusa. Početak menstrualnog ciklusa, folikularne faze, obeležava povećana količina estrogena i znatno niži nivo progesterona. Kombinacija ovih hormona je odgovorna za formiranje edema na glasnicama i povećan protok krvi u ovim strukturama (13). Polisaharidi u glasnicama se lakše razgrađuju i vezuju vodu, produbljujući tečnost koja se akumulira u glasnim naborima. Krvni sudovi u nosnom kanalu se takođe šire, što dovodi do promena u propustljivosti vazduha tokom fonacije (11). U drugoj polovini menstrualnog ciklusa, lutealnoj fazi, nivo progesterona dostiže najviši nivo u odnosu na nivo estrogena. Progesteron podstiče gubitak epitela larinksa i deluje protiv proliferacije. Ovo čini sekreciju žlezda viskoznijim, što dovodi do smanjenja vibracione efikasnosti i mogućnosti povećanja oštećenja ćelija glasnih žica. Ove promene su odgovorne za promene glasa tokom menstrualnog ciklusa (13). Ako žena ima bolne menstruacije i grčeve tokom menstrualnog ciklusa u predelu stomaka, može doći do promena u kvalitetu fonacije, zbog čega glas postaje tiši i slabiji, a govor je prekinut (11).

Kod žena se glas menja i tokom trudnoće pod uticajem hormona (14,15). Period trudnoće se redovno deli na trimestre. Glas žene u prvom i drugom mesecu trudnoće je u skladu sa referentnim vrednostima glasa. Međutim, ulaskom u treći mesec dolazi do promene glasa. Promene nastaju jer usled rasta ploda dolazi do pojačanog pritiska na disajne organe, čime se gubi oslonac organa za disanje neophodan za fonaciju, a glas gubi snagu i kvalitet. Dalje, u četvrtom i petom mesecu, usled rasta materice, dolazi do gastroezofagealnog refluksa. Gastroezofagealni refluks utiče na promene glasa, koje najčešće karakteriše promuklost (15).

Istraživanja o samoproceni kvaliteta glasa kod žena tokom menstrualnog ciklusa pokazuju da same ispitanice uočavaju promene u kvalitetu glasa u pojedinim fazama ciklusa. Žene ističu da im je glas adekvatnog kvaliteta, u sredini menstrualnog ciklusa, kada je lučenje estrogena i progesterona približno jednako (12).

Klimakterična disfonija

Oko četrdesete godine smanjuje se nivo hormona koji proizvode jajnici. Kada broj hormona padne ispod nivoa koji dovodi do menstruacije, dolazi do pojačanog lučenja luteinizirajućeg i folikulostimulirajućeg hormona i do izostanka menstruacije (16,17).

Menopauza predstavlja poslednje fizičko krvarenje iz materice, koje se javlja oko 51. godine, a najčešće između 48. i 58. godine. Tada dolazi do smanjenog lučenja estrogena i progesterona i poremećena je njihova ravnoteža (17). Za razliku od dramatičnog pada estrogena tokom menopauze kod žena, koncentracija testosterona kod muškaraca postepeno opada sa godinama. Procenjuje se da oko 30% muškaraca starijih od 60 godina ima nizak nivo testosterona, što je često praćeno simptomima kao što su prekomerno taloženje masti, niska koštana i mišićna masa i oštećena seksualna, kognitivna i fizička funkcija (1,18). Kako ljudsko telo stari, bilo da je reč o patološkim procesima ili starenju kao normalnom fiziološkom procesu, dolazi do promena u glasu. Kada govorimo o ženskom polu, normalna karakteristika starosti je početak menopauze. Hormonske promene su vidljive i tokom menopauze i posle nje. Usled procesa starenja, mišići larinksa se smanjuju, hrskavice okoštavaju i glasne žice su zadebljane (16).

Neki od prvih simptoma početka menopauze su umor, iscrpljenost, depresija, poremećaj sna i iznenadni talasi vrućine, koji su obično uzrokovani proširenim krvnim sudovima. Talasi vrućine su uzrokovani promenama u hipotalamusu. Nekoliko godina nakon završetka menopauze dolazi do promena na koži i kosi, slabljenja kognitivnih

for changes to occur in the voice of every woman, but in some cases, voice pathologies may appear as a result of hormonal imbalance (10).

The premenstrual period is characterized by numerous symptoms associated with changes in the quality of the voice, the most common of which is a decrease in pitch. Due to the increased level of estrogen in the premenstrual period, Premenstrual Syndrome (PMS) occurs, which is characterized by episodes of irritability, breast tenderness, increased reflux, anxiety and the appearance of edema. As part of these symptoms, in the premenstrual syndrome, numerous changes in voice quality can appear, which we denote by the term premenstrual voice syndrome or *dysfonia premenstrualis* (11). There are several causes that can lead to this condition, and some of them are the appearance of submucosal bleeding in the period before menstruation and the increased secretion of estrogen that leads to the appearance of edema. These phenomena cause the movement of fluid from the inside of cells and capillaries to the outside. The time period before the appearance of the first menstruation is also accompanied by significant changes in the voice. One of the most noticeable changes is the inability to produce high tones (6). The course of the premenstrual phase itself is accompanied by various changes such as too dry vocal cords, increased level of acidity associated with esophageal reflux, decreased tone of laryngeal muscles, edema of the vocal cords, venous dilatation. Some of the voice characteristics are: vocal fatigue, reduced voice range with loss of high tones, loss of vocal power, hoarse voice. In addition, the following can occur: nervousness, stomach pain, flatulence, short-term depression, changes in appetite and the like (12).

A woman's voice goes through cyclical changes during the menstrual cycle. The beginning of the menstrual cycle, the follicular phase, is marked by an increased amount of estrogen and a significantly lower level of progesterone. The combination of these hormones is responsible for the formation of edema on the vocal folds and increased blood flow in these structures (13). Polysaccharides in the vocal folds break down more easily and bind water, deepening the liquid that accumulates in the vocal folds. Blood vessels in the nasal canal also dilate, resulting in changes in air permeability during phonation (11). In the second half of the menstrual cycle, the luteal phase, the level of progesterone reaches its highest level in relation to the level of estrogen. Progesterone promotes loss of laryngeal epithelium and acts against proliferation. This makes the secretions of the glands more viscous, leading to a decrease in vibrational efficiency and the possibility of increased damage to the vocal cord cells. These changes are responsible for voice changes during the menstrual cycle (13). If a woman has painful periods and cramps during the menstrual cycle in the abdominal area, there may be changes in the quality of phonation, making the voice quieter and weaker, and speech interrupted (11).

In women, the voice also changes during pregnancy under the influence of hormones (14,15). The pregnancy period is regularly divided into trimesters. The voice of a woman in the first and second month of pregnancy is in accordance with the reference values of the voice. However, entering the third month, there is a change in voice. The changes occur because due to the growth of the fruit, there is increased pressure on the respiratory organs, which loses the support of the respiratory organs necessary for phonation, and the voice loses its strength and quality. Furthermore, in the fourth and fifth months, due to the growth of the uterus, gastroesophageal reflux occurs. Gastroesophageal reflux affects voice changes, which are most often characterized by hoarseness (15).

Research on self-assessment of voice quality in women during the menstrual cycle shows that the respondents themselves notice changes in voice quality in certain phases of the cycle. Women emphasize that their voice is of adequate quality, in the middle of the menstrual cycle, when the secretion of estrogen and progesterone is approximately equal (12).

Climacteric dysphonia

Around the age of forty, the level of hormones produced by the ovaries decreases. When the number of hormones falls below the level that leads to menstruation, there is increased secretion of luteinizing and follicle-stimulating hormone and absence of menstruation (16,17).

Menopause represents the last physical bleeding from the uterus, which occurs around the age of 51, and most often between the ages of 48 and 58. At that time, there is a reduced secretion of estrogen and progesterone and their balance is

funkcija, posebno pažnje i pamćenja. Menopauza može biti jedan od uzroka vaskularnih oboljenja i osteoporoze (19). U ovom procesu najveće promene se primećuju u larinksu. Javlja se edem, atrofija mišića larinksa, redukcija i degeneracija vlakana koja inerviraju larinks, osifikacija i kalcifikacija hrskavice, degeneracija krikoaritenoidnog zgloba i stanjivanje lamine propria (20).

Skup svih vokalnih simptoma koji uključuju menopauzu naziva se menopauzalni vokalni sindrom. Sastoji se od: smanjenog vokalnog intenziteta, zamora glasa, smanjenog dometa glasa, gubitka visokih tonova, opšteg gubitka kvaliteta glasa, vokalne disfunkcije, suvoće glasnih žica, učestalog kašljanja za pročišćavanje grla, smanjene frekvencije glasa, grubog i promuklog glasa. Prilikom laringoskopskog pregleda uočava se poremećaj funkcije i strukture glasnih žica. Oštećenu funkciju karakteriše smanjena fleksibilnost i smanjen opseg amplitude vibracija. Krikoaritenoidni zglob obavlja svoju funkciju normalno, ali mnogo sporije, zbog gubitka fleksibilnosti ligamenata i prisustva artroze u nekim slučajevima. Poremećaj u strukturi glasnih žica karakteriše njihova asimetrija i jednostrana i bilateralna atrofija mišića (10).

Poslednjih godina sve je češća primena hormonske supstitucione terapije (HST) za žene u menstrualnom i postmenstrualnom periodu. Na ovaj način se povećava mogućnost ograničavanja nekih neželjenih promena koje se javljaju u menopauzi, uključujući i one vezane za glas. Problemi sa ovom terapijom nastaju kada se prepisuju estrogen i progesteron. Poznato je da stimulacija estrogenom dovodi do zadebljanja epitela koji pokriva glasnicu, a stimulacija progesteronom izaziva promene u centralnom sloju lamine proprije u vokalnim naborima. Izgleda da su promene glasa povezane sa ravnotežom ovih hormona i postoje jasni dokazi da su neke žene koje koriste HST svesne izmenjenih karakteristika glasa. Takođe, ne treba zaboraviti da je menopauza, nezavisno od svojih fizičkih efekata, velika promena u životu žene koja se često dovodi u vezu sa promenama u porodičnom okruženju (samostalnost dece i njihovo napuštanje porodičnog doma, gubitak najmilijih, odlazak u penziju) rezultiraju osećanjima koja takođe mogu uticati na promene u kvalitetu glasa (18).

Starenjem hormoni mogu izazvati češću pojavu gastroezofagealnog refluksa usporavanjem pokretljivosti želuca. Zajedno sa hormonskim promenama nakon menopauze, efekti starenja postaju očigledni nakon menopauze. Mišići larinksa se skupljaju, hrskavice očvršćavaju i na kraju okoštavaju, glasne nabore postaju deblje, a količina kolagenih vlakana se smanjuje, što dovodi do ukrućenja glasnog aparata (21). Može se javiti i gluvoća kod starijih, koja takođe može u velikoj meri poremetiti funkciju govora (22).

Zaključak

Ljudski glas je tokom života podložan hormonskim promenama, od puberteta do starosti. Gonadni hormoni imaju ogroman uticaj na strukturu i funkciju vokalnog aparata. Promena glasa se primećuje čak i u fiziološkim stanjima kao što su pubertet i menstruacija. Poslednjih godina vokalni patolozi sve češće upućuju pacijente kod endokrinologa. Ova sve češća pojava može se povezati sa činjenicom da prvi simptomi endokrinih poremećaja polnih hormona utiču na kvalitet glasa. S tim u vezi, neophodan je multidisciplinarni pristup evaluaciji i terapiji endokrinih poremećaja i rehabilitaciji glasa.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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disturbed (17). Unlike the dramatic drop in estrogen during menopause in women, testosterone concentrations in men gradually decline with age. It is estimated that approximately 30% of men aged 60 years or older have low testosterone, which is often accompanied by symptoms such as excess fat deposition, low bone and muscle mass, and impaired sexual, cognitive, and physical function (1,18). As the human body ages, whether it is pathological processes or aging as a normal physiological process, there are changes in the voice. When we talk about the female sex, a normal feature of old age is the onset of menopause. Hormonal changes are visible both during menopause and after it. Due to the aging process, the laryngeal muscles decrease, the cartilages ossify and the vocal cords are thickened (16).

Some of the first symptoms of the onset of menopause are fatigue, exhaustion, depression, sleep disturbances and sudden hot flashes, which are usually caused by dilated blood vessels. Hot flashes are caused by changes in the hypothalamus. A few years after the end of menopause, there are changes in the skin and hair, weakening of cognitive functions, especially attention and memory. Menopause can be one of the causes of vascular diseases and osteoporosis (19). In this process, the biggest changes are observed in the larynx. There is edema, atrophy of laryngeal muscles, reduction and degeneration of fibers that innervate the larynx, ossification and calcification of cartilages, degeneration of the cricoarytenoid joint and thinning of the lamina propria (20).

The set of all vocal symptoms that include menopause is called Menopausal Vocal Syndrome. It consists of: reduced vocal intensity, vocal fatigue, reduced voice range, loss of high tones, general loss of voice quality, vocal dysfunction, dryness of the vocal cords, frequent coughing to clear the throat, reduced voice frequency, rough and hoarse voice. During the laryngoscopic examination, a disturbance in the function and structure of the vocal cords is observed. Impaired function is characterized by reduced flexibility and a reduced range of vibration amplitude. The cricoarytenoid joint performs its function normally, but much more slowly due to the loss of flexibility of the ligaments and the presence of arthrosis in some cases. The disorder in the structure of the vocal cords is characterized by their asymmetry and unilateral and bilateral muscle atrophy (10).

In recent years, the use of hormone replacement therapy HRT - (Hormone replacement therapy) for women in the menstrual and postmenstrual period has become increasingly common. In this way, the possibility of limiting some of the unwanted changes that appear in menopause, including those related to the voice, increases. Problems with this therapy appear when estrogen and progesterone are prescribed. It is known that estrogen stimulation results in thickening of the covering epithelium of the vocal fold, and progesterone stimulation causes changes in the central layer of the laminae propria in the vocal folds. Voice changes appear to be related to the balance of these hormones and there is clear evidence that some women using HRT are aware of altered voice characteristics. We should also not forget that menopause is independent of its physical effects, a major change in a woman's life that is often associated with changes in the family environment (independence of children and their leaving the family home, loss of loved ones, retirement) that result in feelings that can also affect changes in voice quality (18).

With aging, hormones can cause more frequent occurrence of gastroesophageal reflux by slowing down the motility of the stomach. Along with hormonal changes after menopause, the effects of aging become apparent after menopause. The muscles of the larynx shrink, the cartilages harden and eventually ossify, the vocal folds become thicker, and the amount of collagen fibers decreases, which leads to a stiffening of the vocal apparatus (21). Elderly deafness can occur, which can also greatly disturb the function of speech (22).

Conclusion

The human voice is subject to hormonal changes throughout life, from puberty to old age. Gonadal hormones have a huge impact on the structure and function of the vocal apparatus. Voice change is observed even in physiological states such as puberty and menstruation. In recent years, vocal pathologists have increasingly referred patients to endocrinologists. This increasingly frequent phenomenon can be connected with the fact that the first symptoms of endocrine disorders of sex hormones have an impact on the quality of the voice. In this regard, a multidisciplinary approach to the evaluation and therapy of endocrine disorders and voice rehabilitation is necessary.

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Competing interests

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SLEPE I SLABOVIDE OSOBE U ZDRAVSTVENOJ ZAŠTITI: ANALIZA PROBLEMA I POTENCIJALNIH REŠENJA

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SAŽETAK

Cilj ovog preglednog rada je da se na osnovu relevantnih naučnih izvora analiziraju problemi sa kojima se slepi i slabovidi ljudi suočavaju u zdravstvenoj zaštiti, kao i da se identifikuju mogućnosti za rešenja ovih izazova. Slepilo i slabovidost predstavljaju ozbiljna zdravstvena stanja koja mogu značajno uticati na kvalitet života pojedinca. Ove osobe se često suočavaju sa brojnim izazovima prilikom pristupa zdravstvenoj zaštiti. Pristupačnost fizičkog okruženja, komunikacija sa zdravstvenim radnicima, pristup informacijama i korišćenje medicinskih uređaja su neki od ključnih problema. Kroz primenu tehnološkog rešenja, obuku zdravstvenih radnika, pružanje pristupačne komunikacije i informacija, kao i uključivanje slepih i slabovidih osoba u planiranje zdravstvene zaštite, može se unaprediti pristup zdravstvenoj zaštiti za ove osobe.

Ključne reči: slepi, slabovidi, zdravstvena zaštita, kvalitet života

Uvod

Prema međunarodnoj klasifikaciji bolesti oštećenja vida se klasifikuju u dve grupe: oštećenje vida na daljinu (blago, umereno, teško oštećenje i slepilo) i oštećenje vida na blizinu (1). Procenjuje se da oko 2,2 milijarde ljudi širom sveta ima neku formu oštećenja vida, od toga skoro polovina ima oštećenje vida na blizinu (1). Verovatnoća oštećenja vida raste sa godinama među svim populacijama, posebno kod starijih od 60 godina (2). Najčešći uzroci oštećenja vida su katarakta, nekorigovana greška refrakcije, glaukom, starosna degeneracija makule i dijabetička retinopatija. Prevalencija, kao i težina oštećenja vida, varira u različitim geografskim područjima u zavisnosti od etiologije, starosti, rase, etničke pripadnosti i pola, stavljajući određene populacije u veći rizik za određene vrste gubitka vida (1,2). Kako na globalnom nivou stanovništvo stari, predviđa se da će se prevalencija slepila i slabovidosti udvostručiti u narednih 30 godina(3).

Prema podacima Evropskog saveza slepih (eng. *European Blind Uion* - EBU) za 2020. godinu u Republici Srbiji ima oko 1,4 miliona osoba sa oštećenim vidom, od toga oko 24.000 slepih osoba (4).

Vid utiče na to kako ljudi percepiraju i tumače svet oko sebe, koristi se za svakodnevnu komunikaciju, društvene i profesionalne aktivnosti, održavanje ličnog zdravlja, nezavisnosti i mobilnosti kao i brigu o drugima (2). Uticaji slepila i slabovidosti su širokog spektra, uključujući rizik od padova, kognitivnog oštećenja i demencije, depresije, invaliditeta i gubitka nezavisnosti (5,6). Njihov invaliditet dovodi do specifičnih potreba i povezan je sa većom incidencijom zdravstvenih problema i hroničnih bolesti, kao i nižim nivoom blagostanja, samoocenjivanja zdravlja i kvaliteta života u vezi sa zdravljem u poređenju sa opštom populacijom (7,8). Stariji ljudi često imaju komplikovanije zdravstvene potrebe od mlađih odraslih zbog dodatnog redukovanja funkcionalnih sposobnosti, fizičke bolesti i psihosocijalnih potreba. Neispunjene zdravstvene potrebe povećavaju težinu bolesti, komplikacije i smrtnost (9). Nekoliko studija navodi da su slepilo i slabovidost povezani sa povećanim rizikom od smrtnosti (10).

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REVIEW ARTICLE

BLIND AND VISUALLY IMPAIRED PERSONS IN HEALTH CARE: ANALYSIS OF PROBLEMS AND POTENTIAL SOLUTIONS

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SUMMARY

The aim of this review is to analyze, based on relevant scientific sources, the problems faced by blind and partially sighted people in health care, as well as to identify opportunities for solutions to these challenges. Blindness and visual impairment are serious health conditions that can significantly affect an individual's quality of life. These individuals often face numerous challenges when accessing health care. Accessibility of the physical environment, communication with healthcare professionals, access to information, and use of medical devices are some of the key issues. Improving access to health care can be realized through the application of technological solutions, education of health workers, provision of accessible communication and information, and the inclusion of blind and partially sighted people in health care planning.

Key words: blind, visually impaired, health care, quality of life

Introduction

The International Classification of Diseases 11 classifies vision impairment into two groups: distance (mild, moderate, severe impairment and blindness) and near-presenting vision impairment. Globally, at least 2.2 billion people worldwide have some form of visual impairment, of which nearly half have near vision impairment (1). The probability of vision impairment increases with age across all populations, especially among individuals aged 60 and above. The most common causes of visual impairment are cataracts, uncorrected refractive error, glaucoma, age-related macular degeneration, and diabetic retinopathy (2). The prevalence, and the severity of visual impairment, vary across geographic areas depending on etiology, age, race, ethnicity, and gender, placing some populations at greater risk for certain types of vision loss (1,2). As the global population ages, the prevalence of blindness and low vision is expected to double over the next 30 years (3).

According to the data of the European Blind Union (EBU), there are about 1.4 million visually impaired people in Serbia, of which about 24. 000 are blind (4).

Vision plays a crucial role in how individuals perceive and interpret the world, facilitating everyday communication, social interactions, professional activities, and overall well-being. It also enables personal health maintenance, independence, mobility, and caregiving responsibilities (2). The impacts of blindness and low vision are extensive, encompassing various risks such as falls, cognitive impairment, dementia, depression, disability, and loss of independence (5,6). People with visual disabilities have unique needs and experience a higher incidence of health problems and chronic conditions, along with lower levels of well-being, self-rated health, and health-related quality of life compared to the general population (7,8). Older individuals often encounter more complex health requirements compared to younger adults, as they may experience further functional decline, physical ailments, and psychosocial needs. Unmet healthcare needs contribute to increased disease

Osim toga, osobe sa vizuelnim oštećenjima, suočavaju se sa brojnim izazovima u pristupu zdravstvenoj zaštiti (6). Prema Svetskoj zdravstvenoj organizaciji jedna od glavnih prepreka u ostvarivanju zdravstvene zaštite za osobe sa invaliditetom je pristupačnost (1). Prema Zakonu o zdravstvenoj zaštiti, načelo pristupačnosti zdravstvene zaštite podrazumeva obezbeđivanje odgovarajuće zdravstvene zaštite građanima, koja je fizički, komunikacijski, geografski i ekonomski dostupna, odnosno kulturološki prihvatljiva, a posebno osobama sa invaliditetom (11). Uprkos tome što se populacija i zdravstveni sistemi u različitim zemljama sasvim sigurno razlikuju na mnogo načina, pristupačnost zdravstvene zaštite za slepe i slabovide širom sveta je često izazov zbog različitih prepreka sa kojima se ove osobe suočavaju.

Cilj ovog preglednog rada je da se na osnovu relevantnih naučnih izvora analiziraju problemi sa kojima se slepi i slabovidi ljudi suočavaju u zdravstvenoj zaštiti, kao i da se identifikuju mogućnosti za rešenja ovih izazova.

Problemi sa kojima se suočavaju slepi i slabovidi u zdravstvenoj zaštiti

Komunikacijski problemi

Komunikacija predstavlja ključni deo pružanja zdravstvene usluge, međutim, mnogi zdravstveni radnici nemaju iskustva u radu sa slepim i slabovidim osobama, što može dovesti do poteškoća u komunikaciji sa njima (6). Jedan od ključnih problema je nedostatak prilagođenog načina informisanja (12). Na primer, osobe sa oštećenim vidom mogu imati problem u razumevanju pisanih uputstava, potvrđivanju svojih ličnih podataka, čitanju napisa na lekovima ili razumevanju upustva za korišćenje, što može dovesti do grešaka u uzimanju lekova i pogoršanja zdravstvenog stanja (6,12). Većina informacija u vezi sa zdravljem dostupna je u vizuelnom formatu, kao što su brošure, leci, plakati, a to je problem za slepe i slabovide. Pored toga, informacije koje se odnose na procedure prijema u bolnicu, informacije pre prijema, formulare za pristanak za operaciju i procedure, opšte informacije o bolničkim uslugama i osoblju, informacije o lekovima, takođe su u pisanom obliku (13). Nedostatak nezavisnog pristupa ovim informacijama stvara nepotrebnu zavisnost od drugih i ugrožava privatnost i dostojanstvo slepih osoba (7).

Osim toga, nedostatak obuke zdravstvenih radnika o adekvatnoj komunikaciji može dodatno otežati komunikaciju (6). Za razliku od fizičkog oštećenja, oštećenje vida je retko očigledno slučajnom posmatraču. Neki ljudi imaju dovoljno samopuzdanja da obaveste zdravstvene radnike o svojim poteškoćama, ali mnogima je, posebno starijim osobama, neprijatno što ne vide dobro. Mnogi će uzeti pisane informacije ili se potpisati, bez razumevanja šta je dogovoreno i bez postavljanja pitanja. Zdravstveni radnici treba da budu oprezni na suptilne znake koje osoba sa oštećenim vidom može imati u smislu ne uspostavljanja kontakta očima tokom razgovora, ili ne reagovanja kada im se nešto pruža i slično (6,7).

Nedostatak pristupačnih tehnologija

Nedostatak pristupačnih tehnologija za slepe i slabovide osobe u zdravstvenoj zaštiti predstavlja ozbiljan problem s kojim se suočavaju mnogi pacijenti širom sveta. Ovi nedostaci mogu imati negativan utivcaj na kvalitet i dostupnost zdravstvenih usluga za ove osobe, što može dovesti do nejednakosti u pristupu i lošijeg zdravlja. Jedan od glavnih izazova jeste pristup medicinskim informacijama (13). Mnoge zdravstvene ustanove nemaju pristupačne tehnologije za slepe i slabovide osobe, kao što su Brajevi pisači, govorni računari, tehnički uređaji za prevođenje teksta u govor (12) i druge tehnologije koje bi im olakšale pristup zdravstvenoj zaštiti (6).

Poteškoće prilikom korišćenja medicinskih uređaja i lekova

Slepim i slabovidim osobama može predstavljati izazov korišćenje medicinskih uređaja i lekova koji zahtevaju vizuelno uputstvo ili precizno doziranje (14). Većina medicinskih uređaja se oslanja na vizuelne prikaze ili interfejse, kao što su monitori, indikatori i uputstva. Medicinski uređaji često zahtevaju preciznu kontrolu i navigaciju, na primer, podešavanje parametara ili unošenje podataka (15). Uputstva za upotrebu medicinskih uređaja uglavnom su pisana i pružaju detaljne informacije o funkcionalnosti i postupku korišćenja. Zatim, identifikacije i oznake na medicinskim uređajima takođe se oslanjaju na vizuelne elelmente, kao što su natpisi ili simboli. Na primer, čitanje i upotreba insulinske pumpe ili pravilno doziranje lekova može biti teško za osobe sa oštećenim vidom (15,16). Zatim, mnogi uređaji za merenje krvnog

severity, complications, and mortality rates (9). Several studies have demonstrated that blindness and low vision are associated with a heightened mortality risk (10).

Individuals with visual impairments encounter numerous difficulties when it comes to accessing healthcare services (6). According to the World Health Organization, one of the primary barriers to healthcare for people with disabilities is accessibility (1). By the Law on Health Care, the principle of healthcare accessibility entails providing suitable healthcare to citizens that are physically, communicatively, geographically, and economically accessible, while also being culturally acceptable, particularly for individuals with disabilities (11). While populations and healthcare systems may vary across different countries, ensuring accessible healthcare for the blind and visually impaired remains a consistent challenge globally, given the diverse barriers faced by these individuals.

The aim of this review is to analyze, based on relevant scientific sources, the problems faced by blind and partially sighted people in health care, as well as to identify opportunities for solutions to these challenges.

Challenges faced by the blind and visually impaired in healthcare

Communication problems

Effective communication is a fundamental aspect of healthcare provision. Nonetheless, many healthcare professionals lack experience in effectively interacting with individuals who are blind or visually impaired, resulting in challenges in communication with this population. (6). One of the problems is the insufficient availability of adapted information resources (12). For example, individuals with visual impairments may have trouble understanding written instructions or confirming their personal information. They may also face challenges in reading medication labels or comprehending usage instructions, consequently increasing the risk of medication errors and exacerbating their health conditions (6,12). The majority of information is available in visual formats such as brochures, leaflets, and posters, which poses a challenge for the blind and visually impaired. Moreover, information regarding hospital admission procedures, pre-admission information, consent forms for surgery and procedures, general information about hospital services and staff, and medication information are also in written form (13). The lack of independent access to this information creates unnecessary dependence on others and compromises the privacy and dignity of blind individuals (7).

Moreover, the inadequate training of healthcare professionals in effective communication can exacerbate the challenges in interpersonal interaction (6). Unlike physical impairments, visual impairment is rarely evident to a casual observer. Some individuals may have enough confidence to inform healthcare professionals about their difficulties, but many, especially older individuals, may feel uncomfortable about their poor vision. Many will either rely on written information or remain silent, without understanding what has been agreed upon or asking questions. Healthcare professionals should be observant of subtle cues that individuals with visual impairment may display, such as avoiding eye contact during conversations or not acknowledging when something is being presented to them, among other signs (6,7).

Lack of accessible technologies

Many patients worldwide face a significant issue due to the absence of accessible technologies for individuals who are blind or visually impaired in healthcare. These deficiencies can hurt the quality and availability of healthcare services for these individuals, leading to disparities in access and poorer health outcomes. One of the main challenges is accessing medical information (13). Many healthcare institutions do not have accessible technologies for blind and visually impaired individuals, such as Braille printers, speech-enabled computers, text-to-speech translation devices (12), and other technologies that would facilitate their access to healthcare (6).

Difficulties in using medical devices and drugs

Using medical devices and medications that require visual instructions or precise dosage can pose challenges for individuals who are blind or visually impaired (14). Most medical devices rely on visual displays or interfaces, such as monitors, indicators, and instructions. Medical devices often require precise control and navigation, such as adjusting parameters or inputting data (15). User manuals for medical devices are almost entirely

pritiska nisu prilagođeni za osobe sa invaliditetom, što može dovesti do netačnih merenja i neadekvatnog lečenja i nege (17).

Fizičke prepreke

Slepim i slabovidim osobama može biti teško snalaženje u fizičkom okruženju zdravstvenih ustanova, uključujući stepenice, nepravilno postavljene ili nedostajuće oznake, nedostatak taktilnih staza, kao i nedostatak pristupačnih informacija o rasporedu i uputstvima za kretanje. Slepi i slabovidi ljudi često se susreću sa neprilagođenim prostorima, opremom i informacijama u zatvorenim prostorima (18). Kretanje unutar bolnice može biti veoma teško zbog velikog broja pacijenata, medicinskih sestara, lekara i posetilaca, buke i mnogo prepreka, zbog čega im je veoma teško da se orijentišu i pronađu pravi put (19). To može uticati na njihovu sposobnost da se samostalno kreću po zdravstvenim ustanovama, što dovodi do pojačanog stresa i lične frustracije.Moderne bolnice su sve veće i složenije organizacije, u kojima se čini da se malo pažnje posvećuje pronalaženju puta za slepe osobe u ovim složenim okruženjima, a u većini je skoro nemoguće njihovo samostalno kretanje (20).

Potencijalna rešenja za probleme slepih i slabovidih u zdravstvenoj zaštiti

Na osnovu analize problema sa kojima se slepe i slabovide osobe suočavaju u zdravstvenoj zaštiti, identifikovana su potencijalna rešenja koja mogu unaprediti pristup i kvalitet zdravstvene zaštite za ove osobe.

Tehnološka rešenja

Implementacija tehnoloških rešenja može značajno poboljšati pristup zdravstvenoj zaštiti slepim i slabovidim osobama. Neka od tehnoloških rešenja mogu da budu razvoj mobilnih aplikacija sa podrškom za čitače ekrana i alternativnim formatima informacija, kao i upotreba tehnologija za prepoznavanje glasa i prevod teksta u govor kako bi se olakšala komunikacija sa zdravstvenim radnicima (14,21,22).

Obučavanje zdravstvenih radnika

Zdravstveni radnici treba da budu obučeni o potrebama slepih i slabovidih osoba, kao i o prilagođenim tehnikama komunikacije (23). Ova obuka treba da obuhvati upotrebu alternativnih sredstava za komunikaciju, kao i razumevanje kako pružiti podršku u fizičkom okruženju (14). Efikasna komunikacija zdravstvenih radnika sa slepim i slabovidim osobama podrazumeva nekoliko osnovnih principa. U vezi sa tim, važno je predstaviti se pacijentu imenom i ulogom u organizaciji, davati kratka jednostavna uputstva, ponuditi fizičku pratnju, voditi računa da mogu da prepoznaju neverbalne znakove, gestove ili informacije, odvojiti vreme da se pacijent informiše o fizičkom okruženju, obraćati se direktno pacijentu, a ne preko treće osobe, i slično (6,7,14). Ne pretpostavljati da osobe sa oštećenjem vida imaju manji nivo razumevanja ili autonomije od onih koji mogu da vide (22).

Dostupna komunikacija i informacije

Zdravstvene ustanove treba da osiguraju adekvatnu komunikaciju sa slepim i slabovidim osobama. To uključuje obezbeđivanje alternativnih sredstava komunikacije, kao što su Brajevo pismo, govorni prevodioci ili tehnološke aplikacije. Takođe je važno pružiti pristupačne informacije o dijagnozi, terapiji i uputstvima za lečenje i negu putem različitih formata, kao što su zvučni zapisi ili elektronski tekstovi (6,13,14).

Prilagođavanje fizičkog okruženja

U cilju prilagođavanja fizičkog okruženja ovim osobam neophodno je postavljanje taktilnih orijentacionih planova, podnih taktilnih traka za kretanje i orijentaciju na stepenicama i u hodnicima, taktilnih oznaka na vratima, ali i poboljšati kontrast boja za bolju vidljivost, instalirati sistem zvučnih obaveštenja i koristiti navigacioni sistem za olakšano kretanje. Neophodna je i obuka zdravstvenih radnika o tome kako pružiti podršku slepim i slabovidim osobama prilikom njihovog dolaska u zdravstvenu ustanovu (2,18,19).

Uključivanje slepih i slabovidih osoba u planiranje zdravstvene zaštite

Važno je da slepe i slabovide osobe budu aktivno uključene u proces planiranja zdravstvene zaštite. Ovo uključuje njihovo učešče u donošenju odluka, savetovanje i učenje o svojim pravima i mogućnostima. Ova inkluzivna praksa može osigurati da se njihove potrebe i izazovi uzmu u obzir prilikom razvoja politika i pružanja usluga (6,7,14).

Monitoring i evaluacija

Zdravstvene ustanove i relevatne organizacije treba da uspostave sistemsko praćenje i evaluaciju

written and provide detailed information on functionality and usage procedures. Additionally, identification and labels on medical devices also rely on visual elements, such as labels or symbols. For example, reading and using an insulin pump or correctly dosing medications can be challenging for individuals with visual impairments (15,16). Furthermore, people with disabilities often face difficulties as many blood pressure monitoring devices are not adapted to their needs, potentially resulting in inaccurate measurements and inadequate treatment and care (17).

Physical barriers

Navigating the physical environment of healthcare institutions, including encountering stairs, improperly placed or missing signage, the absence of tactile paths, and inaccessible scheduling information and directions, can pose significant challenges for people with visual impairments. Moreover, within indoor settings, individuals who are blind or visually impaired often encounter spaces, equipment, and information that do not accommodate their specific needs (18). Moving within a hospital environment can be exceptionally difficult due to the large number of patients, nurses, doctors, and visitors, as well as the presence of noise and numerous obstacles. This makes it difficult for individuals to orient themselves and find the correct paths to follow (19). Consequently, their ability to independently navigate healthcare facilities is compromised, leading to increased stress and personal frustration. In the case of modern hospitals, which are growing in size and complexity, there is often a lack of attention given to creating pathways that facilitate independent navigation for blind individuals within these intricate settings (20).

Potential solutions for the issues faced by blind and visually impaired individuals in healthcare

Through the analysis of the challenges faced by individuals who are blind or visually impaired in healthcare settings, several potential solutions have been identified. These solutions aim to improve access to healthcare services and enhance the quality of care for this population.

Technological solutions

The fulfillment of technological solutions can significantly improve the accessibility of health care for blind and partially sighted people. That may include the development of mobile applications with support for screen readers and alternative information formats, as the use of voice recognition and text-to-speech technologies to facilitate communication with healthcare professionals (14,21,22).

Training of healthcare professionals

Healthcare professionals should receive training on the needs of individuals who are blind or visually impaired, as well as on adapted communication techniques (23). This training should include the use of alternative means of communication, as well as understanding accessibility and providing support in the physical environment (14). Effective communication between healthcare professionals and individuals who are blind or visually impaired relies on several fundamental principles. It is important to introduce yourself to the patient by name and role within the organization, provide concise and simple instructions, offer physical assistance if needed, be mindful that these individuals may not perceive nonverbal cues, gestures, or visual information, take the time to orient the patient to the physical environment, address the patient directly rather than through a third party, and so on (6,7,14). It is crucial not to assume that individuals with visual impairments have lower levels of understanding or autonomy compared to those with sight (22).

Accessible communication and information

Healthcare institutions should ensure adequate communication with individuals who are blind or visually impaired. That includes providing alternative means of communication, such as Braille, sign language interpreters, or technological applications. Additionally, it is important to offer accessible information about diagnoses, therapies, and treatment instructions through various formats, such as audio recordings or electronic texts (6,13,14).

Adapting the physical environment

This may involve installing tactile orientation maps, floor tactile paths for navigation in staircases and corridors, tactile markings on doors, improving

implementiranih rešenja kako bi se ocenio njihov uticaj i identifikovala područja za poboljšanje. Ovo može uključivati prikupljanje povratnih informacija od slepih i slabovidih osoba, analizu podataka o pristupačnosti i kvalitetu usluga, i redovno izveštavanje o postignutim rešenjima. Osim toga, veoma je važno uključiti slepe i slabovide osobe kao aktivne učesnike u buduća istraživanja (24,25), što će omogućiti identifikovanje napretka, prepoznavanje prepreka i prilagođavanje strategija u skladu s potrebama slepih i slabovidih osoba (12).

Javne politike i podrška

Države treba da usvoje jasne politike i propise koji štite prava slepih i slabovidih osoba u zdravstvenoj zaštiti (14). To može uključivati pravne okvire za pristupačnost, finansijsku podršku za implementaciju tehnoloških rešenja, kao i podsticaje za obuku zdravstvenih radnika. Takođe je važno da se javnost informiše o pravima i potrebama slepih i slabovidih osoba kako bi se stvorila podrška i razumevanje u društvu (26).

Efikasnost i primenljivost predloženih rešenja mogu se razlikovati u različitim kontekstima zdravstvene zaštite. Implementacija tehnoloških rešenja može biti skupa i zahtevati infrastrukturne promene. Obuka zdravstvenih radnika zahteva ulaganje vremena i resursa. Takođe, pristupačnost komunikacije i informacije zahteva promene prakse u zdravstvenim ustanovama. Potrebno je prepoznati ove izazove i raditi na pronalaženju održivih i prilagođenih rešenja (26).

U literaturi postoji tendencija da se osobe sa oštećenim vidom tretiraju kao homogena grupa, pod pretpostavkom da svi imaju iste potrebe, bez obzira na starost, pol, etničku pripadnost, stepen oštećenja, proteklo vreme od pojave oštećenja ili prisustvo drugih bolesti. Međutim, ne sme se zaboraviti da pacijenti imaju različite potrebe za informacijama u različitim fazama procesa bolesti. Potrebe za zdravstvenom zaštitom značajno variraju od pojedinca do pojedinca, a osobe sa oštećenim vidom, kao i osobe sa potpuno očuvanim vidom, imaju svoje individualne preferencije i potrebe (12).

Zaključak

Pružanje pristupačne i kvalitetne zdravstvene usluge slepim i slabovodim osobama predstavlja izazov koji zahteva sistemski pristup i saradnju između zdravstvenih ustanova, organizacija za slepe i slabovide osobe, stručnjaka i društva u celini. Samo kroz zajedničke napore može se osigurati da unapređenje pristupa zdravstvenoj zaštiti postane stvarnost za slepe i slabovide osobe.

Implementacija tehnoloških rešenja, prilagođavanje okruženja, obuka zdravstvenih radnika i pružanje pristupačnih informacija su ključni koraci ka unapređenju pristupa zdravstvenoj zaštiti za ove osobe. Dalja istraživanja u ovoj oblasti su neophodna kako bi se bolje razumeli ovi problemi i identifikovala efikasna rešenja za pružanje kvalitetne i bezbedne zdravstvene usluge slepim i slabovidim osobama.

Konflikt interesa

Autor je izjavio da nema konflikta interesa.

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color contrast for better visibility, installing auditory notification systems, or utilizing navigation systems to facilitate movement. There is also a highlighted need for training healthcare professionals on how to provide support to individuals who are blind or visually impaired upon their arrival at healthcare facilities (2,18,19).

Inclusion of blind and partially sighted people in health care planning

It is crucial for individuals who are blind or visually impaired to be actively involved in the process of healthcare planning. That includes their participation in decision-making, counseling, and learning about their rights and possibilities. This inclusive practice can ensure that their needs and challenges are taken into account in the development of policies and provision of services (6,7,14).

Monitoring and evaluation

Healthcare institutions and relevant organizations should establish systematic monitoring and evaluation of implemented solutions to assess their impact and identify areas for improvement. That may involve collecting feedback from individuals who are blind or visually impaired, analyzing data on accessibility and service quality, and regularly reporting on the achieved solutions. Additionally, it is crucial to involve individuals who are blind or visually impaired as active participants in future research (24,25), enabling the identification of progress, recognition of barriers, and adaptation of strategies according to the needs of individuals who are blind or visually impaired (12).

Public policy and support

Countries should adopt clear policies and regulations that protect the rights of individuals who are blind or visually impaired in healthcare (14). That may include legal frameworks for accessibility, financial support for implementing technological solutions, and incentives for healthcare professionals' training. It is also important to raise public awareness about the rights and needs of individuals who are blind or visually impaired in order to foster support and understanding in society (26).

The effectiveness and applicability of proposed solutions may vary across different healthcare contexts. The implementation of technological solutions can be costly and may require infrastructure changes. Training healthcare professionals necessitates the investment of time and resources. Additionally, ensuring accessible communication and information requires changes in practices within healthcare institutions. It is important to acknowledge these challenges and work towards finding sustainable and tailored solutions (26).

There is a prevailing tendency in the literature to treat individuals with visual impairments as a uniform group, assuming that they share the same needs regardless of factors such as age, gender, ethnicity, severity of impairment, time since onset, or coexisting conditions. However, it is important to acknowledge that patients have distinct information needs that can vary at different stages of the disease process. Healthcare requirements significantly differ from one person to another, and individuals with visual impairments, like those with unimpaired vision, have unique preferences and needs (12).

Conclusion

Providing accessible and quality healthcare services to individuals who are blind or visually impaired presents a challenge that requires a systematic approach and collaboration among healthcare institutions, organizations for the blind and visually impaired, experts, and society in general. Only through collective efforts can we ensure that improving access to healthcare becomes a reality for individuals who are blind or visually impaired. Implementing technological solutions, adapting the environment, training healthcare professionals, and providing accessible information are crucial steps toward improving access to healthcare for these individuals. Further research is necessary in order understand these issues and identify effective solutions for delivering high-quality and safe healthcare to individuals who are blind or visually impaired.

Competing interests

The author declared no competing interests.

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SAVREMENI ASPEKTI UPRAVLJANJA POVIŠENOM TELESNOM TEMPERATUROM

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SAŽETAK

Cilj ovog preglednog rada je bio da se na sistematičan način prikažu savremeni načini upravljanja telesnom temperaturom. Povišena telesna temperatura, jedna je od najstarijih, najpoznatijih i najbolje uočenih manifestacija bolesti. Ona je normalan, koordinisan odgovor organizma na identifikovanu pretnju imunološkom sistemu, što uključuje autonomni, bihejvioralni i neuroendokrini odgovor. Upravljanje povišenom telesnom temperaturom sastavni je aspekt zdravstvene nege na svim nivoima zdravstvene zaštite. Postoje dva osnovna pristupa u rešavanju ovog problema: farmakološko i fizičko zbrinjavanje. U okviru fizičkih metoda zbrinjavanja dostupne su nekontrolisane konvencionalne metode, intravaskularne i perkutane kontrolisane metode, a od farmakoloških, najčešće se primenjuju antipiretici.

Ključne reči: groznica, telesna temperatura, menadžment

Uvod

Povišena telesna temperatura (TT), jedna je od najstarijih, najpoznatijih i najbolje uočenih manifestacija bolesti. Povišena telesna temperatura je normalan, koordinisan odgovor organizma na identifikovanu pretnju imunološkom sistemu, što uključuje autonomni, bihejvioralni i neuroendokrini odgovor (1). Takođe, kao odgovor organizma na stimulus, povišena TT se može javiti kao reakcija na endogene provokacije, te tada ima za cilj da potpomogne imunološkom sistemu. Normalnu vrednost TT održava termoregulacioni centar i to između 36,1^{o}C i 37,5^{o}C. Kod većine pacijenata, povišena TT je korisna i ne zahteva ozbiljnu medicinsku intervenciju, ali veoma često se dešava da od povišene TT pacijent nema očekivanu korist, već je značajno povezana sa lošim ishodom (2) i zahteva strategiju za snižavanje (3). Povišena TT je česta kod hospitalizovanih pacijenata i procenjuje se da se javlja kod gotovo polovine pacijenata tokom perioperativne nege (4). Do povišene TT mogu dovesti brojni faktori, poput različitih infekcija, zapaljenja, reakcije na lekove, neoplazme, autoimune bolesti, kao i vaskularne okluzivne bolesti (5). U većini slučajeva, povišena TT nastaje stvaranjem endogenih pirogena iz mononuklearnih i polimorfonuklearnih leukocita. Najmoćniji od endogenih pirogena su interleukin-1, interleukin-6 i faktor nekroze tumora α (alfa), koji stimulišu proizvodnju metabolita arahidonske kiseline (prostaglandin E-2 i tromboksan A-2), koji deluju na centralni nervni sistem, odnosno na područja koja utiču na regulaciju TT u hipotalamusu i produženoj moždini (6). Tačan mehanizam kojim cirkulišući citokini u sistemskoj cirkulaciji utiču na nervno tkivo ostaje delimično nejasan. Složenost febrilnog odgovora može se pripisati njegovim sistemskim efektima diktiranim endokrinim, neurološkim i imunološkim mehanizmima ponašanja (6). Fiziološki odgovor organizma na povišenu TT uključuje niz kardiovaskularnih i metaboličkih promena poput povećane potrošnje kiseonika, povećanog minutnog srčanog volumena i intenzivnije proizvodnje kateholamina u serumu.

Cilj ovog preglednog rada je da na sistematičan način prikaže rezultate dosadašnjih istraživanja o

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REVIEW ARTICLE

MODERN ASPECTS OF FEVER MANAGEMENT

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SUMMARY

The aim of this review article was to present in a systematic way modern aspects of body temperature management. A fever is one of the oldest, best known and best observed manifestations of the disease. It is a normal, coordinated body's response to an identified threat to the immune system, including the autonomic, behavioral and neuroendocrine response. Fever management is an integral aspect of health care at all levels of health care. There are two basic approaches to solving this problem: pharmacological and physical care. Uncontrolled conventional methods, intravascular and percutaneous controlled methods are available within physical methods of care, while pharmacological methods most frequently include the use of antipyretics.

Key words: fever, body temperature, management

Introduction

A fever is one of the oldest, best known and best observed manifestations of disease. It is a normal, coordinated body's response to an identified threat to the immune system, including the automatic, behavioral and neuroendocrine response (1). In addition, as the body's response to a stimulus, a fever may occur as a reaction to endogenous provocations, and then it aims to support the immune system. The normal value of body temperature is maintained by the thermoregulatory center and it ranges between 36.1°C and 37.5°C. In most patients, a fever is beneficial and it does not demand serious medical intervention, however, it happens very often that the patient does not benefit from the fever, and it is significantly associated with a poor outcome and requires a strategy to lower it (2). Hyperthermia is common in hospitalized patients and it is estimated that it occurs in almost half of patients during the perioperative care (4). Numerous factors can lead to hyperthermia, such as: various infections, inflammation, reactions to drugs, neoplasmas, autoimmune diseases, as well as occlusive arterial diseases (5). In most cases, hyperthermia is caused by the creation of endogenous pyrogens from mononuclear and polymorphonuclear leukocytes. The most powerful endogenous pyrogens are interleukin-1, interleukon-6 and tumor necrosis factor α (alpha), which stimulate the production of metabolites of arachidonic acid (prostaglandin E-2 and thromboxane A-2), which affect the central nervous system, that is, the areas that influence the regulation of body temperature in the hypothalamus and medulla oblongata (6). The exact mechanism, by which the circulating cytokines affect the neural tissue in the systemic circulation, remains partially unknown. The complexity of the febrile response may be attributed to its systemic effects which are dictated by endocrine, neurological and immune mechanisms of behavior (6). The body's physiological response to a rise in body temperature includes a series of cardiovascular and metabolic changes including increased oxygen consumption, increased cardiac output and more

savremenim aspektima menadžmenta (upravljanja) povišenom telesnom temperaturom.

Metode

U okviru ovog preglednog rada uključene su sve studije do kojih se došlo na osnovu pretraživanja sledećih baza podataka: PubMed, CINAHL, PubMed, Web of Science i Embase. U svrhu pretraživanja korišćene su tri ključne reči: groznica, telesna temperatura i menadžment. U analizi podataka korišćeni su rezultati samo onih studija koje su objavljene na engleskom jeziku u periodu od januara 2000. do juna 2023. godine.

Mehanizam termoregulacije

Hipotalamus je glavni prekidač koji radi kao termostat za regulisanje telesne temperature. Ako je TT previsoka, hipotalamus može pokrenuti nekoliko procesa kako bi je snizio. Ovo uključuje povećanje cirkulacije krvi na površini tela kako bi se omogućilo rasipanje toplote kroz kožu i početak znojenja kako bi se omogućilo isparavanje vode na koži da bi se površina ohladila (7). Mehanizam termoregulacije podrazumeva: znojenje, drhtavicu, vazodilataciju i vazokonstrikciju. Znojenje povećava gubitak telesne toplote povećanjem isparavanja znoja. Drhtanje proizvodi toplotu nehotičnim kretanjem mišića. Vazodilatacija i vazokonstrikcija se odnose na promene u krvnim sudovima, koji utiču na temperaturu kože promenom brzine cirkulacije krvi (8). Naime, hipotalamus prvenstveno deluje kao kontrolor gubitka toplote u telu, te svaki porast temperature iznad zadate tačke registruje i dalje šalje nervne impulse za aktiviranje vazodilatacije i znojenja, odnosno aktivira mehanizme gubitka toplote u telu. Pomenuti mehanizam je toliko precizan da se razlike u TT pri vazodilataciji i znojenju razlikuju za svega deseti deo stepena u odnosu na TT pri vazokonstrikciji i iznose nešto više od 37°C. Isti mehanizam reguliše i vrednost TT pri drhtanju koja je nešto niža od 36°C. (9). Takođe, temperatura kože ima sporednu ulogu u kontroli hlađenja tela.

Pri istoj temperaturi unutar centralnog termoregulacionog sistema (CTS), viša temperatura kože može povećati brzinu znojenja, a hladnija je inhibira (8). Svaki termoregulacioni odgovor ima svoj prag, nakon koga dolazi do aktiviranja regulacije temperature na nivou CTS. Prekapilarna vazodilatacija i znojenje su sinhroni procesi i imaju isti prag temperature unutar CTS. Temperature između pragova znojenja i sužavanja krvnih sudova definišu normalnu vrednost telesne temperature – obično oko 37°C (9). Temperature CTS su obično veće kod žena nego kod muškaraca i variraju za oko 1°C na cirkadijalnoj osnovi (8). Hipotalamički regulatorni mehanizmi za regulaciju TT mogu dovesti do pojave povišene TT (febrilnosti) u odgovoru na sindrom sistemskog inflamatornog odgovora. Ovaj sindrom je obično iniciran prisustvom citokina (interleukin (IL)-1β, IL-6 i faktor nekroze tumora (TNF)). On može biti posledica delovanja različitih infektivnih agenasa, uključujući bakterijske, virusne i parazitske infekcije, ali i različitih faktora neinfektivne prirode, kao što su ozbiljan pankreatitis i obimne hirurške intervencije.

Faktori koji utiču na promenu telesne temperature

Veliki je broj faktora koji na posredan ili neposredan način mogu uticati na dnevnu fluktuaciju TT. Naime, naučno dokazane činjenice koje treba uzeti u obzir prilikom merenja TT, a koje idu u prilog promeni vrednosti od ±0,5°C su: pol, starost i mesto merenja (10). Izloženost različitim medikamentima, posebno anesteticima, analgeticima i generalno imunosupresivnoj terapiji, kao i u akutnoj etiologiji neinfektivnih i zaraznih bolesti u perioperativnim i intenzivnim uslovima lečenja, mogu se javiti abnormalnosti koje utiču na porast TT u odnosu na normalne vrednosti (6). Rezultati nedavno objavljenih kliničkih ispitivanja ukazuju na to da se agresivne promene TT najčešće mogu sresti kod postreanimacionih stanja, odnosno kod pacijenata koji su u postreanimacionoj komi u oporavku od reanimacije. Takođe, povišena TT može da bude odbrambeni odgovor organizma na delovanje pirogenih agenasa koji se oslobađaju kao deo zapaljenskog procesa, uzrokujući pojačan imunološki odgovor i zaštitu organizma od uzročnika infekcija (6). Zbog visokog rizika od infekcije povezane sa invazivnim procedurama, imunosupresijom, patološkim stanjima i drugim rizicima povezanim sa hospitalizacijom u jedinici intenzivnog lečenja (JIL), febrilnost se javlja kod više od jedne trećine kritično obolelih pacijenata (8). Zbog toga je čest događaj da u JIL više od 50% hospitalizovanih pacijenata ima povišenu TT uzrokovanu infektivnim ili neinfektivnim agensima (11). Uzroci povišene TT kod pacijenata u JIL su često sledeće bolesti: pneumonija povezana sa mehaničkom ventilacijom, infekcija krvotoka povezana sa cen-

intensive production of catecholamines in the serum.

The aim of this review article is to present in a systematic way the results of previous research on modern aspects of fever management.

Methods

This review article includes all studies that were found during the search of the following databases: PubMed, CINAHL, Veb of Science and Embase. Three keywords were used for the search: fever, body temperature and management. The results of those studies that were published in English from January 2000 to June 2023 were used for the analysis of data.

The mechanism of thermoregulation

The hypothalamus is the main switch that works like a thermostat for the regulation of body temperature. If body temperature is too high, the hypothalamus can initiate several processes in order to lower it. This includes an increase in blood circulation on the surface of the body in order to allow heat to dissipate through the skin and the initiation of sweating in order to allow the evaporation of water on the skin to cool the surface (7). The mechanism of thermoregulation includes: sweating, shivering, vasodilatation and vasoconstriction. Sweating increases the loss of body heat by increasing the evaporation of sweat. Shivering produces heat through involuntary muscle movements. Vasodilatation and vasoconstriction refer to changes in blood vessels, which affect the skin temperature by changing the speed of blood circulation (8). Namely, the hypothalamus primarily acts as a controller of heat loss in the body, and it registers every rise in temperature above the set point and further sends nerve impulses for the activation of vasodilatation and sweating, that is, it activates the mechanisms of heat loss in the body. The above mentioned mechanism is so precise that differences in body temperature during vasodilatation and sweating differ by only one tenth of a degree in comparison to body temperature during vasoconstriction and they amount to slightly more than 37°C. The same mechanism regulates the value of body temperature when shivering, which is slightly lower than 36°C (9). Also, the skin temperature has a secondary role in controlling the body cooling.

At the same temperature within the central thermoregulatory system (CTS), a higher skin temperature can increase the speed of sweating, whereas it is inhibited by a lower temperature (8). Each thermoregulatory response has its own threshold, after which the regulation of temperature is activated at the level of CTS. Precapillary vasodilatation and sweating are synchronous processes that have the same temperature threshold within the CTS. Temperatures between the thresholds of sweating and constriction of blood vessels define the normal value of body temperature – usually around 37°C (9). CTS temperatures are usually higher in women than in men and they vary by about 1°C on a circadian basis (8). The hypothalamic regulatory mechanisms for the regulation of body temperature cam lead to the appearance of high temperature (febrility) in response to the systemic inflammatory response syndrome. This syndrome is usually initiated by the presence of cytokines (interleukin (IL)-1ß, IL-6 and tumor necrosis factor (TNF)). It can be the consequence of different infectious agents, including bacterial, viral and parasitic infections, but also of different non-infectious agents, such as severe pancreatitis and extensive surgical interventions.

Factors that affect the change in body temperature

There are a lot of factors that can influence the daily fluctuation of body temperature in a direct or indirect way. Namely, the scientifically proven facts that should be taken into account when measuring body temperature, and which are in favor of a change in value of +0.5°C, are the following: sex, age, place of measurement (10). Exposure to various medications, especially anesthetics, analgesics and generally to immunosuppressive therapy, as well as in the acute etiology of non-infectious and infectious diseases in perioperative and intensive treatment conditions, abnormalities that affect the rise in body temperature in comparison to normal values may appear (6). The results of recently published clinical studies indicate that aggressive changes in body temperature may be encountered most often in post-resuscitation conditions, that is, in patients who are in post-resuscitation coma recovering from reanimation. Also, a fever may be a defensive response of the body to the action

tralnim venskim kateterom, infekcija urinarnog trakta povezana sa urinarnim kateterom, pseudomembranozni kolitis povezan sa bakterijom *Clostridium difficile*, perforirajući stres ulkus i infekcija povezana sa hirurškom ranom (11).

Neinfektivni poremećaji koji mogu dovesti do povišene TT kod pacijenata hospitalizovanih u JIL su: postoperativna groznica, posttransfuzijske groznice, groznice izazvane primenom određenih lekova, infarkt mozga ili srca, cerebelarna krvarenja, bubrežna insuficijencija, pankreatitis, aspiracioni pneumonitis, akutni respiratorni distres sindrom (ARDS), duboke venske tromboze, plućna embolija i dekubitalni ulkus (12).

Monitoring telesne temperature

TT je jedan od četiri glavna vitalna parametra. Iako je merenje TT deo rutinske kliničke prakse, postoje velike varijacije u metodama i tehnikama merenja telesne temperature. Precizno merenje TT, kao i efikasno i kontinuirano nadgledanje temperaturne fluktuacije omogućavaju da se pojedina stanja uoče na vreme, što dalje omogućava pravovremeno reagovanje i sprovođene određenih intervencija i procedura. Prilikom merenja TT neophodno je koristiti najprikladniju tehniku kako bi bili sigurni da se temperatura tačno meri. Netačni rezultati mogu uticati na dijagnozu i lečenje, dovesti do neuspeha u identifikovanju pogoršanja stanja pacijenta i ugroziti bezbednost pacijenata. Tačnost procene vrednosti TT zavisi od nekoliko faktora, poput metode merenja, mesta (lokalizacije) merenja, pouzdanosti uređaja pomoću kog se vrši merenje, kao i obučenosti zdravstvenog radnika (10). Ne postoji jedinstvena TT, već temperatura tkiva uveliko varira od mesta do mesta, te se tako vrednosti merenja razlikuju uglavnom u odnosu na perfuziju tkiva.

Tehnike merenja TT su različite, te bi njihova osnovna podela bila na invazivne i neinvanzivne tehnike merenja. Svakako, invanzivne tehnike merenja, poput postavljanja temperaturne sonde u jednjak, plućnu arteriju ili mokraćnu bešiku, daju najpouzdanije vrednosti merenja TT, ali su takve tehnike merenja ipak namenjene kritično obolelim pacijentima, jer zahtevaju posebne uslove za izvođenje procedure. Konvencionalno, neinvanzivno merenje TT podrazumeva merenje na dostupnijim mestima: ispod jezika, u aksilama, rektumu i spoljašnjem ušnom kanalu. Neinvanzivne tehnike merenja TT ne zahtevaju posebne uslove za izvršenje procedure, te su takvi načini merenja najpristupačniji na svim nivoima zdravstvene zaštite. Kada je reč o neinvanzivnom merenju TT važno je održati doslednost u odabiru mesta merenja, radi mogućnosti poređenja vrednosti, imajući u vidu da postoje izvesne razlike u vrednostima na različitim mernim mestima. Da bi se postigla preciznija termometrija, veoma je važno uzeti u obzir sve faktore koji utiču na merenje telesne temperature uključujući tehničke karakteristike, konfiguraciju uređaja, kalibraciju, održavanje i preporuke za korišćenje date od strane proizvođača.

Terapeutska hipotermija

Ciljano upravljanje TT (eng. *Targeted temperature management* - TTM), ranije poznato kao blaga terapijska hipotermija, kod pacijenata koji su preživeli vanbolnički iznenadni srčani zastoj može značajno poboljšati stope dugotrajnog neurološkog oštećenja, a moglo bi se pokazati kao jedan od najvažnijih kliničkih napredaka u resuscitacionoj nauci (11). Ciljano upravljanje temperaturom putem indukovane hipotermije (između 32−36°C) trenutno se smatra tretmanom prve linije tokom lečenja pacijenata nakon srčanog zastoja koji su primljeni na odeljenje intenzivnog lečenja. Naime, svaki deseti pacijent ima srčani zastoj, a od njih samo polovina preživi u prihvatljivom neurološkom stanju. Pacijenti koji su preživeli srčani zastoj imaju postreanimacioni sindrom kog karakterišu oštećenje mozga, disfunkcija miokarda, sistemski ishemijsko-reperfuzijski sindrom, kao i kliničke komplikacije nastale kao posledica srčanog zastoja (10). Cilj TTM-a je omogućiti neuroprotekciju i smanjiti sekundarna neurološka oštećenja uzrokovana anoksijom. Hipotermija nudi različite potencijalno korisne efekte u upravljanju postreanimacionim sindromom: smanjuje metaboličku aktivnost dozvoljavajući na taj način organima da tolerišu duže periode ishemije bez nepopravljivih oštećenja, i u stanju je da smanji štetne efekte reperfuzije, posebno neurološka oštećenja izazvana oslobađanjem inflamatornih medijatora nakon obnavljanja krvotoka. Zauzvrat, hipotermija takođe smanjuje inflamatorni odgovor i porast intrakranijalnog pritiska, kao i rizik od sekundarne groznice zbog sistemske inflamatorne reakcije. U ovom sindromu postoji kritično vremensko razdoblje koje pokriva period između oporavka spontane cirkulacije i

of pyrogenic agents that are released as part of the inflammatory process, causing an increased immune response and protection of the body against infectious agents (6). Due to the high risk of infection associated with the invasive procedures, immunosuprression, pathological conditions and other risks related to hospitalization in intensive care units (ICUs), febrility occurs in more than one-third of critically ill patients (8). Therefore, it is common that more than 50% of patients who are hospitalized in ICUs have a fever caused by infectious or non-infectious agents (11). The causes of fever in ICU patients are often the following diseases: pneumonia associated with mechanical ventilation, bloodstream infection associated with a central venous catheter, urinary tract infection associated with a urinary catheter, pseudomembranous colitis associated with the bacterium Clostridium difficile, perforating stress ulcus and infections associated with surgical wounds (11).

Non-infectious disorders that can lead to fever in patients hospitalized in ICUs are the following: postoperative fever, post-transfusion fever, fever caused by certain drugs, brain or heart infarction, cerebral hemorrhage, renal insufficiency, pancreatitis, aspiration pneumonitis, acute respiratory distress syndrome (ARDS), deep vein thrombosis, pulmonary embolism and pressure ulcers (12).

Body temperature monitoring

Body temperature (BT) is one of the four main vital parameters. Although measuring BT is part of routine clinical practice, there are great variations with regard to the methods and techniques for measuring body temperature. Precise measuring of BT, as well as effective and continuous monitoring of body fluctuations allow certain conditions to be detected in time, which further enables timely response and implementation of certain interventions and procedures. When measuring BT, it is necessary to use the most appropriate technique in order to ensure accurate measuring. Inaccurate results may affect the diagnosis and treatment, lead to failure regarding the identification of deterioration of patient's state and endanger the patient's safety. The accuracy of the assessment of values of BT depends on several factors, such as the method of measurement, place (localization) of measurement, the reliability of the device that is used for the measurement, as well as health care worker's skills (10). There is no single body temperature, however, the tissue temperature significantly varies from place to place, so the measurement values differ mainly in relation to tissue perfusion.

Measurement techniques are different, and therefore, the basic classification includes invasive and non-invasive measurement techniques. Certainly, invasive measurement techniques , such as placing a temperature probe in the esophagus, pulmonary artery or bladder, give the most reliable measurement values, but such measurement techniques are intended for critically-ill patients, because they require special conditions for performing the procedure. Conventional, non-invasive measurement of BT involves the measurement in places that can be easily accessed: under the tongue, in the axilla, rectum and external auditory canal. Non-invasive techniques of measurement of BT do not require special conditions for performing the procedure, and therefore, such measurement methods are the most accessible at all levels of health care. As far as non-invasive measurement of body temperature is concerned, it is important to maintain the consistency in the selection of the measurement site, so that values could be compared, having in mind differences in values when body temperature is measured at different sites. In order to achieve more precise thermometry, it is very important to take into consideration all the factors that influence body temperature measurement including technical characteristics, device configuration, calibration, maintenance and recommendations for usage provided by the manufacturer.

Therapeutic hypothermia

Targeted temperature management (TTM), which was formerly known as mild therapeutic hypothermia, in patients who have survived after the out-of-hospital sudden cardiac arrest, can significantly improve the rates of long-term neurological damage, and it may prove to be one of the most important clinical advances in the science of resuscitation (11). Targeted temperature management with the help of induced hypothermia (between 32-36°C) is currently considered to be the first-line treatment during the treatment of patients who suffered

pokretanja upalnog odgovora, u kojem smanjenje TT može imati blagotvorne efekte. Veruje se da ovaj period može trajati oko 4–5 sati (11).

Metode perifernog hlađenja

U kliničkoj praksi postoje različite metode za indukovanje, održavanje i vraćanje TT u fiziološke okvire. Dostupne su nekontrolisane konvencionalne metode, intravaskularne i perkutane kontrolisane metode. Optimalni način hlađenja podrazumeva neophodan multimodalni pristup za rešavanje sve tri faze hlađenja: indukciju, održavanje i ponovno zagrevanje. Generalno, najveći broj studija sugeriše na korišćenje dve kombinovane metode indukovane hipotermije: površinsko hlađenje i endovaskularno hlađenje(13-15).

Površinske metode hlađenja uključuju primenu posebno dizajniranih ploča za hlađenje, koje omogućavaju smanjenje TT za 3,5°C/sat i koje se najčešće koriste u savremenoj kliničkoj praksi. Tehnika površinskog hlađenja pomoću hipokarbonskih ploča za hlađenje je jednostavna i brza za izvođenje, čak i u vanbolničkim uslovima. Ipak, u kliničkoj praksi se još uvek mogu sresti i konvencionalne metode hlađenja, poput vazdušnih dušeka, ledenih obloga i alkoholnih frikcija. Prednost površinskog hlađenja je u tome što ne zahteva naprednu opremu ili stručnost u postavljanju intravaskularnog katetera i izbegava rizike povezane sa postavljanjem centralnog venskog katetera. U studijama koje se bave procenom savremenih sistema za hlađenje apsolutna prednost se daje savremenim sistemima za hlađenje poput pomenutog koji snižava TT za 3,5°C/sat i neinvanzivan je u odnosu na invanzivne metode rashlađivanja čija je maksimalna brzina rashlađivanja 2°C/sat (15).

Endovaskularno hlađenje pomoću katetera je invanzivna procedura, koja zahteva kraće vreme za postizanje ciljne temperature u odnosu na konvencionalne metode hlađenja (16). Kod primene endovaskularnog hlađenja pacijenata, važna odrednica efikasnog hlađenja je površina tela. Ipak, plasiranje endovaskularnog katetera zahteva dostupnst opreme i uslova, kao i postojanje kontrolne rashladne jedinice koja sadrži integrisane rashladne sisteme i mogućnost strože i preciznije kontrole TT kako bi se uspešno izbeglo prekoračenje i slučajno zagrevanje pacijenta, te nenamerno povećanje intrakranijalnog pritiska i cerebralni edem. Takođe, kod upotrebe ovog načina hlađenja, neophodno je smanjiti drhtavicu pacijenta radi efikasnije razmene toplote. Neželjeni događaji povezani sa endovaskularnim hlađenjem uključuju upalu pluća, srčanu aritmiju, trombocitopeniju i vaskularnu disekciju (16).

Bez obzira o kojoj metodi hlađenja se radi, zaštitni mehanizmi protiv hipotermije uključuju drhtavicu mišića i kožnu vazokonstrikciju. Vazokonstrikcija kože smanjuje provodljivost toplote kroz kožu, dok drhtanje proizvodi energiju i toplotu kroz ponavljajuće kontrakcije mišića. Pored supstanci koje menjaju kontrolu temperature hipotalamusa, neuromuskularni blokatori su efikasni protiv drhtavice. U kliničkim ispitivanjima hipotermije kod pacijenata nakon srčanog zastoja, neuromuskularna blokada je najčešće korišćena za sprečavanje i lečenje drhtavice. Drhtanje kod svesnog pacijenta stvara nelagodu i smanjuje efikasnost hlađenja. Većina pacijenata sa velikim ishemijskim moždanim udarom ima smanjeno stanje svesti, te da bi se osigurala udobnost pacijenta i efikasno rashlađivanje, drhtavica se mora smanjiti centralno aktivnim sredstvima. Kod pacijenata koji primaju endovaskularnu hipotermiju, površinski pokrivači za zagrevanje kože mogu smanjiti prag drhtavice i povećati toleranciju i udobnost pacijenata. Većina podataka o kontroli drhtavice dolazi iz istraživanja za kontrolu drhtavice nakon anestezije (10).

Primena antipiretika

Pored prethodno opisanog fizičkog hlađenja, u terapiji febrilnih pacijenata mogu se koristiti i antipiretici. Antipiretik može smanjiti telesnu temperaturu smanjenjem praga kontrole telesne temperature u hipotalamusu. Postoje dve kritične pretpostavke kod primene antipiretičke terapije. Jedna pretpostavka je da je povišena TT bar delimično štetna, a druga pretpostavka je da će suzbijanje febrilnosti smanjiti, ako ne i eliminisati, štetne efekte povišene TT. Nijedna od navedenih pretpostavki nije eksperimentalno potvrđena, ali kako je povišena TT uobičajeni znak infekcije, tako se smatra jasnim signalom inflamacije. Febrilni odgovor kao komponenta procesa febrilnosti podrazumeva kompleksnu reakciju organizma na patogene što uključuje rast TT posredovane delovanjem citokina i aktiviranjem brojnih fizioloških, endokrinoloških i imunoloških mehanizama.

Antipiretici podrazumevaju grupu lekova koji inhibiraju proizvodnju prostaglandina, a nastaju delovanjem enzima ciklooksigenaza (COX). Inhibicija COX-1 uzrokuje štetne nuspojave, a inhibicija

from cardiac arrest and who were admitted to the intensive care unit. Namely, every tenth patient has cardiac arrest, while only half of them survive and have acceptable neurological condition. Patients who survived cardiac arrest have a post-resuscitation syndrome, which is characterized by brain damage, myocardial dysfunction, systemic ischemia-reperfusion syndrome, as well as clinical complications resulting from cardiac arrest (10). The goal of TTM is to enable the neuroprotection and reduce secondary neurological damage caused by anoxia. Hypothermia offers different, potentially beneficial effects in the management of post-resuscitation syndrome: it reduces the metabolic activity, thus allowing organs to tolerate longer periods of ischemia without irreparable damage, and it is able to reduce the harmful effects of reperfusion – especially neurological damage caused by the release of inflammatory mediators after the reperfusion. In turn, hypothermia also reduces the inflammatory response and increase in intracranial pressure, as well as the risk of secondary fever due to a systemic inflammatory reaction. In this syndrome, there is a critical time period covering the period between the recovery of spontaneous circulation and the initiation of inflammatory response, in which a decrease in body temperature can have beneficial effects. It is believed that this period can last around 4-5 hours (11).

Methods of peripheral cooling

In clinical practice, there are various methods for inducing, maintaining and returning body temperature to physiological limits. Uncontrolled conventional methods, intravascular and percutaneous controlled methods are available. The optimal method of cooling implies the necessary multimodal approach used for solving all three phases of cooling: induction, maintenance and reheating. Generally speaking, the majority of studies suggest the use of two combined methods of induced hypothermia: surface cooling and endovascular cooling (13-15).

Surface cooling methods include the application of specially designed cooling plates, which enable the decrease in BT by 3.5°C per hour and which are most often used in modern clinical practice. The technique of surface cooling with the help of hypocarbon plates is simple and can be quickly performed, even in outpatient conditions. However, conventional cooling methods such as air mattresses, ice packs and alcohol frictions can still be seen in clinical practice. The advantage of surface cooling is that it does not require advanced equipment or expertise to place the intravascular catheter and it avoids the risks connected with the placement of central venous catheter. In studies, which assess the contemporary cooling systems, the absolute advantage is given to modern cooling systems, such as the above mentioned system, which lowers BT by 3.5°C per hour and it is non-invasive in comparison to invasive cooling methods, whose maximum cooling rate is 2°C/hour (15).

Endovascular cooling using a catheter is an invasive procedure, which demands a shorter time necessary to reach the target temperature in comparison to conventional cooling methods (16). When endovascular cooling of patients is applied, an important determinant of efficient cooling is the body surface area. However, placing the endovascular catheter requires the availability of equipment and conditions, as well as the existence of a control cooling unit, which contains integrated cooling systems and the possibility of stricter and more precise control of body temperature in order to successfully avoid the overshoot and accidental warming of the patient, and the inadvertent increase in intracranial pressure and cerebral edema. Also, when this cooling method is used, it is necessary to reduce the patient's shivering for the more efficient heat exchange. Adverse events related to endovascular cooling include pneumonia, cardiac arrhythmia, thrombocytopenia, and vascular dissection (16).

Regardless of which cooling method is used, protective mechanisms against hypothermia include muscle shivering and cutaneous vasoconstriction. Cutaneous vasoconstriction reduces thermal conduction through skin, while shivering produces energy and heat through repetitive muscle contractions. In addition to the substances that change the hypothalamic temperature control, neuromuscular blocking agents are efficient against shivering. In clinical trials of hypothermia in patients after cardiac arrest, neuromuscular blockade is most commonly used to prevent and treat shivering. Shivering in a conscious patient causes discomfort and reduces the efficiency of cooling. The majority of patients with major ischemic stroke have a lowered level of

COX-2 smanjuje upalu, temperaturu i bol (15). Antipiretici koji se najčešće upotrebljavaju u kliničkoj praksi za lečenje povišene TT su paracetamol, ibuprofen i diklofenak, te u određenim indikacijama naproksen. Razlozi za upotrebu antipiretičke terapije uključuju ublažavanje tegoba, smanjenje morbiditeta i mortaliteta, prevenciju febrilnih napada, smanjenje kognitivnih oštećenja, kao i smanjenje komplikacija moždanog udara ili povreda mozga. Primena antipiretičkih lekova posebno je značajna za sedirane pacijente. Sedacija bi trebalo da potisne hladne reakcije, pa bi sedacija u kombinaciji sa fizičkim hlađenjem trebalo da bude efikasna za smanjenje telesne temperature. Međutim, ako pacijent nije pod sedacijom, zadata vrednost TT se ne menja, pa fizičko hlađenje može stoga izazvati hladnu reakciju, poput drhtavice ili suženja krvnih sudova koja nije poželjna. U tom slučaju bilo bi teško smanjiti TT, a potrošnja kiseonika i minutna ventilacija mogu se povećati. Dok se ne objave rezultati velikih randomizovanih ispitivanja o efektima antipiretičke terapije na kritično bolesne pacijente, čini se da bi antipiretičku terapiju trebalo izvoditi u skladu sa situacijom i individualno za svakog pacijenta.

Zaključak

Niz novih saznanja iz oblasti perifernog hlađenja i temoregulacije može biti od velike koristi u svakodnevnoj kliničkoj praksi i može značajno uticati na trenutnu praksu koju zdravstveni radnici sprovode. U skladu sa tim, potrebno je podsticati istraživanja u ovoj oblasti, kako bi upravljanje povišenom TT bilo zasnovano na naučnim dokazima primenjivim u praksi.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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consciousness, and therefore, in order to ensure the patient's comfort and efficient cooling, shivering must be reduced by centrally active agents. In patients who have endovascular hypothermia, surface covering of skin can reduce the threshold of shivering and increase the patient's tolerance and comfort. The majority of data on the control of shivering come from the research on the control of shivering after anesthesia (10).

The application of antipyretics

In addition to the previously described physical cooling, antipyretics can also be used in the treatment of febrile patients. An antipyretic can lower the body temperature by reducing the threshold of body temperature control in the hypothalamus. There are two critical assumptions regarding the application of antipyretic therapy. One assumption is that a fever is at least partially harmful, while another assumption is that the suppression of febrility will reduce, if not eliminate, the harmful effects of fever. None of the above mentioned assumptions has been experimentally confirmed, but since high temperature is a common sign of infection, it is considered to be a clear signal of inflammation. The febrile response as a component of the febrile process implies a complex reaction of the organism to pathogens, which includes the rise in the body temperature mediated by the action of cytokines and the activation of numerous physiological, endocrine and immunological mechanisms.

Antipyretics include a group of drugs that inhibit the production of prostaglandins, which are produced by the action of cyclooxygenase (COX) enzymes. The inhibition of COX-1 causes adverse side effects, while the inhibition of COX-2 reduces the inflammation, fever, and pain (15). Antipyretics that are most frequently used in clinical practice for the treatment of hyperthermia are paracetamol, ibuprofen, diclofenac and naproxen, and in certain indications, naproxen. The reasons for the use of antipyretic therapy include relief of symptoms, reduction of morbidity and mortality, prevention of febrile seizures, reduction of cognitive impairment and reduction of complications caused by stroke or brain injuries. The application of antipyretic drugs is especially important for sedated patients. Sedation should suppress cold reactions, and therefore, sedation combined with physical cooling should be effective in lowering BT. However, if the patient is not sedated, the given value of body temperature is not changed, and therefore, physical cooling may cause a cold reaction, such as shivering or vasoconstriction, which is not desirable. In that case, it would be difficult to reduce the body temperature, and oxygen consumption and minute ventilation may increase. Until the results of large randomized trials on the effects of antipyretic therapy in critically ill patients are published, it seems that antipyretic therapy should be applied in accordance with the situation and individually for each patient.

Conclusion

A series of new findings in the field of peripheral cooling and thermoregulation can be of great use in daily clinical practice and can significantly influence the current practice which is carried out by healthcare workers. Accordingly, it is necessary to encourage the research in this area, so that the management of fever would be based on scientific evidence applicable in practice.

Competing interests

The authors declared no competing interests.

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PROCENA RAZLIČITIH TERAPIJSKIH PRISTUPA KINEZITERAPIJE U REDUKCIJI POSTOPERATIVNOG BOLA KOD PACIJENATA SA ARTROPLASTIKOM ZGLOBA KOLENA

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SAŽETAK

Cilj ovog preglednog rada je da se analiziraju različiti terapijski pristupi kineziterapije u smanjenju postoperativnog bola kod pacijenata sa artroplastikom zgloba kolena. Osteoartritis kolena često uzrokuje bol i smanjenu pokretljivost, što se može otkloniti totalnom artroplastikom zgloba kolena. Na osnovu dosadašnjih istraživanja uočava se da preoperativni trening snage poboljšava funkcionalnost i obim pokreta posle jednog i tri meseca od operacije. Neke studije, mada ne sve, pokazuju da nakon rehabilitacije, koja podrazumeva preoperativni trening snage, kod pacijenata sa totalnom artroplastikom zgloba kolena dolazi do smanjenja bola. Takođe, uočava se pojava bola većeg intenziteta devetog dana posle operacije, koji se konstantno smanjuje tokom narednih dana. Intezitet postoperativnog bola povezan je sa polom, indeksom telesne mase i postojanjem deformiteta kolena. Iako preoperativni trening snage pozitivno utiče na oporavak funkcionalnosti i obima pokreta, njegov efekat na smanjenje postoperativnog bola zahteva dalja istraživanja. Dosadašnja istraživanja ukazuju na potrebu za personalizovanim rehabilitacionim pristupima pacijentima sa totalnom artroplastikom zgloba kolena, uzimajući u obzir složenost bola i različite faktore rizika za nastanak postoperativnog bola. Razvoj personalizovanih protokola rehabilitacije može pružiti znatno bolji oporavak pacijenata nakon urađene totalne artroplastike zgloba kolena u poređenju sa dosadašnjim standardnim pristupima.

Ključne reči: totalna artroplastika zgloba kolena, kineziterapija, postoperativni bol, rehabilitacija

Uvod

Glavna indikacija za totalnu artroplastiku zgloba kolena je osteoartritis kolena jer dovodi do bola i ograničene pokretljivosti, a potom i do invaliditeta (1). Osteoartritis (gonartroza) je degenerativni proces koji se razvija u kolenu kao rezultat nesrazmere između opterećenja i podnošenja opterećenja od strane zglobne hrskavice kolena. Najčešći faktori koji doprinose njegovom nastanku su starenje, gojaznost, nedostatak fizičke aktivnosti, ulazak žene u menopauzu, nasleđe, povrede zgloba kolena, zanimanja koja dodatno opterećuju zglobove kolena i drugo (1-3).

Kod većine pacijenata totalna artroplastika zgloba kolena otklanja bol, poboljšava pokretljivost, a samim tim doprinosi poboljšanju kvaliteta života (1). Ishod totalne artroplastike zgloba kolena zavisi od dobro postavljenih indikacija za operaciju, dobro obavljene operacije, kao i od pravovremenog i adekvatnog rehabilitacionog tretmana. Ishod artroplastike zgloba kolena može se meriti različitim instrumentima. Jedan od najčešće korišćenih specifičnih upitnika za procenu bola, ukočenosti i funkcije kolena kod osoba sa osteoartritisom je Indeks osteoartritisa univerziteta Zapadni Ontario i McMaster (engl. *The Western Ontario and McMaster Universities Arthritis Index* - WOMAC). To je kratak i jednostavan instrument koji pacijent popunjava 12-15 minuta i koji se sastoji od 24 pitanja koja su podeljenja u tri subskale koje procenjuju bol (pet pitanja), ukočenost (dva pitanja) i fizičku funkciju kolena (17 pitanja) (2). Korišćenjem ovog upitnika u većini studija uočava se poboljšanje u pogledu bola i fizičkog funkcionisanja nakon totalne artroplastike zgloba kolena (2). Najveće

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ASSESSMENT OF VARIOUS KINESIOTHERAPY TREATMENT APPROACHES IN REDUCING POSTOPERATIVE PAIN IN PATIENTS WITH KNEE JOINT ARTHROPLASTY

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SUMMARY

The aim of this review is to analyze various kinesiotherapy treatment approaches in reducing postoperative pain in patients with knee joint arthroplasty. Knee osteoarthritis often causes pain and reduced mobility, which can be alleviated by total knee joint arthroplasty. Based on previous research, it is observed that preoperative strength training improves functionality and range of motion one to three months after surgery. Some studies indicate that rehabilitation, which includes preoperative strength training, results in decreased pain in patients with total knee joint arthroplasty. Also, some studies suggest an increase in pain intensity 9 days after surgery, which gradually decreases in the following days. Gender, BMI, and knee deformity are associated with higher postoperative pain intensity. Although preoperative strength training has a positive impact on functional recovery and range of motion, its effect on reducing postoperative pain requires further investigation. Previous research highlights the need for personalized rehabilitation approaches for patients undergoing total knee joint arthroplasty, taking into account the complexity of pain and various risk factors for postoperative pain occurrence. The development of personalized rehabilitation protocols may provide significantly better recovery outcomes for patients after total knee joint arthroplasty compared to traditional standard approaches.

Keywords: total knee arthroplasty, kinesiotherapy, postoperative pain, rehabilitation

Introduction

The main indication for total knee athroplasty is osteoarthritis of the knee because it leads to pain and limited mobility, and consequently to disability (1). Osteoarthritis (gonarthrosis) is a degenerative process that develops in the knee, as a result of a disproportion between the load and load bearing by the knee cartilage. The most common factors that contribute to its appearance are aging, obesity, lack of physical activity, menopause, heredity, injuries of the knee joint, occupations that additionally load the knee joint, etc. (1-3).

In most patients, total knee arthroplasty eliminates pain, improves mobility, and thus contributes to improving the quality of life (1). The outcome of total knee arthroplasty depends on well-established indications for surgery, well-performed surgery, as well as on timely and adequate rehabilitation treatment. The outcome of knee arthroplasty can be evaluated with different instruments. One of the most frequently used specific questionnaires for assessing knee pain, stiffness and function of the knee in patients with osteoarthritis is The Western Ontario and McMaster Universities Arthritis Index (WOMAC). It is a short and simple instrument, which the patient fills in 12-15 minutes, and it consists of 24 questions that are divided into three subscales that estimate pain (five questions), stiffness (two questions) and physical function of the knee (17 questions) (2). With the help of this questionnaire, the improvement in pain and physical functioning after total knee arthroplasty is observed in most studies (2). The greatest postoperative improvement related to pain and physical functioning is achieved six months after surgery, while additional improvement is achieved one or two years after surgery (2).

postoperativno poboljšanje u pogledu bola i fizičkog funkcionisanja se postiže 6 meseci nakon operacije, dok se manje dodatno poboljšanje postiže posle jedne ili dve godine od operacije (2).

Brojne studije bave se ispitivanjem zadovoljstva pacijenata kod kojih je urađena totalna artroplastika zgloba kolena. Oko 10–20% pacijenata sa urađenom totalnom artroplastikom zgloba kolena je nezadovoljno hirurškim ishodom i prijavljuju uporni postoperativni bol (1). To može dovesti do odložene mobilizacije, dužeg trajanja hospitalizacije, a samim tim i do većih troškova za zdravstveni sistem. Zbog toga je multidisciplinarno lečenje postoperativnog bola od velikog značaja, a to uključuje aktivnosti i saradnju različitih medicinskih stručnjaka kako bi se efikasno upravljalo postoperativnim bolom. Rana rehabilitacija predstavlja poseban izazov za ove pacijente i njihovu reintegraciju (1).

Veoma često mogu nastati postoperativne komplikacije kao što su uporan bol, narušena propriocepcija, poremećena posturalna stabilnost i snaga mišića, a one mogu da traju nekoliko godina, što ima ozbiljan uticaj na postoperativni oporavak pacijenata. Najznačajnija komplikacija nakon totalne artroplastike zgloba kolena je smanjenje mišićne snage. Preoperativna snaga kvadricepsa je bitan faktor u predviđanju funkcije kolena nakon totalne artroplastike zgloba kolena, a snaga mišića je značajno povezana sa bolom, funkcijom kolena, propriocepcijom i funkcijom ravnoteže. Mnoge međunarodne smernice preporučuju trening snage kao osnovnu strategiju lečenja osteoartritisa kolena, a ova terapija je takođe pogodna za pacijente koji čekaju na totalnu artroplastiku zgloba kolena. Preoperativni trening snage ima višestruke pozitivne efekte na rehabilitaciju nakon totalne artroplastike zgloba kolena, odnosno doprinosi smanjenju bola, povećanju mišićne snage i obima pokreta, i boljem funkcionisanju zglobova i oporavku fizičke funkcije (3,4).

Takođe, važan je i program rehabilitacije za poboljšanje postoperativne fizičke funkcije kolena kod pacijenata kod kojih je urađena totalna artroplastika zgloba kolena (5). Program rehabilitacije može da podrazumeva niz fizičkih komponenti, uključujući obnovu obima pokreta (engl. *range of motion* - ROM), jačanje mišića, hodanje, funkcionalne vežbe, vežbe izdržljivosti i ravnoteže.

Cilj ovog preglednog rada je da se analiziraju različiti terapijski pristupi kineziterapije u smanjenju postoperativnog bola kod pacijenata sa totalnom artroplastikom zgloba kolena.

Metode

U ovom preglednom radu procenjeni su različiti terapijski pristupi kineziterapije u smanjenju postoperativnog bola kod pacijenata sa totalnom artroplastikom zgloba kolena i to na osnovu najnovije literature koja je dobijena pretraživanjem nekoliko relevantnih baza podataka: PubMed, SCIndeks, HRČAK i DOISerbia.

Pretraživanje literature je realizovano za period 2015-2023. godine korišćenjem sledećih ključnih reči: bol, kineziterapija, artroplastika, zglob kolena i rehabilitacija. Svi radovi su bili na engleskom jeziku.

U okviru ovih istraživanja, korišćeni su različiti instrumenti: Numerička skala ocenjivanja bola (engl. *Numerical Pain Rating Scale* - NRS), Indeks osteoartritisa Univerziteta Zapadni Ontario i McMaster (WOMAC) upitnik, Vizuelna analogna skala bola (VAS) i *Knee Injury and Osteoarthritis Outcome Score* (KOOS). Korišćenjem ovih instrumenata istraživači su merili i ocenjivali intenzitet bola, stepen pokretljivosti i funkcionalnosti pacijenata nakon totalne artroplastike zgloba kolena. Svi radovi odnosili su se na pacijente starosti između 40 i 80 godina.

Redukcija postoperativnog bola kod pacijenata sa totalnom artroplastikom kolena

Sistematski pregled i meta-analiza, autora *Wu* i saradnika, koja je obuhvatila rezultate sedam randomizovanih kontrolisanih kliničkih studija, je pokazala da preoperativni trening snage dovodi do statitistički značajnih poboljšanja u redukciji bola i ukočenosti, kao i u poboljšanju funkcije kolena, funkcionalnoj sposobnosti i fizičkoj funkciji, u poređenju sa kontrolnom grupom koja nije dobijala preoperativni trening snage (3). Nakon totalne artroplastike zgloba kolena, trening snage je pokazao statistički značajno poboljšanje postoperativne funkcije kolena, obima pokreta i funkcionalne sposobnosti nakon jednog i tri meseca, kao i poboljšanje postoperativne snage, redukcije ukočenosti i povećanja WOMAC indeksa nakon 3 meseca, i smanjenje postoperativnog bola nakon 6 meseci (3). Međutim, meta-analiza koja je obuhvatila pet studija je otkrila da preoperativni trening snage nije doprineo značajnom smanjenju postoperativnog bola nakon totalne artroplastike zgloba kolena (3). Međutim, sve ove studije koristile su

Numerous studies examine the satisfaction of patients who have undergone total knee arthroplasty. About 10—20% of patients, who have undergone total knee arthroplasty, are dissatisfied with the surgical outcome and report persistent postoperative pain (1). This can lead to delayed mobilization, longer hospitalization, and therefore, to higher costs for the healthcare system. Therefore, the multidisciplinary treatment of postoperative pain is of great importance, which includes the activities and cooperation of various medical professionals in order to effectively manage the postoperative pain. Early rehabilitation represents a special challenge for these patients and their reintegration (1).

Very often, postoperative complications, such as the persistent pain, impaired proprioception, impaired postural stability and muscular strength, may appear and they can last for several years, and therefore, have a serious impact on the postoperative recovery of patients. The most significant complication after total knee arthroplasty is a decrease in muscular strength. The preoperative strength of quadriceps is an important factor in predicting the knee function after total knee arthroplasty, while muscular strength is significantly associated with pain, function of the knee, proprioception and balance. Many international guidelines recommend strength training as a basic treatment strategy for knee osteoarthritis, and this therapy is also suitable for patients awaiting total knee arthroplasty. Preoperative strength training has multiple positive effects on rehabilitation after total knee arthroplasty, that is, it contributes to reducing pain, improving muscular strength and range of motion, as well as to improving joint functioning and recovery of physical function (3,4).

In addition, the rehabilitation program is also important for improving the postoperative physical function of the knee in patients who have undergone total knee arthroplasty (5). A rehabilitation program may include a number of physical components, including the restoration of range of motion (ROM), improving muscular strength, walking, functional exercises, exercises of endurance and balance.

The aim of this review article is to analyze different therapeutic approaches of kinesitherapy in reducing the postoperative pain in patients with total knee arthroplasty.

Methods

In this review article, different therapeutic approaches of kinesitherapy in reducing the postoperative pain in patients with total knee arthroplasty were evaluated based on the latest literature, which was obtained by searching several relevant databases: PubMed, SCIndex, HRCAK and DOISerbia.

The literature search was carried out for the period 2015-2023 using the following key words: pain, kinesitherapy, arthroplasty, knee joint and rehabilitation. All papers were in English.

Within this research, the following instruments were used: Numerical Pain Rating scale (NRS), Western Ontario and McMaster University Osteoarthritis Index (WOMAC) questionnaire, Visual Analogue Pain Scale (VAS) and Knee Injury and Osteoarthritis Outcome Score (KOOS). With the help of these instruments, the researchers measured and evaluated the intensity of pain, the degree of mobility and functionality of patients after total knee arthroplasty. All studies were related to patients aged between 40 and 80 years.

The reduction in postoperative pain in patients with total knee arthroplasty

A systematic review and meta-analysis of Wu et al., which included the results of seven randomized controlled clinical studies, showed that preoperative strength training led to the statistically significant improvement in pain and stiffness reduction, as well as in the improvement in knee function, functional ability and physical function, in comparison to the control group that did not receive the preoperative strength training (3). After total knee arthroplasty, strength training showed a statistically significant improvement in postoperative knee function, range of motion and functional capacity one to three months after surgery, as well as the improvement in postoperative strength, reduction in stiffness and increase in WOMAC index after three months, and the reduction in postoperative pain after 6 months (3). However, a meta-analysis, which included five studies, found that preoperative strength training did not contribute to a significant reduction in postoperative pain after total knee arthroplasty (3). However, all these studies used different instruments to measure pain, including the Visual Analogue Scale (VAS), the Copenhagen Osteoarthritis Scale (COS) and the WOMAC questionnaire.

različite instrumente za merenje bola, uključujući VAS, KOOS i WOMAC upitnik.

U meta-analizi autora *Alrawashdeh* i sar, objavljenoj 2021. godine, obuhvaćeni su rezultati šest kliničkih randomizovanih studija, gde su autori koristili VAS za merenje inteziteta bola nakon završetka programa rehabilitacije nakon urađene totalne artroplastike kolena (6). Kontrolna grupa je dobijala standardni program rehabilitacije (uključujući obnovu obima pokreta, jačanje mišića, hodanje) a eksperimentalna grupa pored tog standardnog programa i dodatnu metodu rehabilitacije (progresivna snaga, vežbe sa slingom, neuromuskularna električna stimulacija, vežbe ravnoteže, kontinuirano pasivno kretanje zgloba, vežbe u vodi). Prema numeričkoj vrednosti VAS-a došlo je do nešto veće redukcije postoperativnog bola u eksperimentalnoj grupi, nego među kontrolama, ali razlika nije bila statistički značajna (6).

Međutim, četiri kliničke randomizovane studije (7-10) su prikazale značajno bolje prosečno poboljšanje redukcije postoperativnog bola u eksperimentalnoj grupi (koja je dobijala progresivne vežbe) u poređenju sa kontrolnom grupom (koja je dobijala standardni program koji obuhvata vežbe obima pokreta, vežbe jačanja mišića i vežbe mobilnosti). Ove četiri studije su primenjivale različite pristupe preoperativnom treningu snage. Jedna je koristila progresivnu snagu paralelno sa vežbama obima pokreta (ROM), snage, funkcije i hodanja, druga je koristila vežbe sa slingom, treća je kombinovala vežbe obima pokreta, vežbe snage, funkcije i hodanja sa dodatnim vežbama kao što su transfer i vežbe aktivnosti svakodnevnog života, a četvrta je koristila neuromuskularnu električnu stimulaciju (NMES) uz vežbe snage, ROM-a, funkcije i hodanja.

U istoj meta-analizi (6), objedinjeni su rezultati osam kliničkih randomizovanih studija gde je WOMAC indeks korišćen za procenu postoperativnog bola, ukočenosti i funkcije. Značajno poboljšanje svih parametara je bilo u eksperimentalnoj grupi koji su u programu rehabilitacije imali vežbe snage, ROM, hodanje i vežbe funkcije. Jedna studija je koristila dodatno i vežbe ravnoteže i izdržljivosti i uočila je značajno veće poboljšanje od ostalih studija. Ove studije su potvrdile da je preoperativni trening mišićne snage korisna strategija za poboljšanje funkcionalnosti i oporavka pacijenata koji će biti podvrgnuti totalnoj artroplastici kolena (6).

U studiji autora *Schindler* i sar. (1) uočeno je da se postoperativni bol značajno smanjuje tokom prve nedelje nakon totalne artroplastike zgloba kolena, sa najvećim smanjenjem intenziteta bola osmog dana od operacije. Međutim, nakon perioda od 9 dana, primećen je blag porast intenziteta bola, da bi se zatim konstantno smanjivao tokom narednih dana. Uočeno je da su ženski pol, nizak indeks telesne mase i preoperativni zglobni deformiteti kolena značajno povezani sa većim intenzitetom postoperativnog bola. Ovi nalazi sugerišu potrebu za personalizacijom rehabilitacionog pristupa kako bi se smanjilo nezadovoljstvo pacijenata i prevenirao hroničan bol (1).

Zaključak

Ispitivanjem procene uticaja različitih terapijskih pristupa kineziterapije na redukciju postoperativnog bola pacijenata sa artroplastikom zgloba kolena, dolazimo do zaključka da postoji potencijal za poboljšanje postoperativnog oporavka i funkcionalnosti uz pomoć preoperativnog treninga snage. Iako rezultati ukazuju na značajno poboljšanje postoperativne funkcije kolena, obima pokreta i funkcionalne sposobnosti nakon primene kineziterapije, nalazi u vezi sa smanjenjem postoperativnog bola nisu uniformni.

Neophodna su dalja istraživanja u ovoj oblasti kako bi se razjasnila uloga kineziterapije u smanjenju bola nakon artroplastike zgloba kolena, uz uzimanje u obzir dinamične prirode postoperativnog bola i različitih faktora rizika koji mogu uticati na njegov intenzitet. Ova istraživanja pružaju osnovu za dalji razvoj personalizovanih rehabilitacionih protokola, koji će omogućiti individualizovan pristup svakom pacijentu i doprineti optimalnom postoperativnom ishodu u smislu smanjenja bola i ukupnog funkcionisanja nakon zamene kolena.

Konflikt interesa

Autor je izjavio da nema konflikta interesa.

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A meta-analysis of Alrawashdeh et al., which was published in 2021, included the results of six randomized controlled trials, where the authors used VAS to measure pain intensity after completing the rehabilitation program after total knee arthroplasty (6). The control group received a standard rehabilitation program (including the recovery of range of motion, improving muscular strength, walking), while the experimental group received an additional rehabilitation method apart from the standard program (progressive strength, exercises with the sling, neuromuscular electrical stimulation, balance exercises, continuous passive joint movement, exercises in water). According to the numerical value of VAS, there was a slightly greater reduction in postoperative pain in the experimental group than in the control group, but the difference was not statistically significant (6).

However, four randomized controlled trials (7-10) showed a significantly better average improvement in postoperative pain reduction in the experimental group (which received progressive exercises) in comparison to the control group (which received a standard program which included exercises for the range of motion, exercises for developing muscular strength and mobility exercises). These four studies applied different approaches to preoperative strength training. One used progressive strength in parallel with the exercises of range of motion (ROM), strength, function and walking, while the second used exercises with the sling, the third combined range of motion, strength, function and walking exercises with additional exercises such as transfer exercises and exercises of everyday activities, and the fourth used neuromuscular electrical stimulation (NMES) with exercises of strength, ROM, function and walking (6).

In the same meta-analysis (6), the results of eight randomized controlled trials, where the WOMAC index was used to assess the postoperative pain, stiffness and function, were collected. A significant improvement in all parameters was in the experimental group that had strength exercises, ROM, walking and function exercises in the rehabilitation program. One study additionally used balance and endurance exercises, and a significantly greater improvement was found in this study in comparison to other studies. These studies have confirmed that preoperative strength training is a useful strategy to improve the functionality and recovery of patients who will undergo total knee arthroplasty (6).

In the study of Schindler et al. (1), it was noticed that the postoperative pain significantly decreased during the first week after total knee arthroplasty, with the greatest decrease in pain intensity on the eighth day after surgery. However, after the period of 9 days, a slight increase in pain intensity was observed, and it decreased constantly during the following days. It was observed that the female gender, low body mass index and preoperative knee joint deformities were associated with the higher intensity of postoperative pain. These findings suggest the need for a personalized rehabilitation approach in order to reduce patients' dissatisfaction and prevent chronic pain (1).

Conclusion

By examining the assessment of the impact of different therapeutic approaches of kinesitherapy on the reduction in postoperative pain in patients with knee arthroplasty, the conclusion is reached that there is potential for improving the postoperative recovery and functionality with the help of preoperative strength training. Although the results point to a significant improvement in postoperative knee function, range of motion and functional ability after the application of kinesitherapy, findings related to the postoperative pain reduction are not uniform.

Further research in this field is necessary in order to clarify the role of kinesitherapy in reducing pain after knee arthroplasty, taking into consideration the dynamic nature of postoperative pain and different risk factors that may influence its intensity. These studies provide the basis for further development of personalized rehabilitation protocols, which will enable an individualized approach to each patient and contribute to the optimal postoperative outcome in terms of pain reduction and overall functioning after knee replacement.

Competing interests

The author declared no competing interests.

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