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IMPROVING HEALTHCARE THROUGH THE SKILLS MIX OF THE WORKFORCE

IZBOLJŠANJE ZDRAVSTVENEGA VARSTVA Z MEŠANICO ZNANJ IN SPRETNOSTI DELOVNE SILE

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ABSTRACT

The latest definition of skill mix refers to changes in tasks, skills, competencies or roles within and between healthcare professionals and healthcare workers in three areas: Task shifting, role expansion and multi-professional collaboration. There is evidence of the effectiveness of many changes in the skill mix — particularly in the areas of health promotion and disease prevention, chronic disease management and care of vulnerable populations. The implementation of skill-mix approaches begins with interprofessional education, which emphasises collaborative practice aimed at fostering working relationships between two or more health professions. The evidence for the effectiveness of many skill mix changes should not be understood as a resource-neutral intervention. Changes in skill mix have implications for the structure of labour shortages, as workload shifts or increases. In addition, education and training interventions require time and resources and therefore considerable joint effort from the stakeholders involved.

Keywords
Healthcare
Workforce
Multi-professional collaboration
Skill-mixing
Interprofessional education
Labour shortages

IZVLEČEK

Najnovejša definicija prepleta znanj in spretnosti se nanaša na spremembe v nalogah, spretnostih, kompetencah ali vlogah znotraj in med zdravstvenimi delavci in sodelavci na treh področjih: prenos nalog, razširitev vlog in večpoklicno sodelovanje. Obstajajo dokazi o učinkovitosti številnih sprememb v okviru prepleta znanj in spretnosti — zlasti na področjih promocije zdravja in preprečevanja bolezni, obvladovanja kroničnih bolezni in oskrbe ranljivega prebivalstva. Implementacija prepleta znanj in spretnosti se začne z medpoklicnim izobraževanjem, ki poudarja prakso sodelovanja in je namenjeno spodbujanju delovnih odnosov med dvema ali več zdravstvenimi poklici. Dokazov o učinkovitosti številnih sprememb v okviru prepleta znanj in spretnosti ne bi smeli razumeti kot intervencijo, ki ne vpliva na vire. Spremembe v prepletu znanj in spretnosti imajo učinek na strukturo pomanjkanja delovne sile, saj se delovna obremenitev spreminja ali povečuje. Poleg tega posegi na področju izobraževanja in usposabljanja zahtevajo čas in vire ter zato veliko skupnega truda vključenih deležnikov.

Ključne besede
zdravstvo
delovna sila
medpoklicno sodelovanje
preplet spretnosti
medpoklicno izobraževanje
pomanjkanje delovne sile

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1 INTRODUCTION

The skill mix of the healthcare workforce is not a new topic; it has been discussed for decades (1, 2), but has gained considerable importance in the last decade due to the ever-growing shortage of healthcare professionals, the increase in chronic diseases, and the need for tailored approaches for hard-to-reach populations (3). The latest definition of skill mix refers to changes in tasks, skills, competencies or roles within and between healthcare professionals and healthcare workers. Skill mix can be divided into three types: 1) task shifting - reassignment of tasks, recognised as task shifting, from higher to lower skilled occupations (synonymous with delegation, substitution), 2) role expansion - addition of new tasks or roles that did not previously exist or were not routinely performed (synonymous with augmentation), and 3) multi-professional collaboration - introduction or modification of teamwork or changes in collaboration between at least two or more occupations (3-6).

2 EVIDENCE

Several systematic reviews and meta-analyses over the past decade have summarised a growing body of evidence for different interventions in different populations (e.g., maternal care, at-risk individuals, patients with chronic conditions, hard-to-reach communities), for different outcomes (e.g., mortality, hospitalisations, patient experience, access to services, costs), in different care settings and health systems (5, 6). The heterogeneity of the evidence illustrates the breadth of skill-mix innovation, but also poses a challenge for its interpretation and generalisation. In terms of job roles, most of the evidence relates to the nursing and pharmacy professions. In terms of skill mix typology, the most commonly implemented skill mix is task shifting (3).

Task shifting is the transfer of specific tasks to healthcare workers who did not normally perform these tasks as part of their job. It was developed in response to the shortage of qualified healthcare professionals and aims to make efficient use of human resources to improve the health of vulnerable populations and increase cost-effectiveness (7).

In Europe, there are many successful practices of task shifting from doctors to nurses (8-10), but there is a problem of inconsistency in postgraduate education and training for nurses taking over tasks from physicians. According to the guidelines of the International Council of Nurses (ICN) and the European Specialist Nurses Organisation (ESNO), a master's degree in a specific clinical area with at least 500 hours of clinical practice under the supervision of physicians and advanced practice nurses should be required (11). In two meta-analyzes, Paier-Abuzahra et al. (10) found that nurse-led care led to a reduction in mortality (with the reduction being significant in one analysis) and hospitalisations, but not in patient-relevant outcomes (such as physical functioning, quality of life, or pain); notably, the reduction in mortality was greatest for highly skilled nurses (advanced nurse practitioners), as opposed to registered nurses or nursing assistants. Wit et al (12) found in a study in the Netherlands that while skill shifting may attract more people to the nursing profession, we should also be mindful of excessive workload and the relationship with physicians. A large number of tasks may be subject to task shifting and exceed the competencies of basic nursing education at bachelor level (13). Overall, studies of task shift implementation reported that care provided by advanced nurses was associated with fewer emergency department visits, hospital admissions and costs (14). Systematic reviews of arterial hypertension (15), atrial fibrillation (16) and heart failure (17) provide evidence of the effectiveness of nurse-led clinics in improving clinical outcomes, but also show considerable variation in structure, scale, funding and contextual factors across health systems.

Pharmacy is another profession in which there is a considerable shift in tasks. As pharmacists increasingly take on a more patient-centred role and work as part of a multidisciplinary team, they are seen as key professionals in assessing and treating patients and supporting medication management, particularly in older people and patients with chronic conditions and complex polypharmacy (6). Pharmacist-led care can increase adherence, reduce medication errors and improve outcomes such as blood pressure control (18, 19); of note, pharmacist practise in immunisation, which was expanded globally during the last pandemic, was associated with an increase in vaccination rates (20).

The second typology concerns the addition of new tasks or the expansion of roles, also known as task augmentation, such as care coordination, the use of new technologies or electronic health monitoring. This typology refers to healthcare professionals expanding their role and taking on new tasks that did not previously exist or were not routinely performed. Thus, this typology refers to the expansion of an individual's and team's skills and roles (6). There is evidence of the successful implementation of expanded roles in health promotion, prevention and lifestyle intervention (e.g. smoking, nutrition, physical activity, weight management, immunisation, screening, emergency contraception), with most role expansions involving pharmacists, physiotherapists, nurses, dieticians, midwives and school nurses (3).

The third typology of skill mix involves the introduction of teamwork and collaboration for at least two professions, which directly affect the way they work together. This also concerns measures to improve cooperation and collaboration, such as the effectiveness of teamwork or

interprofessional education (5, 6). Schmutz et al. (21) conducted a meta-analysis of the skill mix in teamwork, including various contextual factors, and examined the relationship between teamwork and clinical performance in acute care. The analysis of 1,390 teams from 31 different studies showed that teams that engage in teamwork processes are 2.8 times more likely to achieve high performance than teams that do not. Teamwork is related to performance regardless of team or task characteristics. Therefore, clinicians and educators in all healthcare disciplines should strive to maintain or improve effective teamwork.

The implementation of skill-mix approaches begins with interprofessional education, which emphasises collaborative practice aimed at fostering working relationships between two or more health professions. Interprofessional education at the level of education and training is not exactly the practice of healthcare systems based on hierarchical relationships. In a meta-analysis, Guraya & Barr (22) showed a significant positive impact and effectiveness of educational interventions through interprofessional education modules in various healthcare disciplines.

The evidence for the effectiveness of many skill mix changes should not be understood as a resource-neutral intervention. Changes in skill mix have implications for the structure of labour shortages in the institutions in which they are applied, as workload shifts or increases. This may be especially challenging in systems with a critical shortage and high workload of nurses (23). In addition, education and training interventions require time and resources and therefore considerable joint effort from the stakeholders involved (24). Finally, it should be noted that the introduction of the skill mix also requires a change in the responsibilities of healthcare professionals set out in legislation, as it entails a redistribution of responsibilities among healthcare professionals, who do not always have national legal bases.

3 CONCLUSION

There is evidence of the effectiveness of many changes in the skill mix — particularly in the areas of health promotion and disease prevention, chronic disease management and care of vulnerable populations. Task shifting, role expansion and multi-professional collaboration offer an opportunity for the resilience and sustainability of health systems, but also pose challenges for context-specific adaptation and implementation. Overall, the importance of skill mix underscores how critical it is for countries to address health system reforms that prioritise workforce development and the networking of experts from different disciplines, and to redesign the division of labour, roles and responsibilities in health teams to achieve the best possible accessibility of healthcare and improve the quality of health services.

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Stefa J, Gega M, Refatllari B, Hyska G, Qirjako G, Burazeri G. Prevalence and sociodemographic correlates of nutritional habits among schoolchildren aged 11-15 years in Albania. Zdr Varst. 2025;64(3):133-142. doi: 10.2478/sjph-2025-0017.

PREVALENCE AND SOCIODEMOGRAPHIC CORRELATES OF NUTRITIONAL HABITS AMONG SCHOOLCHILDREN AGED 11-15 YEARS IN ALBANIA

RAZŠIRJENOST IN SOCIODEMOGRAFSKI KORELATI PREHRANJEVALNIH NAVAD MED ŠOLARJI, STARIMI OD 11 DO 15 LET, V ALBANIJI

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ABSTRACT

Objective
Healthy nutritional habits during childhood promote healthy growth and development and foster psycho-emotional wellbeing. Our aim was to assess the prevalence and sociodemographic correlates of selected nutritional habits among Albanian schoolchildren.

Methods
A cross-sectional study was conducted in Albania in 2022, in the framework of the Health Behaviour in School-aged Children survey, including a nationwide representative sample of 5,454 schoolchildren aged 11-15 years (≈52% girls; ≈96% response). Data on nutritional habits were gathered, along with the children's sociodemographic factors. Binary logistic regression was used to assess the associations of nutritional habits with sociodemographic factors.

Results
In multivariable-adjusted analysis, the odds of daily breakfast consumption on weekdays were significantly higher among males (OR=1.3, 95%CI=1.2-1.5), younger children (OR=2.7, 95%CI=2.4-3.2) and those from more affluent families (OR=1.2, 95%CI=1.1-1.4). Conversely, the odds of daily consumption of fruits and/or vegetables were lower among males (OR=0.8, 95%CI=0.7-0.9 and OR=0.7, 95%CI=0.6-0.7, respectively), but higher in younger children (OR=1.5, 95%CI=1.3-1.8 and OR=1.4, 95%CI=1.2-1.6, respectively) and those from wealthier families (OR=1.3, 95%CI=1.2-1.5 and OR=1.2, 95%CI=1.0-1.3, respectively). Additionally, the odds of daily consumption of sweets were lower among males (OR=0.7, 95%CI=0.6-0.8) and younger children (OR=0.5, 95%CI=0.5-0.6). Also, the odds of daily consumption of sugary soft drinks were lower in younger children (OR=0.6, 95%CI=0.5-0.6) and urban residents (OR=0.8, 95%CI=0.7-0.9).

Conclusions
Our findings provide useful insights into the complex interplay of sociodemographic characteristics in shaping nutritional practices of children. There is a need for targeted nutritional interventions based on the specific sociodemographic backgrounds of children in Albania and elsewhere, ultimately supporting healthier nutritional habits.

Keywords
Albania
Breakfast
Nutrition
Schoolchildren
Fruits and vegetables

IZVLEČEK

Cilj
Zdrave prehranjevalne navade v otroštvu spodbujajo zdravo rast in razvoj ter krepijo psihično in čustveno dobro počutje. Naš cilj je bil oceniti razširjenost in sociodemografske korelate izbranih prehranjevalnih navad med albanskimi šolarji.

Metode
V Albaniji je bila leta 2022 v okviru raziskave o vedenju šoloobveznih otrok v zvezi z zdravjem izvedena presečna študija, v katero je bil vključen reprezentativni vzorec 5.454 šolarjev, starih od 11 do 15 let (≈52 % deklet; ≈96-% odziv). Zbrani so bili podatki o prehranjevalnih navadah in sociodemografski dejavniki otrok. Za oceno povezanosti prehranjevalnih navad s sociodemografskimi dejavniki je bila uporabljena binarna logistična regresija.

Rezultati
V multivariatno prilagojeni analizi je bila verjetnost vsakodnevnega uživanja zajtrka ob delavnikih znatno večja pri fantih (RO = 1,3, 95-% IZ = 1,2-1,5), mlajših otrocih (RO = 2,7, 95-% IZ = 2,4-3,2) in otrocih iz premožnejših družin (RO = 1,2, 95-% IZ = 1,1-1,4). Nasprotno je bila verjetnost dnevnega uživanja sadja in/ali zelenjave nižja pri fantih (RO = 0,8, 95-% IZ = 0,7-0,9 oziroma RO = 0,7, 95-% IZ = 0,6-0,7), višja pa pri mlajših otrocih (RO = 1,5, 95-% IZ = 1,3-1,8 oziroma RO = 1,4, 95-% IZ = 1,2-1,6) in otrocih iz premožnejših družin (RO = 1,3, 95-% IZ = 1,2-1,5 oziroma RO = 1,2, 95-% IZ = 1,0-1,3). Poleg tega je bila verjetnost dnevnega uživanja sladkarij manjša pri fantih (RO = 0,7, 95-% IZ = 0,6-0,8) in mlajših otrocih (RO = 0,5, 95-% IZ = 0,5-0,6). Tudi verjetnost dnevnega uživanja sladkih brezalkoholnih pijač je bila manjša pri mlajših otrocih (RO = 0,6, 95-% IZ = 0,5-0,6) in živečih v mestih (RO = 0,8, 95-% IZ = 0,7-0,9).

Zaključki
Naše ugotovitve ponujajo koristen vpogled v zapleten preplet sociodemografskih značilnosti pri oblikovanju prehranjevalnih navad otrok. Potrebni so ciljno usmerjeni prehranski ukrepi, ki temeljijo na posebnih sociodemografskih značilnostih otrok v Albaniji in drugod, kar bi na koncu prispevalo k bolj zdravim prehranjevalnim navadam.

Ključne besede
Albanija
zajtrki
prehranjevanje
šolarji
sadje in zelenjava

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1 INTRODUCTION

Poor nutritional habits constitute an important risk factor for ill-health and premature mortality (1). Inducement to healthy nutritional practices starting from an early age is crucial, as behavioural patterns developed in childhood and adolescence often carry over into adulthood (2, 3). Unhealthy dietary patterns and practices during childhood and adolescence contribute to the development of obesity and increased body fat (4, 5), a higher incidence of dental caries (6), increased blood pressure, poorer mental health and a lower quality of life (5, 7, 8). Conversely, healthy nutritional habits during childhood and adolescence not only reduce the risk of developing chronic conditions and noncommunicable diseases later in life (1), but also promote healthy growth and development (9, 10), and foster psycho-emotional wellbeing (5, 7, 8).

Regular breakfast consumption is one of the main indicators of healthy nutritional practices in children (11) and has been convincingly linked to a healthier body mass index (BMI), better mental health, improved school performance and improved overall diet quality (11-14). Indeed, a comprehensive systematic review including about 290,000 children and adolescents in 33 countries (15) has reported that breakfast consumption among children and adolescents is associated with a lower BMI, better nutritional intake (16) and better cognitive status (17).

Regarding specific food items, consumption of fruit and vegetables is essential for the good physical and mental health of children (11, 18). Therefore, the World Health Organization (WHO) recommends consumption of at least five portions of fruit and vegetables per day and reduction of the consumption of free sugars to less than 10% of daily energy intake (11, 18).

Reports from many countries have linked various sociodemographic factors with the eating habits of children (11, 18). Thus, fairly recent evidence indicates that breakfast consumption levels are higher among boys, younger children (11 years) and those from more affluent families (11). Conversely, daily consumption of fruit and/or vegetables has been reported to be higher among girls, younger children and those from more affluent families (11). Furthermore, daily consumption of sweets has been reported to be higher among girls, whereas the association with other sociodemographic factors is seemingly not consistent (11). Regarding daily consumption of sugary soft drinks, the available evidence indicates a higher level of consumption among boys and children from less affluent families (11).

The Health Behaviour in School-aged Children (HBSC) study is a large school-based survey conducted every four years in many countries in Europe, Central Asia and Canada (11, 19). The HBSC survey collects important information on several health behaviours, health outcomes and the social environments of children aged 11, 13 and 15 years (11, 19). The last round of the HBSC survey was conducted in 2021-2022 in 44 countries including Albania (11, 19, 20). In addition to many health outcomes and behavioural factors, the survey included a set of questions measuring selected nutritional habits among schoolchildren aged 11-15 years (11, 19).

Fairly recent evidence from Albania indicates that almost 1/3 of schoolchildren aged 12-15 years do not exhibit the best attitudes towards health promotion, including the ability to maintain and improve health (21). Furthermore, a previous study reported a strong and consistent positive relationship between breakfast skipping and obesity, but not overweight among Albanian children aged 7-10 years (22).

In this framework, the objective of our study was to assess the prevalence and sociodemographic correlates of selected nutritional habits among schoolchildren, based on the data obtained from the last round of the HBSC survey conducted in Albania in 2022 (20). In line with the evidence obtained from the previous rounds of HBSC surveys (11, 19), we hypothesised a higher prevalence of breakfast consumption among boys, younger children and those from more affluent families. Conversely, we hypothesised a higher consumption of fruits and vegetables among girls, younger children and those from more affluent families, based on indications from previous HBSC rounds (11, 19). Additionally, we hypothesised a higher consumption of sweets among girls, but a higher consumption of sugary soft drinks in boys and children from less affluent families (11, 19). On the other hand, in the absence of supporting literature, we did not formulate any hypotheses regarding the association of eating habits with place of residence or parental employment status.

2 METHODS

2.1 Design and study population

The data presented in this article were obtained from a cross-sectional study corresponding to the last round of the HBSC survey, which was carried out in Albania and in many other countries in Europe and beyond during the period 2021-2022 (11, 19).

The study population comprised a nationwide representative sample of schoolchildren aged 11, 13 and 15 years (stratified multistage cluster sampling with probability proportional to size) (20). Stratification was based on prefectures (regions) of Albania, which ensured an adequate representativeness of the sample at a national level. Overall, of 5,700 targeted children for inclusion in the study, the sample included 5,454 schoolchildren aged 11, 13 and 15 years (2,844 girls, or ≈52% of the total sample). The overall response rate was: 5,454/5,700≈96% (20). There was no need for weighting the data as the distribution of gender, age and geographical region in the final study sample corresponded to the target population (i.e., the overall number of schoolchildren in Albania).

2.2 Data collection

Data collection was conducted in May 2022. A structured self-administered and anonymous internationally standardised questionnaire included, among other health behavioural characteristics, assessment of nutritional habits (breakfast consumption and consumption of selected food items) and information on sociodemographic factors of schoolchildren (11, 19).

Measurement of breakfast consumption on weekdays was based on the following question (19): "During weekdays, how often do you usually have breakfast (more than a glass of milk or fruit juice)?". Potential response categories were as follows: "never", "one day", "two days", "three days", "four days", "five days". In the analysis, breakfast consumption was dichotomised into: "daily" (5 days) vs. "non-daily" (0-4 days).

Conversely, measurement of the frequency of consumption of selected food items was based on the following questions (19): "How many times a week do you usually eat or drink: fruits, vegetables, sweets, and sugary soft drinks?". Potential response categories for each food item were as follows: "never", "less than once a week", "once a week", "2-4 days a week", "5-6 days a week", "once a day, every day", and "every day, more than once". In the analysis, the frequency of consumption of each food item was dichotomized into: "daily" (≥1/day) vs. "non-daily" (≤5-6/week) (19).

Sociodemographic characteristics included children's gender (boys vs. girls), age (11, 13 and 15 years), place of residence (urban vs. rural areas), mother's and father's current employment status (for each: yes vs. no), and family affluence scale (dichotomised into: less affluent [below median scores] vs. more affluent families [above median scores]) (19).

2.3 Ethical aspects

The study was approved by the Ethics Committee of Tirana Medical University (approval ID: No.700/1). All schoolchildren were informed about the objectives and procedures of the study, as well as the aspects regarding the anonymity of the survey and the subsequent aggregated data analysis. Furthermore, passive consent was sought from the parents through the teachers from each respective school.

2.4 Statistical analysis

Binary logistic regression was used to assess the association of nutritional habits with sociodemographic characteristics of schoolchildren. Initially, crude (unadjusted) models were run (Table 2). Odds ratios (ORs) and their respective 95% confidence intervals (95%CIs) and p-values (P) were calculated for each nutritional habit. Next, all sociodemographic factors (gender, age, residence, mother's and father's employment status, and family affluence scale) were entered simultaneously into the logistic regression models (Table 3). Multivariable-adjusted ORs and their respective 95%CIs and p-values were calculated for each of the nutritional habits (breakfast intake, and consumption of fruits, vegetables, sweets and sugary soft drinks). For all the multivariable-adjusted logistic regression models, a Hosmer-Lemeshow test was used to assess the goodness-of-fit; all multivariable-adjusted models fit the Hosmer-Lemeshow criterion (23). For all statistical tests employed, $P \leq 0.05$ was considered statistically significant. Statistical Package for the Social Sciences (SPSS, version 19.0) was used for all the statistical analyses.

3 RESULTS

Table 1 presents the distribution of nutritional habits by sociodemographic characteristics of the schoolchildren. The overall prevalence of daily breakfast consumption was about 48%.

Daily breakfast consumption was more frequent among boys, 11-year-olds, children living in urban areas, those whose parents were both employed and children from more affluent families. The overall prevalence of daily fruit and/or vegetable consumption was around 59% and 47%, respectively. Fruit and/or vegetable consumption was more frequent among girls, youngest children, those whose fathers were employed and in children from more affluent families. The overall prevalence of daily consumption of sweets was about 36%. Consumption of sweets was more frequent for girls among the oldest children, in those from rural areas and in children with unemployed fathers. The overall prevalence of daily consumption of sugary soft drinks was around 29%. Consumption of sugary soft drinks was more frequent among the oldest children, in those from rural areas and in schoolchildren whose mothers were unemployed.

Table 2 presents the crude/unadjusted associations of nutritional habits with sociodemographic characteristics of the schoolchildren.

Table 1. Distribution of selected nutritional habits by sociodemographic characteristics in a nationwide sample of Albanian schoolchildren, HBSC 2022.

Sociodemographic characteristics	Daily consumption				
	Breakfast	Fruit	Vegetables	Sweets	Sugary soft drinks
Total sample (n=5454)	2461 (48.2) [a]	3174 (58.8)	2549 (47.3)	1911 (35.5)	1582 (29.4)
Gender:					
Boys (n=2610)	1265 (52.1)	1434 (55.7)	1072 (41.9)	791 (30.9)	766 (29.9)
Girls (n=2844)	1196 (44.7)	1740 (61.5)	1477 (52.3)	1120 (39.7)	816 (28.9)
Age:					
11 years (n=1784)	1023 (62.2)	1145 (64.7)	946 (53.5)	495 (28.1)	409 (23.2)
13 years (n=1785)	754 (45.6)	1004 (57.0)	759 (43.3)	631 (35.9)	524 (29.9)
15 years (n=1877)	681 (37.9)	1021 (54.8)	841 (45.3)	782 (42.1)	647 (34.8)
Residence:					
Urban areas (n=3648)	1676 (48.8)	2125 (58.7)	1701 (47.2)	1253 (34.8)	1007 (27.9)
Rural areas (n=1806)	785 (46.9)	1049 (58.9)	848 (47.6)	658 (36.9)	575 (32.3)
Father's employment:					
Yes (n=4928)	2260 (49.0)	2897 (59.3)	2327 (47.8)	1697 (34.8)	1424 (29.2)
No (n=479)	190 (42.0)	248 (52.2)	204 (43.3)	193 (40.8)	142 (30.1)
Mother's employment:					
Yes (n=3676)	1701 (49.3)	2164 (59.4)	1710 (47.1)	1259 (34.6)	1033 (28.4)
No (n=1710)	734 (45.9)	975 (57.6)	814 (48.3)	623 (36.9)	528 (31.3)
Family affluence:					
Less affluent (n=2600)	1113 (45.8)	1434 (55.5)	1179 (45.9)	898 (34.9)	747 (29.1)
More affluent (n=2715)	1290 (50.4)	1657 (61.7)	1303 (48.6)	962 (35.9)	798 (29.8)

Legend: [a] Absolute numbers and their respective percentages (in parentheses). For nutritional habits, there were the following missing values: breakfast consumption (n=349), fruit consumption (n=53), vegetable consumption (n=70), consumption of sweets (n=68), and consumption of sugary soft drinks (n=70). In addition, there were the following missing values for sociodemographic factors: age of schoolchildren (n=8), father's employment status (n=47); mother's employment status (n=68); and family affluence score (n=139).

Table 2. Associations of nutritional habits with sociodemographic characteristics of schoolchildren; results from unadjusted binary logistic regression models.

Daily consumption	Demographic variables					
	Male		Age 11 [b]		Urban areas	
	OR (95%CI) [a]	P [a]	OR (95%CI)	P	OR (95%CI)	P
Breakfast	1.35 (1.21-1.51)	<0.001	2.70 (2.35-3.09)	<0.001	1.08 (0.96-1.21)	0.199
Nagelkerke R^2	0.01		0.05		<0.01	
Area under the curve (AUC)	54%		60%		51%	
Fruit	0.79 (0.71-0.88)	<0.001	1.51 (1.32-1.73)	<0.001	0.99 (0.89-1.12)	0.917
Nagelkerke R^2	0.01		0.01		<0.01	
AUC	47%		54%		50%	
Vegetables	0.66 (0.59-0.73)	<0.001	1.39 (1.22-1.59)	<0.001	0.98 (0.88-1.10)	0.759
Nagelkerke R^2	0.02		0.01		<0.01	
AUC	45%		55%		50%	
Sweets	0.68 (0.61-0.76)	<0.001	0.54 (0.47-0.62)	<0.001	0.91 (0.81-1.02)	0.114
Nagelkerke R^2	0.01		0.02		<0.01	
AUC	46%		45%		49%	
Sugary soft drinks	1.05 (0.93-1.18)	<0.001	0.57 (0.49-0.65)	<0.001	0.81 (0.72-0.92)	<0.001
Nagelkerke R^2	<0.01		0.02		<0.01	
AUC	51%		45%		48%	
Daily consumption	**Socioeconomic variables**					
	Father employed		Mother employed		More affluent	
	OR (95%CI) [a]	P [a]	OR (95%CI)	P	OR (95%CI)	P
Breakfast	1.32 (1.09-1.61)	0.005	1.15 (1.02-1.29)	0.024	1.21 (1.08-1.35)	0.001
Nagelkerke R^2	<0.01		<0.01		<0.01	
Area under the curve (AUC)	54%		52%		52%	
Fruit	1.34 (1.11-1.61)	0.003	1.08 (0.96-1.21)	0.210	1.29 (1.16-1.44)	<0.001
Nagelkerke R^2	<0.01		<0.01		0.01	
AUC	54%		51%		53%	
Vegetables	1.20 (0.99-1.45)	0.064	0.95 (0.85-1.07)	0.416	1.12 (1.00-1.24)	0.047
Nagelkerke R^2	<0.01		<0.01		<0.01	
AUC	52%		49%		51%	
Sweets	0.78 (0.64-0.94)	0.010	0.91 (0.80-1.02)	0.112	1.04 (0.93-1.17)	0.463
Nagelkerke R^2	<0.01		<0.01		<0.01	
AUC	47%		49%		51%	
Sugary soft drinks	0.96 (0.78-1.18)	0.700	0.87 (0.77-0.99)	0.030	1.03 (0.92-1.17)	0.578
Nagelkerke R^2	<0.01		<0.01		<0.01	
AUC	50%		49%		50%	

Legend: [a] Odds ratios and their respective 95% confidence intervals (in parentheses), as well as p-values from crude (unadjusted) binary logistic regression models. Reference groups for nutritional habits were as follows: "non-daily" (0-4 days) for breakfast consumption during weekdays, and "non-daily" (≤5-6/week) for the other dietary practices. [b] Compared to age 15.

Table 3. Independent associations of sociodemographic factors with nutritional habits; results from multivariable-adjusted binary logistic regression models.

Daily consumption	Demographic variables					
	Male		Age 11 [b]		Urban areas	
	OR (95%CI) [a]	P [a]	OR (95%CI)	P	OR (95%CI)	P
Breakfast	1.30 (1.16-1.46)	<0.001	2.73 (2.37-3.15)	<0.001	1.08 (0.95-1.22)	0.229
Fruit	0.76 (0.68-0.85)	<0.001	1.52 (1.33-1.75)	<0.001	0.99 (0.87-1.11)	0.809
Vegetables	0.65 (0.58-0.72)	<0.001	1.40 (1.22-1.60)	<0.001	0.99 (0.89-1.12)	0.974
Sweets	0.68 (0.61-0.77)	<0.001	0.54 (0.47-0.62)	<0.001	0.90 (0.79-1.02)	0.086
Sugary soft drinks	1.08 (0.95-1.22)	0.228	0.55 (0.48-0.64)	<0.001	0.79 (0.70-0.90)	<0.001
Daily consumption	**Socioeconomic variables**					
	Father employed		Mother employed		More affluent	
	OR (95%CI) [a]	P [a]	OR (95%CI)	P	OR (95%CI)	P
Breakfast	1.18 (0.96-1.45)	0.116	1.11 (0.98-1.25)	0.113	1.21 (1.08-1.36)	0.002
Fruit	1.21 (0.99-1.47)	0.062	1.06 (0.94-1.19)	0.379	1.33 (1.18-1.49)	<0.001
Vegetables	1.16 (0.95-1.42)	0.141	0.95 (0.85-1.08)	0.437	1.16 (1.04-1.30)	0.009
Sweets	0.82 (0.67-1.01)	0.056	0.93 (0.82-1.05)	0.237	1.07 (0.95-1.21)	0.258
Sugary soft drinks	1.02 (0.83-1.27)	0.834	0.89 (0.78-1.01)	0.078	1.03 (0.91-1.17)	0.601

Legend: [a] Odds ratios and their respective 95% confidence intervals (in parentheses), as well as p-values from crude (unadjusted) binary logistic regression models. Reference groups for nutritional habits were as follows: "non-daily" (0-4 days) for breakfast consumption during weekdays, and "non-daily" (≤5-6/week) for the other dietary practices. [b] Compared to age 15.

The odds of daily breakfast consumption were significantly higher among males (OR=1.4, 95%CI=1.2-1.5), in the youngest children (OR=2.7, 95%CI=2.4-3.1), in those whose fathers and/or mothers were employed (OR=1.3, 95%CI=1.1-1.6 and OR=1.2, 95%CI=1.0-1.3, respectively), and among children from more affluent families (OR=1.2, 95%CI=1.1-1.4). Conversely, the odds of daily fruit consumption were significantly lower among males (OR=0.8, 95%CI=0.7-0.9), but higher among younger children (OR=1.5, 95%CI=1.3-1.7), in those whose fathers were employed (OR=1.3, 95%CI=1.3-1.6) and among children from more affluent families (OR=1.3, 95%CI=1.2-1.4). Likewise, the odds of daily vegetable consumption were significantly lower among males (OR=0.7, 95%CI=0.6-0.7), but higher among younger children (OR=1.4, 95%CI=1.2-1.6) and those from more affluent families (OR=1.1, 95%CI=1.0-1.2). In turn, the odds of daily consumption of sweets were significantly lower among males (OR=0.7, 95%CI=0.6-0.8), children aged 11 (OR=0.5, 95%CI=0.5-0.6) and those whose fathers were employed (OR=0.8, 95%CI=0.6-0.9). Furthermore, the odds of daily consumption of sugary soft drinks were significantly lower among the youngest children (OR=0.6, 95%CI=0.5-0.7), urban residents (OR=0.8, 95%CI=0.7-0.9) and those whose mothers were employed (OR=0.9, 95%CI=0.8-1.0).

In multivariable-adjusted binary logistic regression models (Table 3), the odds of daily breakfast consumption were significantly higher among males (OR=1.3, 95%CI=1.2-1.5), children aged 11 (OR=2.7, 95%CI=2.4-3.2) and those from more affluent families (OR=1.2, 95%CI=1.1-1.4).

Conversely, the odds of daily fruit intake were significantly lower among males (OR=0.8, 95%CI=0.7-0.9), but higher in children aged 11 (OR=1.5, 95%CI=1.3-1.8) and those from more affluent families (OR=1.3, 95%CI=1.2-1.5). Furthermore, the odds of daily vegetable intake were significantly lower among males (OR=0.7, 95%CI=0.6-0.7), but higher in younger children (OR=1.4, 95%CI=1.2-1.6) and those from more wealthy families (OR=1.2, 95%CI=1.0-1.3). Additionally, upon multivariable adjustment, the odds of daily consumption of sweets were significantly lower among males (OR=0.7, 95%CI=0.6-0.8) and children aged 11 (OR=0.5, 95%CI=0.5-0.6). In turn, the odds of daily consumption of sugary soft drinks were significantly lower in younger children (OR=0.6, 95%CI=0.5-0.6) and urban residents (OR=0.8, 95%CI=0.7-0.9).

4 DISCUSSION

In our study, daily breakfast consumption among Albanian schoolchildren aged 11-15 years was more frequent among boys, younger individuals and those from more affluent families, highlighting the role of socioeconomic factors in dietary habits. In contrast, fruit and vegetable intake were more frequent among girls, younger children and those from more affluent families. Daily sweets consumption was

more frequent among girls and younger children, whereas sugary soft drink intake was more prevalent among older children and those from rural areas.

A fairly recent report indicating the same nutritional habits among all 44 participating countries in the last HBSC survey round conducted in 2021-22 (11) indicates that only half of adolescents (51%) eat breakfast daily on weekdays, which is slightly higher than our finding related to Albanian children of the same age group (48%). Daily breakfast consumption has been reported as low as 8% among 15-year-old girls in North Macedonia to 86% among 11-year-old boys in the Netherlands (11). Generally, a significant decline between 2018 and 2002 in daily breakfast consumption was observed in more than half of the countries included in the last HBSC round (11). In Albania, there is evidence of a small decline. Conversely, the largest decrease is evident in North Macedonia (29% and 28% decreases among boys and girls respectively), whereas Serbia is the only country with an increase in daily breakfast consumption across all gender and age groups (11).

Furthermore, according to the multi-country HBSC 2021-22 report (11), a higher proportion of boys (56%) reported daily breakfast consumption compared to girls (46%), a gender-difference which is similar to our findings (52% in boys vs. 45% in girls).

Our finding regarding an inverse relationship of breakfast consumption with age is in line with a fairly recent systematic review which has convincingly documented that the frequency of breakfast consumption decreases across the primary-school transition (24). According to this review, it may be possible that, as children transition into adolescence, their daily sleep patterns evolve, which may lead to a reduced sense of hunger upon waking in the morning (24, 25). Other influencing factors for skipping breakfast among older children may include their growing autonomy and increased peer pressure (24, 26).

In our study, boys and girls from more affluent families were more likely to eat breakfast daily, a finding which is compatible with the multi-country HBSC 2021-22 report (11). It has been convincingly shown that parents from wealthier families, among other things, play a significant role as a positive model for their children in acquir¬ing and adopting healthy dietary patterns (27). Also, in the Albanian context, this may be presumably due to a greater awareness about the importance of breakfast intake among children from a wealthier background, or due to a more structured family routine as parents from affluent backgrounds often have more flexible work schedules, allowing for a more organised morning routine that includes breakfast. Conversely, Albanian children from less affluent families may skip breakfast due to economic hardship, or lack of time and/or limited parental supervision.

The recent multi-country HBSC report indicates that only 38% of children consume fruits and vegetables daily (11), which is lower than our findings in Albania (59% for fruits and 47% for vegetables). Regarding the relationship with gender and age, in our study, consumption of fruits and vegetables was higher in girls than in boys and declined with age in both genders – findings which are compatible with the multi-country HBSC 2021-22 report (11). Also, we found the same social gradient in daily consumption of fruits and/or vegetables as evidenced in the recent multi-country HBSC report, with higher levels among schoolchildren from more affluent families (11). Daily fruit and vegetable consumption may be higher among schoolchildren from more affluent families in Albania due to greater financial ability to purchase these products, higher parental education levels, and an increased awareness of healthy eating habits. In contrast, less affluent families in Albania may rely more on cheaper, calorie-dense foods, leading to lower intake of fruits and vegetables among their children.

In 2018-2022, on average, fruit and vegetable consumption remained almost stable in HBSC participating countries, which is also the case of Albania and several neighbouring countries except North Macedonia, which exhibited a notable decrease in daily vegetable consumption (11).
In our study, more than 1/3 of children (36%) reported daily consumption of sweets, which is higher than the average estimate of the recent multi-country HBSC report (25%) (11). Generally, girls reported eating sweets more often than boys in countries which participated in the last HBSC round (11), which is in line with our findings. On the other hand, daily consumption of sweets was generally higher among schoolchildren from high-affluence families according to the HBSC multi-country report (11), a finding which was not evident in our study. On the other hand, between 2018 and 2022, daily consumption of sweets decreased in Albania (4% in boys and 5% in girls), a reduction which was higher than in Serbia, Croatia, North Macedonia, or the Republic of Moldova (11).

The overall prevalence of daily consumption of sugary soft drinks in our study (29%) was almost twice as high as the multi-country average (15%). Generally, boys were more likely than girls to consume sugary soft drinks daily in countries which participated in the last HBSC round (11), a finding which was not also evident in our study. Furthermore, we did not find an association of sugary soft drinks with family wealth, in contrast to several former communist countries (including the Republic of Moldova and Poland) where the consumption was more frequent among children from more affluent families (11).

In our study, there was no evidence of significant associations between place of residence and nutritional habits, except for sugary soft drinks. This may be due to the relatively homogeneous food environment across urban

and rural settings in Albania, where access to food options does not differ substantially. Furthermore, we did not find any significant associations between parental employment status and nutritional habits of schoolchildren. Seemingly, employment status does not strongly influence children's dietary patterns in the Albanian context, probably due to the extended family structures and strong cultural norms around family meals which likely reduce the direct impact of parental employment on children's dietary patterns, as grandparents or other family members often take responsibility for meal preparation and supervision. However, our findings related to parental employment and place of residence should be confirmed in future studies.

A major strength of our study consists of the large nationwide representative sample of schoolchildren and the use of an internationally standardised instrument (19). Yet, regarding external validity, a potential limitation of this study may include the lack of generalisability to out-of-school Albanian children aged 11-15 years. Furthermore, there is a possibility of information bias including in particular social desirability bias (over-reporting of fruit and vegetable intake and/or under-reporting of consumption of sweets and sugary soft drinks), or intentional misreporting. Additionally, validation studies in Belgian and Italian schoolchildren have indicated that overestimation must be considered while estimating consumption frequencies in the HBSC surveys (28). Also, the cross-sectional study design may constitute another limitation, preventing the establishment of causal relationships.

Nonetheless, our study provides useful evidence on the prevalence and sociodemographic distribution of several important nutritional habits among Albanian schoolchildren. Targeted interventions need to be implemented in Albania and elsewhere to help children develop healthier behaviours and prevent habits that could impact their current health and well-being, as well as their future health outcomes as adults (11). In any case, a variety of public health approaches are essential to effectively address the intricate factors influencing positive changes in nutritional habits among children (11). In the context of Albania, the government should act swiftly to limit the marketing of unhealthy foods and beverages, especially when such marketing is aimed at children and adolescents (11). Also, introduction of school-based programmes should be considered to encourage breakfast consumption among older children and those from less wealthy families. Furthermore, school-based programmes in Albania should consider the provision of free or subsidised fruits and vegetables, combined with interactive nutrition education and parental engagement, which can effectively increase their consumption among schoolchildren.

5 CONCLUSIONS

In conclusion, our study conducted in Albania provides useful insights into the complex interplay of sociodemographic characteristics in shaping nutritional practices of children. There is a need for targeted nutritional interventions based on specific sociodemographic backgrounds of children in Albania and in other countries, ultimately supporting healthier nutritional habits.

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INFORMED CONSENT

Written informed consent was obtained from all individual participants included in the study. This study was approved by the Ethics Committee of Tirana Medical University (approval ID: No.700/1, date: 05-04-2022), and all procedures were conducted in accordance with the Declaration of Helsinki.

CONFLICTS OF INTERESTS

None declared.

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ETHICAL APPROVAL

This study was approved by the Ethics Committee of Tirana Medical University (approval ID: No.700/1, date: 05-04-2022).

AVAILABILITY OF DATA AND MATERIALS

All data and materials used in this study are available upon reasonable request.

AUTHORS' CONTRIBUTIONS

Jonida Stefa, Gentiana Qirjako and Genc Burazeri contributed to the study conceptualisation and design, analysis and interpretation of the data and writing of the article. Migena Gega, Brizida Refatllari and Grejd Hyska commented comprehensively on the manuscript. All authors have read and approved the submitted manuscript.

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MIND THE GAP: A RETROSPECTIVE STUDY OF DISCREPANCIES IN SELF-REPORTED AND ADMINISTRATIVE DATABASE-IDENTIFIED MENTAL HEALTH ISSUES IN SLOVENIA

RETROSPEKTIVNA ŠTUDIJA O NESKLADJIH MED SAMOPOROČANIMI IN V ADMINISTRATIVNIH ZBIRKAH PODATKOV UGOTOVLJENIMI TEŽAVAMI V DUŠEVNEM ZDRAVJU V SLOVENIJI

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ABSTRACT

Background
This study assessed discrepancies between self-reported and administrative data sources in identifying mental health issues in Slovenia, and investigated associated socio-demographic factors.

Methods
Data were linked from the 2019 Slovenian European Health Interview Survey (EHIS; n=9,900) and national health administrative databases capturing inpatient hospitalisations, outpatient prescription drugs and mental health-related sick leave. Mental health issues were identified in EHIS by self-report and in administrative databases using diagnostic codes and medication claims. Socio-demographic factors were obtained from EHIS. Discrepancies were assessed and multinomial logistic regression was used to analyse the association between these factors and the source of case identification.

Results
Of the 9,900 EHIS respondents, 1,336 (13.5%) self-reported mental health issues, while 1,675 (16.9%) were identified in administrative databases. Only 613 individuals (4.6% of the total sample) were identified in both sources. Older age was associated with being identified in both data sources and administrative data only compared to not being identified. Females and unemployed persons were more likely than males and employed persons to be identified as having mental health issues, regardless of the data source. Compared to those with primary education or lower, individuals with higher education were less likely to be identified in administrative data only or in both data sources.

Conclusions
discrepancies exist between self-reported and administrative data sources in identifying mental health issues. Discrepancies are associated with socio-demographic factors and may lead to different interpretations of population mental health. This study underscores the importance of cautiously interpreting self-reported and administrative health data in public health.

Keywords
Mental health
Epidemiology
Data linkage
Self-report
Routinely collected health data

IZVLEČEK

Uvod
Z raziskavo smo ocenili neskladja v prepoznavi posameznikov s težavami v duševnem zdravju pri uporabi samoporočanih in administrativnih podatkov v Sloveniji ter raziskali povezane socialno-demografske dejavnike.

Metode
Podatki so bili pridobljeni iz Nacionalne raziskave o zdravju in zdravstvenem varstvu (EHIS) iz leta 2019 (n = 9.900) in treh zdravstvenih administrativnih baz podatkov, ki zajemajo bolnišnične obravnave, izdajo ambulantnih zdravil na recept ter koriščenje bolniškega staleža. Težave z duševnim zdravjem so bile v raziskavi EHIS opredeljene s samoporočanjem, v administrativnih bazah podatkov pa z uporabo diagnostičnih kod in izdanih receptov za zdravila. Socialno-demografski dejavniki so bili pridobljeni iz raziskave EHIS. Neskladja v prepoznavi posameznikov s težavami v duševnem zdravju in povezanost socialno-demografskih dejavnikov so bila analizirana z uporabo polinomne regresijske analize.

Rezultati
Od 9.900 anketirancev v raziskavi EHIS jih je 1.336 (13,5 %) samoporočalo o težavah z duševnim zdravjem, medtem ko jih je bilo 1.675 (16,9 %) prepoznanih v administrativnih bazah podatkov. Le 613 posameznikov (4,6 % celotnega vzorca) je bilo prepoznanih hkrati v obeh virih. Starejša starost je bila povezana s prepoznavo v obeh virih podatkov in samo v administrativnih podatkih v primerjavi z neprepoznavo v katerem koli viru podatkov. Ženske in brezposelni posamezniki so bili bolj verjetno kot moški in zaposleni prepoznani kot osebe s težavami v duševnem zdravju, ne glede na vir podatkov. V primerjavi s tistimi z osnovnošolsko ali nižjo izobrazbo so bili posamezniki z višjo izobrazbo manj verjetno prepoznani samo v administrativnih podatkih ali v obeh virih podatkov.

Zaključki
Pri prepoznavi težav z duševnim zdravjem obstajajo znatna neskladja med samoporočanjem in administrativnimi viri podatkov. Neskladja so povezana z različnimi socialno-demografskimi dejavniki in lahko vodijo do različnih interpretacij duševnega zdravja prebivalstva. Ta študija poudarja pomen previdne interpretacije samoporočanih in administrativnih zdravstvenih podatkov v javnem duševnem zdravju.

Ključne besede
duševno zdravje
epidemiologija
povezovanje podatkov
samoporočanje
rutinsko zbrani zdravstveni podatki

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1 INTRODUCTION

Mental health is an area of growing public health importance. Despite successful global efforts in reducing the burden of other non-communicable diseases, the burden of mental disorders and self-harm behaviour remains stable (1). The persistent burden of mental disorders and self-harm underscores the importance of valid and reliable population prevalence data for public health decision-making.

Population surveys and health administrative databases are common sources for mental disorder prevalence data (2). Existing research indicates significant differences in the populations identified as having mental disorders by surveys and those identified through health administrative databases (3-6). For example, studies show substantial discordance between data sources: Edwards et al. (3) found only 19.4% agreement between survey and administrative diagnoses of mood and anxiety disorders in Ontario. Davis et al. (5) reported limited agreement (Cohen's kappa 0.24-0.46) even between different self-report methods in the UK Biobank. While O'Donnell et al.'s (6) trend analysis in Canada noted a convergence over time, administrative prevalence remained consistently higher than self-report. Even when self-report is used in online registries, Sordo Vieira et al. (4) found that while it can indicate general psychopathology, in-depth interviews are still needed for specific disorder identification.

However, this evidence is limited to a small number of studies, each applying a different methodology. These discrepancies may result due to variations in population coverage, types of health services included, classifications used to register data and classification algorithms or the way mental health disorder is defined (7). In this study, we use the term 'mental health issues' to encompass a broad range of mental health experiences, including diagnosable mental disorders (as defined by clinical criteria) as well as subthreshold manifestations and transient distress that may not meet diagnostic criteria but still impact wellbeing. This distinction is important because it allows us to examine the full spectrum of mental health in the population, rather than focusing solely on diagnosed conditions.

With the aim of assessing the discrepancies between self-reported and administrative data sources in identifying mental health issues in Slovenia, the objectives of the present study were: to assess the discrepancies in self-reported and database-identified groups of cases with mental health issues in Slovenia, linking data from a large population-based survey and three health administrative databases; and to gain insight into which socio-demographic factors contribute to the identification of a case in either of the data sources or in both of them.

2 METHODS

The study was designed as a retrospective study using data from the 2019 Slovenian European Health Interview Survey (EHIS) (8), conducted by the National Institute of Public Health (NIPH), and from three national health administrative databases, also maintained by the NIPH. This approach allowed us to compare individual-level data on mental health service utilisation with self-reported mental health status, providing a comprehensive assessment of the agreement between these data sources.

2.1 Data sources

2.1.1 Definition of the baseline case group

The study baseline case group was derived from respondents of the EHIS (8). The survey targeted Slovenian residents aged 15 and over residing in private households. The Statistical Office of the Republic of Slovenia prepared the probability sample, utilising the framework of census districts and the Central Population Register. A two-stage sampling method was employed, resulting in a stratified two-stage sample. Stratification was explicit by size and type of settlement, and implicit by statistical regions. Data collection was conducted through online (CAWI) and personal (CAPI) interviews. Data were analysed in their unweighted form.

2.1.2 Case groups defined on the basis of administrative databases

The study sample was identified from the health administrative databases using unique personal registration numbers, consistent across databases and included in the EHIS dataset. The databases used include the National Hospital Health Care Statistics Database (NHHCS) (9), Outpatient Prescription Drugs Database (OPD) (10), and Absence from Work Database (AFW) (11) for 2018 and 2019. The administrative databases, encompassing records of public health care utilisation for all residents covered by Slovenian compulsory health insurance, have been utilised in previous mental health research (12, 13). Utilisation is recorded as either an episode (of inpatient treatment or sick leave) or a drug claim (obtained through prescription). Identification of the sample from each individual database occurred in a secure room at NIPH. Individual administrative databases data were matched with EHIS.

2.2 Data sources linkage

After identifying the EHIS case group individuals in the health administrative databases, the personal registration numbers were replaced with sequence numbers from EHIS for data privacy. These sequence numbers were randomly allocated to each individual survey participant, ensuring anonymity while maintaining the ability to link data across databases.

2.3 Outcome measures and observed outcomes

2.3.1 The EHIS outcome measure

Data on mental health issues were obtained from the EHIS self-reported health variable ("Having depression in the past 12 months" with two possible answers: yes or no) and two additional variables ("Having anxiety in the past 12 months" and "Having any other mental health issue in the past 12 months"). A positive answer to any of the three questions was recorded as a case of prevalent mental health issue.

2.3.2 The administrative databases outcome measures

Cases with prevalent mental health issues were identified from the health administrative databases using the following criteria:

- NHHCS: any hospitalisation with the main or additional diagnosis from the 5th Chapter in the ICD-10 within a period of 12 months before responding to EHIS,
- OPD: any claim with a psycholeptic or psychoanaleptic drug prescribed (all drugs under ATC classification N05A, N05B, N05C, N06A, N06B subgroups were included) within a period of 12 months before responding to EHIS,
- AFW: any sick leave with the main diagnosis from the 5th Chapter in the ICD-10 within a period of 12 months before responding to EHIS.

2.3.3 Observed outcomes

Outcome measures from administrative databases were added to the basic EHIS database as new variables. In the creation of the outcome variable, EHIS was taken into account as one data source, and all three administrative databases together as another. Based on this, a new outcome variable "source of case identification" with the following values was created: 1=case identified in both data sources, 2=case identified in one of the administrative data sources only, 3=case identified in the survey data source only, 0=absence of identification in any of the data sources. A "case identified in EHIS only" (0=no, 1=yes) represented a separate outcome variable.

2.3.4 Socio-demographic characteristics

Data on age, gender, educational status and employment status were obtained from EHIS, representing explanatory factors for the observed outcomes.

2.4 Statistical analysis

Statistical analysis unfolded in three distinct stages. The initial stage involved creating a Venn diagram, using the InteractiVenn tool, to visualise the overlaps of groups where cases were identified (14). The second stage entailed a cross tabulation of the identification of mental health issues from health administrative databases and EHIS. We employed the chi-square test to test the association between identification from the two data sources. To gauge the strength of agreement between the data sources, we utilised the Kappa statistic. In the third stage, we examined the socio-demographic characteristics of individuals identified with mental health issues in one or both sources, or in neither of them. First, we conducted chi-square tests to examine associations among categorical variables across different groups, and ANOVA tests to analyse variations in continuous variables. Finally, we conducted a multinomial logistic regression analysis to investigate the association between explanatory factors and the outcome variable. The final multinomial logistic regression model included all the socio-demographic variables described in section 2.3.4. All variables were entered simultaneously into the model. No stepwise or other automated variable selection procedures were performed. No extrapolation was used. The "absence of identification in any of the data sources" category represented the reference category. We checked for multicollinearity using the Variance Inflation Factor (VIF), ensuring the independent variables in the regression model were not excessively correlated. Categorical independent variables were included in the models as dummy variables. A simple method was applied. Data analysis was carried out using the IBM Statistical Package for the Social Sciences (SPSS) version 25 (15).

3 RESULTS

3.1 Study group description

The EHIS consisted of 9,900 records (response rate 67%), which represented the study group (Table 1).

Table 1. Socio-demographic characteristics of the study group in the study of discrepancies in self-reported and administrative database-identified mental health issues in Slovenia.

Variable	Mean±SD/ N (%)
Age	50.6±19.1
Gender	
Male	4479 (45.2%)
Female	5421 (54.8%)
Education status	
Primary school or lower	1737 (17.5%)
Secondary school	5257 (53.1%)
Tertiary or higher	2906 (29.4%)
Employment status	
Employed, self-employed	4813 (48.9%)
Unemployed	667 (6.8%)
Student	913 (9.3%)
Retired	3332 (33.8%)
Other	127 (1.3%)

3.2 Analysis of overlapping of the case identification sources

A total of 1,336 individuals self-reported mental health issues in EHIS and 1,675 were identified as having mental health issues based on their utilisation of healthcare services. The majority of the latter cases were identified in the OPD (n=1625), while a small percentage was identified in the NHHCS (n=78) and the AFW (n=97). Overlaps between survey and administrative database derived case groups are presented with a Venn diagram (Figure 1).

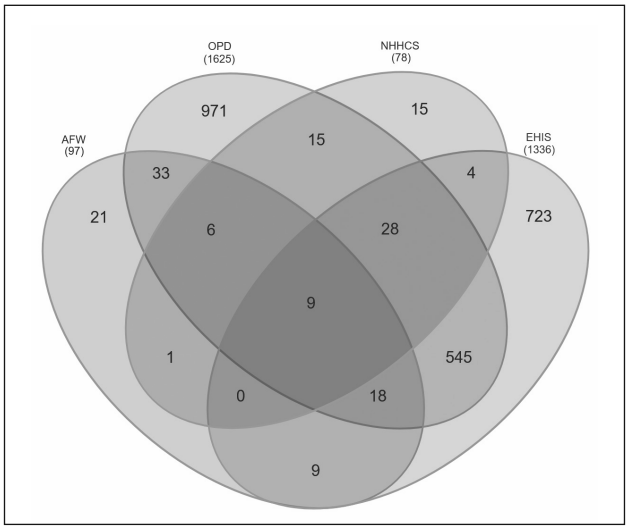

Figure 1. Comparison of number of cases identified as having mental health issues across four data sources (AFW=Absence from Work Database, OPD=Outpatient Prescription Drugs Database, NHHCS=National Hospital Health Care Statistics Database, EHIS=European Health Interview Surveys).

3.3 Derivation of the "source of case identification" observed outcome

Cross tabulation of the groups identified as cases in administrative databases or self-reporting mental health issues in the survey shows significant discrepancies in group representation between the two data sources (Table 2). Socio-demographic characteristics of the groups are presented in Table 3.

Out of 1,336 self-reported cases from EHIS only 613 of them (45.9%) had a record in the administrative databases in the 12 months preceding their participation in EHIS. And out of 1,675 individuals identified as cases in administrative databases only 613 (36.6%) self-reported having mental health issues in that same time period. Overall, the results suggest a modest level of agreement between self-assessment and administrative databases, indicating that the concordance between the two data sources is limited (Kappa=0.302; $p<0.001$). In total, 24.2% of the total sample was identified experiencing mental health issues from at least one data source in the period of 12 months preceding their participation in EHIS, out of which 25.6% were identified in both data sources.

Table 2. Identification or self-identification of mental health issues in three administrative databases of the National Institute of Public Health in the study of discrepancies in self-reported and administrative database-identified mental health issues in Slovenia.

At least 1 record in any database	Self-reporting of mental health issues (survey)		
	Present	Absent	Total
Present	613 (45.9%)	1062 (12.4%)	1675 (16.9%)
Absent	723 (54.1%)	7502 (87.6%)	8225 (83.1%)
Total	1336 (100.0%)	8564 (100.0%)	9900 (100.0%)

$p_{chi\text{-}square}$ <0.001

Table 3. Socio-demographic characteristics of the case groups identified with mental health issues in three administrative databases of the National Institute of Public Health in the study of discrepancies in self-reported and administrative database-identified mental health issues in Slovenia.

Variable	Survey and administrative n=613	Administrative n=1062	Survey n=723	Neither n=7502	Total n=9.900	p-value
	Mean±SD/ N (%)					
Age	57.8±2.0	63.2±15.8	42.8±19.7	49.0±18.6	50.6±19.1	<0.001
Gender						
Male	181 (29.5%)	367 (34.6%)	257 (35.5%)	3674 (49.0%)	4479 (45.2%)	<0.001
Female	432 (70.5%)	695 (65.4%)	466 (64.5%)	3828 (51.0%)	5421 (54.8%)	
Education status						
Primary school or lower	142 (23.2%)	251 (23.6%)	172 (23.8%)	1172 (15.6%)	1737 (17.5%)	<0.001
Secondary school	327 (53.3%)	593 (55.8%)	323 (44.7%)	4014 (53.5%)	5257 (53.1%)	
Tertiary or higher	144 (23.5%)	218 (20.5%)	228 (31.5%)	2316 (30.9%)	2906 (29.4%)	
Employment status						
Employed, self-employed	197 (32.1%)	301 (28.4%)	330 (46.1%)	3985 (53.4%)	4813 (48.9%)	<0.001
Unemployed	98 (16.0%)	70 (6.6%)	78 (10.9%)	421 (5.6%)	667 (6.8%)	
Student	21 (3.4%)	15 (1.4%)	157 (21.9%)	720 (9.6%)	913 (9.3%)	
Retired	289 (47.1%)	656 (61.8%)	144 (20.1%)	2243 (30.1%)	3332 (33.8%)	
Other	8 (1.3%)	19 (1.8%)	7 (1.0%)	93 (1.2%)	127 (1.3%)	

3.4 Analysis of multinomial regression analysis

The results showed that higher age is significantly associated with being identified as having mental health issues in administrative source only, and administrative and survey data sources compared to not being identified in any of the sources (Table 4). Females were more than twice as likely as males to be identified as having mental health issues in both data sources (OR=2.23), only in administrative data (OR=1.77), and only in survey data (OR=1.69) compared to not being identified in any of the sources. Compared to individuals with primary school education or lower, those with secondary school education were less likely to be identified as having mental health issues only in survey data (OR=0.73) and those tertiary or higher education were less likely to be identified only in administrative data (OR=0.75) compared to not being identified in any of the sources. Unemployed individuals were about four times more likely than employed individuals to be identified in both data sources (OR=4.07), and they were also more likely to be identified only in administrative data (OR=1.82) and only in survey data (OR=2.20). Students were more likely than employed individuals to be identified only in survey data (OR=2.06) compared to not being identified in any of the sources. The Likelihood Ratio Test compared the final model to a model with only the intercept, and the significant result ($p<0.001$) indicated that the predictors in the model significantly improved the fit. To assess the goodness-of-fit of the multinomial logistic regression model, we employed both Pearson's test, which yielded a statistically significant result ($p=0.006$), and Deviance test, the result of which was non-significant ($p=0.999$).

4 DISCUSSION

The analysis revealed pronounced disparities in mental health issue prevalence estimates obtained from self-reported data compared to health administrative databases, and only a minority of individuals identified as experiencing mental health issues were found in both data sources.

This finding highlights a significant measurement challenge in public mental health research. Nearly a third of individuals self-reported mental health issues but were not identified in the administrative data sources, while almost half that were identified in the administrative data did not report mental health issues in the EHIS. The discordance in two case groups derived from administrative and survey data sources was expected, as it was already identified in previous similar research (5-8).

What separates our research from previous studies is that we have not focused on specific mental health disorders (i.e. mood and anxiety disorders), yet we have still found a substantial part of the population using mental health services while not self-reporting any mental issues in the same time window. While administrative data is generally expected to underestimate the prevalence of mental health conditions, our finding of a higher prevalence in administrative data compared to the EHIS survey, consistent with observations

Table 4. Results of multinomial regression analysis of mental health issue identification across different data sources in the study of discrepancies in self-reported and administrative database-identified mental health issues in Slovenia.

Variable	Administrative and survey			Only administrative			Only survey		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
Age	1.02	1.01-1.03	<0.001	1.03	1.03-1.04	<0.001	0.99	0.98-1.00	0.086
Gender									
Male	1.00			1.00			1.00		
Female	2.23	1.86-2.68	<0.001	1.77	1.44-1.99	<0.001	1.77	1.44-1.99	<0.001
Education status			<0.001			<0.001			<0.001
Primary school or lower	1.00			1.00			1.00		
Secondary school	0.86	0.69-1.08	0.198	0.95	0.79-1.14	0.572	0.73	0.59-0.90	0.004
Tertiary or higher	0.75	0.57-0.99	0.039	0.75	0.60-0.93	0.009	0.88	0.69-1.13	0.310
Employment status			<0.001			<0.001			<0.001
Employed, self-employed	1.00			1.00			1.00		
Unemployed	4.07	3.11-5.34	<0.001	1.82	1.37-2.42	<0.001	2.20	1.67-2.89	<0.001
Student	0.86	0.51-1.45	0.569	0.57	0.32-1.01	0.054	2.06	1.51-2.81	<0.001
Retired	1.41	1.05-1.90	0.022	1.48	1.17-1.87	0.001	0.93	0.69-1.27	0.666
Other	0.92	0.43-1.97	0.836	1.28	0.72-2.19	0.368	0.76	0.34-1.67	0.489

from a similar study (6), underscores the complexity of mental health measurement and the need to further investigate the factors contributing to this discrepancy.

The sizeable group of individuals identified in the healthcare databases yet not self-reporting mental health issues in the EHIS presents an intriguing facet of the measurement discrepancy. We found higher age is associated with being identified as having mental health issues in administrative data sources. The majority of cases identified from administrative databases were captured in OPD. A study on antidepressant prescribing trends in Slovenia showed substantial differences in the prevalence of antidepressant recipients between those aged 54 or lower and those older than 55 years, with prevalence reaching 20% in individuals aged 80 and over (16). Even though neither the referenced or present study delves into the interpretation of possible causes of high consumption of psychoactive drugs among the elderly, the results indicate higher healthcare usage with increasing age. In parallel, older adults are less likely to recognise mental health issues as such, (17) and might be treated for mental health symptoms caused by physical illness, therefore not identifying as having mental health issues in the surveys, because the primary source of poor mental health is associated with a physical illness (18). They could also be unaware of the connection between their symptoms and a diagnosable condition, or this information might not have been effectively communicated to them by healthcare providers. Consequently, while their conditions are reflected in administrative data, their self-reports may not include mental health concerns. Recall bias could also influence this discrepancy (19). Participants in the EHIS might have difficulty remembering experiencing mental health issues or they might underestimate their past negative experience in the function of coping, although research indicates the latter might not be a common phenomenon (20). Lastly, we have to consider stigma as an important factor in using healthcare services and self-reporting mental health issues. Stigma appears to have a greater impact on self-reporting of mental health issues in surveys compared to the actual usage of mental health care services (21-23). Individuals may be more willing to seek professional help than to disclose mental health problems. Individuals with higher education were less likely to be identified only in administrative data, potentially suggesting a greater comfort level with self-disclosure of mental health issues in this population group. While our study design cannot definitively measure the impact of stigma, these findings hint at a potential interplay between stigma and data source discrepancies. Higher prevalence observed in administrative data might appear counterintuitive, however it highlights the potential influence of prescription drug data and the varying pathways individuals take to access mental healthcare. This underscores the importance of using multiple data sources to capture a more complete picture of mental health in the population.

It is also important to note that while the overall prevalence of mental health issues was higher in the administrative databases, a subset of individuals reported these issues in

the EHIS survey but did not appear in the administrative data. For these individuals, stigmatising attitudes towards help-seeking behaviour, such as negative expectations of professional help or fear of being stigmatised for having a mental disorder, may be a significant barrier to seeking help, as documented in previous research (24, 25). One key factor is likely the individual's perception of their need for healthcare services. Individuals who do not perceive a need for professional help, perhaps due to mild symptoms, minimal functional impairment, or other personal beliefs, are less likely to engage with the healthcare system and thus be recorded in administrative databases. Some individuals might seek help outside of the traditional healthcare system, through alternative therapies or support groups, which would not be reflected in administrative data (17). However, these individuals may still acknowledge and report experiencing mental health issues in surveys. Furthermore, limitations inherent in the health data collection methods themselves might play a role. Incomplete data coverage within the administrative databases is a possibility. For example, individuals using outpatient services without claiming psychoactive medications were not captured in the administrative data sources we used in this study. Additionally, under-diagnosis by healthcare providers could contribute to the discrepancy. Stigma surrounding mental health or a lack of awareness among providers could lead to missed diagnoses, resulting in individuals experiencing mental health issues but not being recorded in administrative databases (26, 27). Also, younger participants of the EHIS survey, students specifically, were less likely to be identified only in administrative and more likely to be identified in only survey data sources. This could be explained by a number of factors previously researched within this age group, such as preference towards informal sources of help and favouring counselling compared to psychiatric or psychological services, (17) or even interpreting and reporting milder forms of distress as mental health issues (28).

This study has some limitations. First, the administrative databases used capture only a part of mental health service utilisation within the formal healthcare system, potentially underestimating service use. Additionally, the accuracy of administrative data relies on consistent and reliable coding practices. Second, the EHIS mental health assessment used in this study is less structured than instruments such as the Composite International Diagnostic Interview and is not commonly used to assess mental disorder prevalence. This approach may encompass a broader range of mental distress, potentially including subthreshold experiences, and may not be directly comparable to studies using validated mental disorder screening tools. However, a broader scope is valuable for understanding the full spectrum of mental health within a population, not solely clinical diagnoses. The inclusion of subthreshold experiences offers insights that have value in contributing to better understanding of help-seeking behaviour as well as identification of at-risk populations (28, 29). A single-item question on experiencing symptoms or receiving a diagnosis of mental disorder during a certain time period in the past is an approach often used in population surveys in the field of mental health (30) as well as in other fields (31). Secondly, the goodness-of-fit of our multinomial logistic regression model, as indicated by the Pearson test, was less than ideal. While the Deviance test suggested adequate fit, the Pearson test indicated suboptimal goodness-of-fit for our multinomial logistic regression, possibly due to large sample size and outcome class imbalance. A secondary analysis with reduced imbalance improved the Pearson test. Although statistical fit has limitations, the model's face validity and meaningful insights remain valuable. Readers should consider fit limitations when interpreting results. Finally, someone may dispute lack of sensitivity analysis. In fact, this analysis was done, but due to the limits of the journal it could not be presented. However, the results can be obtained from the authors. A key strength of this study lies in its unique access to both self-reported data from the large, representative EHIS survey and comprehensive administrative health databases, linked at the individual level. This approach allows for a more comprehensive understanding of the discrepancies and complexities inherent in identifying mental health issues using different data sources. Finally, by focusing on the Slovenian population within its unique healthcare context of universal coverage and a mixed public-private provider model, this study offers insights relevant to similar health systems where diverse factors may influence mental health help-seeking and reporting.

5 CONCLUSION

Integrating diverse data sources and refining measurement instruments are crucial steps towards a more comprehensive and accurate picture of mental health in our communities. Additionally, a deeper understanding of the factors influencing help-seeking behaviour, and how this relates to mental health and health outcomes, is essential for developing effective interventions and support systems. Future research should further explore the factors influencing discrepancies between data sources and develop strategies to bridge the gap between self-reported experiences and objective health records.
To improve agreement between these data sources, collaborative efforts are needed. Improving the accuracy and completeness of administrative data requires implementing standardised coding practices and encouraging the use of validated clinical assessment tools. This necessitates cooperation between public health researchers, healthcare providers and policymakers.

Enhancing the validity of self-reported data relies on using validated questionnaires with clear instructions, while ensuring respondent privacy. Finally, reconciling discrepancies requires implementing data linkage initiatives and analysing the reasons for discrepancies between data sources.

These efforts, along with initiatives such as the European Health Data Space, which opens possibilities for large-scale, multinational longitudinal studies, are crucial for ensuring data accurately reflect the mental health needs of the population.

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CONFLICTS OF INTEREST

The authors have no relevant financial or non-financial interests to disclose.

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ETHICAL APROVAL

National Statistics Act, Regulation (EC) No 1338/2008, Commission Regulation (EU) 2018/255, Annual Programme of Statistical Surveys for 2019 provide the legal basis for EHIS data collection. These article also encompass ethical considerations.

AVAILABILITY OF DATA AND MATERIALS

Due to the sensitive nature of individual health information and data protection regulations, the raw data cannot be made publicly available. For further information or inquiries regarding the data, please contact the corresponding author.

AI USAGE STATEMENT

During the preparation of this article the authors did not use generative language models.

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THE EFFECT OF A HATHA YOGA EXERCISE PROGRAMME WITH SEGMENTAL STABILISATION EXERCISES ON TRUNK FLEXIBILITY

UČINEK HATHA JOGE, STOPNJEVANE PO NAČELIH SEGMENTNE STABILIZACIJE HRBTENICE IN MEDENICE, NA GIBČNOST TRUPA

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ABSTRACT

Introduction
In addition to sufficient trunk muscle endurance, adequate trunk flexibility, i.e. trunk muscle extensibility and spinal mobility, is an important element for the stability of the spine and pelvis. The aim of this intervention study was to investigate the effects of a preventive exercise programme on trunk flexibility.

Methods
The participants were healthy adults without pain or injury in the lower back. They were divided into two groups: the exercise group (EG), which performed a hatha yoga exercise programme with segmental stabilisation exercises (12 weeks), and the control group (CG), in which they maintained their previous lifestyle during the study period. Before and after the intervention the measured variables, the extensibility of the trunk muscles and the mobility of the thoracolumbar spine were compared.

Results
Seventy-two participants (n_{EG}=36, age 32.2±6.8 years; n_{CG}=36, age 29.9±7.8 years) took part in the study. After the exercise programme, the EG participants achieved significantly better extensibility of the iliopsoas muscle ($p \leq 0.001$), the V-Sit and Reach Test ($p=0.001$) and the mobility of the thoracolumbar spine ($p<0.05$). Significant differences between the two groups were found in four of five extensibility tests ($p \leq 0.041$) and in flexion, left lateral flexion and right rotation of the spine ($p \leq 0.036$).

Conclusions
The proposed exercise programme indicated a significant improvement in trunk flexibility. Future studies should investigate the long-term effects of the proposed exercise programme on a larger number of participants.

Keywords
Stabilisation exercise
Prevention
Low back pain

IZVLEČEK

Uvod
Poleg primerne vzdržljivosti mišic trupa predstavljata pomembna elementa sistema stabilnosti hrbtenice in medenice tudi primerna raztegljivost mišic trupa in ustrezna gibljivost hrbtenice. Namen raziskave je bil preveriti učinke hatha joge, stopnjevane po načelih segmentne stabilizacije hrbtenice in medenice, na gibčnost trupa.

Metode
V raziskavo so bili vključeni zdravi odrasli brez bolečin in/ali poškodb hrbtenice in medenice, ki pred vključitvijo v raziskavo niso redno izvajali vadb za izboljšanje raztegljivosti mišic in/ali gibljivosti hrbtenice. Razdeljeni so bili v dve skupini: vadbeno (VS), v kateri so v obdobju treh mesecev, dvakrat na teden po 60 minut, izvajali hatha jogo, stopnjevano po načelih segmentne stabilizacije hrbtenice in medenice; ali v primerjalno (PS), v kateri niso spreminjali svojega trenutnega življenjskega sloga. Ob vključitvi v raziskavo (PRED) in po končanem trimesečnem vadbenem obdobju (PO) je bila merjena raztegljivost mišic trupa in kolka ter gibljivost prsno-ledvenega dela hrbtenice. Analizirane so bile spremembe merjenih spremenljivk (PRED-PO, VS-PS).

Rezultati
V raziskavi je sodelovalo 72 preiskovancev (n_{VS} = 36, stari 32,2 ± 6,8 let; n_{PS} = 36, stari 29,9 ± 7,8 let). Preiskovanci VS so po zaključku vadbenega programa dosegli statistično značilno boljšo raztegljivost mišice iliopsoas in rezultat testa V-doseg sede ($p \leq 0,001$) ter gibljivost prsno-ledvenega dela hrbtenice ($p < 0,05$). Med skupinama VS in PS so bile statistično značilne razlike ugotovljene pri štirih od petih testov raztegljivosti mišic ($p \leq 0,041$) ter pri izboljšanju obsega fleksije, lateralne fleksije v levo ter rotacije hrbtenice v desno stran ($p \leq 0,036$).

Zaključki
S hatha jogo, stopnjevano po načelih segmentne stabilizacije hrbtenice in medenice, lahko pomembno izboljšamo gibčnost trupa, in sicer tako z vidika boljše raztegljivosti nekaterih mišic kot tudi gibljivosti prsno-ledvenega dela hrbtenice. V nadaljnjih raziskavah bi bilo smiselno preveriti še dolgoročne učinke vadbenega programa na večjem vzorcu preiskovancev.

Ključne besede
stabilizacijska vadba
preventiva
bolečina v spodnjem delu hrbta

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1 INTRODUCTION

Low back pain (LBP) is an important global public health problem (1). In 2019, LBP was the leading cause of functional disability (2) and maintained its leading position in recent years (1). Preventive measures to reduce the incidence of LBP have the potential to significantly reduce the burden associated with this condition. There is moderate evidence that an exercise programme alone or in combination with education is effective in reducing the risk of a future episode of LBP (3).

The normal function of the spine stabilising system is to provide the spine with sufficient stability to accommodate momentary fluctuations in stability demands due to changes in spinal posture and static and dynamic loading (4). Trunk flexibility (i.e. muscle extensibility and joint mobility) and trunk muscle endurance are interrelated: any factor that reduces the extensibility of the muscle-tendon structures and/or the joint mobility of the spine also has a negative effect on muscular endurance and vice versa, which increases the risk of LBP (5). Research in this area suggests that reduced trunk muscle endurance, reduced lateral spinal flexion, reduced hamstring extensibility and reduced lumbar lordosis are important risk factors for musculoskeletal overload of the spine and the occurrence of LBP (6, 7).

Hatha yoga is one of the traditional types of yoga that emphasises the importance of physical fitness through various postures (asanas), breathing techniques (pranayamas), relaxation and concentration techniques, etc. (8, 9). In recent years, yoga has been increasingly studied as one of the effective treatment strategies for LBP (10). However, most of the available studies in the field of yoga research investigated the efficacy and appropriateness of yoga as a therapeutic approach in (chronic) LBP patients, while less is known about its preventive outcomes (11, 12).

When hatha yoga is combined with segmental stabilisation exercises, the endurance of the trunk muscles increases (13). Since adequate trunk flexibility is also a very important factor for spinal and pelvic stability, the effect of the above combination of exercises on muscle extensibility and joint mobility must also be investigated. The objective of this study was to investigate the effectiveness of a professional and scientifically based hatha yoga exercise programme that integrates the principles of the segmental stabilisation exercise model to improve muscle extensibility and spinal mobility in healthy adults, in order to provide evidence for an effective health intervention to prevent LBP or reduce the risk of recurrence of LBP.

2 MATERIALS AND METHODS

2.1 Study design, time frame and setting

The study was part of a larger intervention study (non-randomised controlled trial), and other parts of the study have already been published (13-15). It was conducted from September 2019 to March 2022 at the Faculty of Health Sciences of the University of Ljubljana (Slovenia).

2.2 Study participants

Potential candidates were invited to participate in the study via electronic media and chain reference sampling. The following inclusion criteria were considered for participation in the study: 1) healthy adults aged between 20 and 45 years, 2) without LBP at the time of enrolment in the study, 3) without musculoskeletal injuries or other conditions that could be a contraindication or pose a risk to the individual's health, and 4) without yoga practice or spinal stabilisation exercise programmes (continuous, at least once a week) in the last six months. All participants who met the inclusion criteria signed an informed consent form when participating in the study.

Participants were assigned to one of two study groups: a) an exercise group (EG) or b) a control group (CG) according to the case-control matching method (16), considering gender, age and physical activity. The EG participants took part in a three-month exercise programme (see below for more information on exercise), while the CG participants were asked to maintain their current lifestyle and level of physical activity during the study period. At the end of the study, CG participants were offered participation in the exercise programme.

2.3 Study instruments and protocols

First, the inclusion criteria were checked using a questionnaire on the participants' demographic data, health status and physical activity (17). If all inclusion criteria were met, the participants' height (in metres) and weight (in kilogrammes) were then measured.

Muscle extensibility measurements were then performed. The following tests were used: 1) modified Thomas test (18) for the extensibility of the iliopsoas and rectus femoris (in °, using a universal plastic goniometer (Baseline measurement instruments, USA)) and 2) V-Sit and Reach Test (19) for the flexibility of the lower back and hamstring (in cm; using a measuring tape (Enraf Nonius, Netherlands)).

The last series of measurements consisted of linear measurements of the mobility of the thoracolumbar part of the spine (in cm), specifically: thoracolumbar flexion (20, 21), extension (20), lateral flexion (left and right) (20) and rotation (left and right) (22).

All measurements described above were performed twice in the study: for the first time at enrolment ("BEFORE" measurements) and for the second time after the three-month study period (i.e. after completion of the exercise programme (EG participants) or after the three-month study period without exercise (CG participants); "AFTER" measurements). For clinically significant differences, a difference of ≥5.0° in goniometric measurements and ≥1.3 cm in tape measure measurements was used (23, 24).

2.4 Exercise programme

The exercise programme is based on hatha yoga practised according to the principles of the segmental stabilisation exercise model. A three-month exercise programme comprised a total of 25 training sessions, which were carried out twice a week for 60 minutes each. It consisted of yoga postures (asanas) and controlled breathing techniques (pranayamas). In accordance with the three-stage model of segmental stabilisation exercises (25), the contraction of the deep trunk muscles was emphasised in each asana, different positions or dynamic movements of the lower/upper limbs (in closed or open chain) during the holding of the basic asana were performed progressively, and so forth. Each training session began with 10 minutes of gradual warm-up exercises, followed by the main part of the training session to improve the endurance and flexibility of the trunk muscles (35 minutes) and gradual stretching and relaxation exercises at the end of the training session (15 minutes). All techniques and postures were gradually intensified during the exercise programme but remained in the range of low to moderate intensity exercises (ratings 9-15 on the Borg Rating of Perceived Exertion Scale 6-20) (26, 27).

The exercise programme and measurements were carried out by a physiotherapist (Master's degree) who is also a yoga teacher (YT 500) and has several years of experience in these two professional fields. For implementation reasons, neither the participants nor the investigator were blinded.

2.5 Methods of analysis

All collected variables were checked for distribution. Since not all variables were normally distributed and we were interested in the differences within each individual value, the parametric test was used when the variables were normally distributed and a corresponding non-parametric test was used when the variables were not normally distributed. Changes in muscle extensibility and spinal mobility were compared between: 1) BEFORE and AFTER measurements using the t-test for related samples or the non-parametric Wilcoxon signed-rank test for related samples (BEFORE-AFTER comparison) and 2) EG and CG participants using the t-test for unrelated samples or the Mann-Whitney U-test for unrelated samples (EG-CG comparison). Statistical significance was set at $p \leq 0.05$ for all analyses.

The data analysis was carried out using IBM SPSS Statistics 27 (IBM, New York, USA) and an Excel programme (Microsoft Corporation, Washington, USA).

3 RESULTS

3.1 Participants

At the beginning of the study, 85 participants met all inclusion criteria, of whom 13 participants withdrew from the study for various reasons (e.g. pregnancy, significant change in physical activity level and/or lifestyle). Seventy-two participants completed the study, including 36 participants in the EG (7 men and 29 women) and 36 participants in the CG (8 men and 28 women). There were no significant differences in baseline data between EG and CG participants (Table 1).

Table 1. Demographic characteristics of participants in EG and CG.

Characteristic	Group				p
	EG (n=36)		CG (n=36)		
	$\bar{x}$	SD	$\bar{x}$	SD	
Age (years)	32.2	6.8	29.9	7.8	0.187
Body height (m)	1.69	0.06	1.69	0.08	0.680
Body mass (kg)	65.9	9.7	67.2	13.2	0.662
BMI (kg/m^2)	23.2	3.2	23.4	3.6	0.866

Legend: BMI=body mass index; EG=exercise group; n=number of participants; CG=control group

Participation in the training sessions was 85.1% (21.3 out of a total of 25 sessions).

3.2 Effectiveness of the exercise programme

At baseline (BEFORE measurements), there were no significant differences between the EG and CG in muscle extensibility (p>0.05) or spinal mobility (p>0.05).

3.2.1 Muscle extensibility

A statistically significant improvement in the extensibility of the iliopsoas muscles was observed in the EG participants (p≤0.001). In the V-Sit and Reach Test, both groups achieved statistically significant BEFORE-AFTER differences; the EG participants improved the distance (p=0.001), and the CG participants achieved a worse distance on the second measurement (p=0.031). The changes in the other measures of muscle extensibility were not statistically significant (Table 2).

When comparing the mean BEFORE-AFTER difference between the two groups, the analysis showed statistically significant differences in four out of five extensibility tests (except for the right rectus femoris muscle; p>0.05) (Table 3). The calculated Cohen's d coefficients indicate a large effect, with the exception of the rectus femoris muscle, where the effect is small (Table 3).

3.2.2 Spine mobility

The mobility of the thoracolumbar spine changed statistically significantly (p≤0.041) in the EG participants by at least ≥0.5 cm in all measured directions; except for the thoracolumbar extension movement, which decreased, the ranges of all other movements increased. In CG participants, a slight decrease in thoracolumbar spinal mobility (≤0.5 cm) was observed for most of the measured movements, but these changes were not statistically significant (Table 4).

Table 2. Results of muscle extensibility of the lower back and hip muscles (comparison of BEFORE-AFTER measurements).

Group	Test	m	$\bar{x}$	95% CI	SD	Me	Min.	Max.	p
EG (n=36)	L-IL (°)	BEFORE	16.1	13.7; 18.6	7.3	17.0	-1.0	34.0	0.001[b]
		AFTER	18.6	16.5; 20.7	6.2	19.5	6.0	34.0	
	R-IL (°)	BEFORE	15.9	13.6; 18.3	6.9	16.5	3.0	34.0	<0.001[b]
		AFTER	18.7	16.4; 21.0	6.9	19.0	7.0	34.0	
	L-RF (°)	BEFORE	54.1	51.3; 56.8	8.1	54.0	35.0	74.0	0.172[b]
		AFTER	52.7	50.2; 55.2	7.4	54.0	31.0	65.0	
	R-RF (°)	BEFORE	55.5	52.5; 58.6	9.0	55.5	36.0	72.0	0.265[b]
		AFTER	54.2	51.5; 56.9	8.0	56.0	34.0	70.0	
	V-SRT (cm)	BEFORE	8.1	5.8; 10.4	6.9	9.0	-14.5	20.5	0.001[b]
		AFTER	10.6	8.8; 12.5	5.5	11.3	0.0	22.0	
CG (n=36)	L-IL (°)	BEFORE	18.6	16.1; 21.0	7.3	18.0	-6.0	35.0	0.501[a]
		AFTER	18.0	15.2; 20.8	8.4	17.5	-3.0	43.0	
	R-IL (°)	BEFORE	18.4	15.9; 20.9	7.4	18.0	-7.0	38.0	0.260[a]
		AFTER	17.8	15.3; 20.3	7.3	17.0	-3.0	38.0	
	L-RF (°)	BEFORE	51.6	49.6; 53.5	5.8	52.0	36.0	71.0	0.257[a]
		AFTER	53.1	50.5; 55.8	7.8	53.0	35.0	68.0	
	R-RF (°)	BEFORE	52.9	50.9; 54.9	5.9	52.0	41.0	67.0	0.804[b]
		AFTER	53.1	50.5; 55.7	7.7	55.0	39.0	70.0	
	V-SRT (cm)	BEFORE	7.8	4.6; 10.9	9.3	7.0	-25.0	26.5	0.031[a]
		AFTER	6.6	3.4; 9.9	9.6	6.0	-26.0	22.0	

Legend: EG=exercise group; n=number of participants; CG=control group; L-IL=left iliopsoas muscle; R-IL=right iliopsoas muscle; L-RF=left rectus femoris muscle; R-RF=right rectus femoris muscle; V-SRT=V-Sit and Reach Test; m=measurement; BEFORE=measurements before the exercise programme; AFTER=measurements after the exercise programme; 95% CI=95% confidence interval; Me=median; Min.=minimum value; Max.=maximum value; a=Wilcoxon signed ranks test; b=paired samples t-test.

Table 3. Results of BEFORE-AFTER differences in muscle extensibility of the lower back and hip muscles (comparison of EG-CG measurements).

Test	Group	$\bar{x}$	SD	%	p	Cohen's d
L-IL (°)	EG	2.4	4.2	15.1	0.004	0.70
	CG	-0.6	4.4	-3.1		
R-IL (°)	EG	2.8	4.0	17.2	<0.001	0.83
	CG	-0.6	4.2	-3.2		
L-RF (°)	EG	-1.4	5.9	-2.5	0.041	-0.50
	CG	1.6	6.0	3.0		
R-RF (°)	EG	-1.4	7.2	-2.5	0.293	-0.25
	CG	0.2	5.3	0.4		
V-SRT (cm)	EG	2.6	4.0	31.6	<0.001	1.06
	CG	-1.2	3.1	-14.8		

Legend: L-IL=left iliopsoas muscle; R-IL=right iliopsoas muscle; L-RF=left rectus femoris muscle; R-RF=right rectus femoris muscle; V-SRT=V-Sit and Reach Test; EG=exercise group (n=36); CG=control group (n=36); $\bar{x}$ =mean BEFORE-AFTER difference; %=percentage of BEFORE-AFTER difference; Cohen's d= Cohen's d coefficient.

Table 4. Results of mobility (in cm) of the thoracolumbar spine (comparison of BEFORE-AFTER measurements).

Group	Motion	m	$\bar{x}$ (cm)	95% CI (cm)	SD (cm)	Me (cm)	Min. (cm)	Max. (cm)	p
EG (n=36)	FL	BEFORE	8.4	7.9; 9.0	1.7	8.5	5.0	12.0	0.015[b]
		AFTER	8.9	8.4; 9.5	1.6	9.0	5.0	12.0	
	EX	BEFORE	3.0	2.4; 3.6	1.7	3.0	0.5	8.0	0.038[a]
		AFTER	2.4	2.0; 2.8	1.2	2.0	0.5	6.0	
	L-LF	BEFORE	19.6	18.3; 21.0	4.0	19.5	11.5	29.0	0.031[a]
		AFTER	20.3	19.0; 21.6	3.8	20.0	13.0	31.5	
	R-LF	BEFORE	19.6	18.4; 20.9	3.7	19.5	12.5	28.0	0.041[a]
		AFTER	20.3	19.1; 21.6	3.6	20.0	14.5	33.5	
	L-RO	BEFORE	8.3	7.7; 9.0	1.9	8.5	4.5	12.5	0.040[b]
		AFTER	8.9	8.2; 9.6	2.0	9.0	5.0	13.0	
	R-RO	BEFORE	8.5	7.9; 9.0	1.7	8.5	6.0	12.0	0.003[b]
		AFTER	9.1	8.5; 9.7	1.8	9.0	6.5	13.0	
CG (n=36)	FL	BEFORE	9.1	8.5; 9.7	1.8	9.0	5.0	13.0	0.416[a]
		AFTER	8.8	8.3; 9.4	1.6	8.5	6.5	12.0	
	EX	BEFORE	2.6	2.2; 3.0	1.2	2.3	0.5	5.0	0.777[a]
		AFTER	2.5	2.1; 3.0	1.4	2.5	0.5	7.0	
	L-LF	BEFORE	20.8	19.4; 22.2	4.2	21.3	12.0	30.0	0.143[b]
		AFTER	20.3	18.9; 21.8	4.3	20.3	12.0	29.0	
	R-LF	BEFORE	20.8	19.5; 22.1	3.8	21.0	13.0	31.5	0.854[b]
		AFTER	20.8	19.5; 22.2	4.0	21.5	12.5	31.0	
	L-RO	BEFORE	8.2	7.7; 8.6	1.4	8.0	5.0	10.5	0.408[b]
		AFTER	8.0	7.5; 8.5	1.5	8.0	5.5	11.0	
	R-RO	BEFORE	8.3	7.8; 8.8	1.4	8.3	5.5	13.0	0.666[b]
		AFTER	8.2	7.6; 8.8	1.7	8.0	4.0	11.5	

Legend: EG=exercise group; n=number of participants; CG=control group; FL=thoracolumbar flexion; EX=thoracolumbar extension; L-LF=left lateral spinal flexion; R-LF=right lateral spinal flexion; L-RO=left spinal rotation; R-RO=right spinal rotation; m=measurement; BEFORE=measurements before the exercise programme; AFTER=measurements after the exercise programme; 95% CI=95% confidence interval; Me=median; Min.=minimum value; Max.=maximum value; a=Wilcoxon signed ranks test; b=paired samples t-test.

Table 5. Results of BEFORE-AFTER differences in mobility (in cm) of the thoracolumbar spine (comparison of EG-CG measurements).

Motion	Group	$\bar{x}$ (cm)	SD (cm)	%	p	Cohen's d
FL	EG	0.5	1.1	5.8	0.036[a]	0.64
	CG	-0.3	1.4	-2.7		
EX	EG	-0.6	1.5	-19.0	0.337[a]	-0.40
	CG	-0.04	1.3	-1.6		
L-LF	EG	0.7	1.8	3.5	0.010[b]	0.67
	CG	-0.5	1.8	-2.2		
R-LF	EG	0.7	1.9	3.7	0.135[b]	0.32
	CG	0.1	1.8	0.3		
L-RO	EG	0.6	1.5	6.5	0.082[a]	0.59
	CG	-0.2	1.2	-2.0		
R-RO	EG	0.6	1.2	7.5	0.003[a]	0.56
	CG	-0.1	1.3	-1.2		

Legend: FL=thoracolumbar flexion; EX=thoracolumbar extension; L-LF=left lateral spinal flexion; R-LF=right lateral spinal flexion; L-RO=left spinal rotation; R-RO=right spinal rotation; EG=exercise group (n=36); CG=control group (n=36); $\bar{x}$ =mean BEFORE-AFTER difference; %=percentage of BEFORE-AFTER difference; a=Mann-Whitney U-test for unrelated samples; b=t-test for unrelated samples; Cohen's d=Cohen's d coefficient.

Statistically significant differences in the BEFORE-AFTER increase/decrease in thoracolumbar spine mobility were found between the EG and CG for thoracolumbar flexion, left lateral flexion and the right-sided rotation range (Table 5). The calculated Cohen's d coefficients indicate a small to medium effect (Table 5).

4 DISCUSSION

Regular performance of the hatha yoga exercise programme with segmental stabilisation exercises led to statistically significant improvements in trunk flexibility. Participants in the EG achieved statistically significantly better results in four out of five extensibility tests and statistically significantly better spinal mobility in flexion, left lateral flexion and right rotation compared to the CG participants. The improvement in the V-Sit and Reach Test was also clinically significant in the EG participants. Compared to the EG participants, the CG participants showed no statistically or clinically significant changes in most of the observed variables and even tended to show a worsening of the results in the second measurement.

Considering that reduced hamstring and lower back muscle extensibility and limited spinal mobility are associated with a higher risk of LBP (6, 7), it makes sense to include exercises to improve trunk flexibility in preventive exercise programmes. By gradually intensifying the exercises and moving the spine in all directions and through the full range of motion, regular yoga practice also contributes to trunk flexibility (28, 29). The EG participants in our study achieved statistically significantly better extensibility of the iliopsoas muscles as well as the hamstring and lower back muscles, while in the CG statistically significantly poorer extensibility was indicated. The extensibility of the rectus femoris muscle did not change significantly in either group, and recent studies on risk factors suggest that poorer extensibility of the rectus femoris muscle does not correlate statistically significantly with the risk of LBP (6).

In a literature review on risk factors for LBP, Sadler et al. (6) also emphasised poorer mobility of the spine (particularly in the direction of lateral flexion) as an important risk factor. In our study, EG participants achieved statistically significantly better thoracolumbar spine mobility in all measured movements, except for extension, which was statistically significantly lower after completion of the exercise programme. The reason for this could be that the participants had better knowledge of the spinal stability system and higher trunk muscle tone after the three-month preventive exercise programme, while they may have performed the extension movement of the spine in a different, more muscle-supported way. However, this remains an area for further research. In terms of comparability of the range of motion on the left and right side of spinal mobility in the anatomical frontal and transverse planes, the effect of the exercise programme was consistent in the increase in lateral flexion range of motion and both rotations, but not all improvements were statistically significant. For most CG participants, the ranges of the individual movements remained the same or were even slightly smaller in the second measurement than in the first measurement. The improvement in mobility of the EG participants is comparable to the results of a pilot study on the effects of a regular five-month hatha yoga practice on flexibility in healthy young women (30), in which the participants (n=9, mean age 23.8±2.9 years) achieved similar improvements in thoracolumbar spine mobility at the second measurement (after two months of

practice) to those of the participants in our study (≥0.5 cm for each movement). Therefore, the hatha yoga exercise programme with segmental stabilisation exercises can improve spinal mobility.

In a literature review on the therapeutic effects of yoga on spinal mobility, Rathore et al. (31) emphasised that improvements in various aspects of spinal mobility, including flexion, extension and lateral flexion, were also observed in patients with chronic LBP. However, overstretching without integrating endurance exercises for the trunk muscles could have the opposite effect in symptomatic and asymptomatic individuals by increasing the risk of developing LBP (32).

One limitation of the study is small sample size. In order to maintain the quality of the therapeutic exercise approach, participation in each training session of the exercise programme was limited to small groups (up to 11 participants per group). Another limitation is the gender imbalance among the participants, as most of the participants were women. A further limitation is that randomisation of the participants into EG and CG groups was not possible for implementation reasons, as sufficient motivation and time of the participants was crucial for the implementation of the study (especially in the EG group for participation in the regular training sessions). Another limitation is the lack of clinically significant changes in most outcome measures, and the absence of blinding of both participants and investigators should be maintained in future studies if possible.

From the preventive point of view, despite the limitations, this study offers an important basis for using hatha yoga for preventive purposes. Moreover, through various techniques, hatha yoga strives for a dynamic balance between strength and flexibility that takes place on a physical, mental and emotional level (8, 9). Since sufficient endurance and extensibility of the trunk muscles together with sufficient mobility of the spine are the basis for spinal health and thus for the prevention of musculoskeletal complaints in the lower back, the strength of our study lies in the combination of exercises. The regular hatha yoga practice in combination with segmental stabilisation exercises improves muscle endurance in all four major trunk muscle groups (13, 14), but also the extensibility of most trunk and hip muscles and thoracolumbar mobility, as the results of our study showed. There is much evidence to suggest that yoga could be a suitable preventive approach in the management of LBP. Additionally, it could be an important preventive approach for maintaining physical fitness in seniors (33), as well as for maintaining good physical fitness in professions where the lower back is more stressed during work, e.g., in health professions such as physiotherapists or occupational therapists (34).

5 CONCLUSIONS

Hatha yoga with the segmental stabilisation exercises can significantly improve trunk flexibility both in terms of the extensibility of the back and hip muscles and the mobility of the spine in healthy participants.

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INFORMED CONSENT

Written informed consent was obtained from all individual participants included in the study. The study was approved by National Medical Ethics Committee of the Republic of Slovenia (0120-220/2019/6), and all procedures were conducted in accordance with the Declaration of Helsinki.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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ETHICAL APPROVAL

The study was approved by National Medical Ethics Committee of the Republic of Slovenia (0120-220/2019/6).

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study can be obtained upon request from the corresponding author.

AI USAGE STATEMENT

During the preparation of this article the authors did not use generative language models.

PREPRINT STATEMENT

There is no preprint of this study.

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Skela-Savič B, Sermeus W, Bahun M, Pivač S, Albreht T. Reasons for the intention to leave among nurses working in internal medicine and surgery departments of Slovenian hospitals – a cross sectional study. Zdr Varst. 2025;64(3):160-166. doi: 10.2478/sjph-2025-0021.

REASONS FOR THE INTENTION TO LEAVE AMONG NURSES WORKING IN INTERNAL MEDICINE AND SURGERY DEPARTMENTS OF SLOVENIAN HOSPITALS – A CROSS SECTIONAL STUDY

RAZLOGI ZA ZAPUŠČANJE DELOVNEGA MESTA MED MEDICINSKIMI SESTRAMI NA INTERNISTIČNIH IN KIRURŠKIH ODDELKIH SLOVENSKIH BOLNIŠNIC – PRESEČNA RAZISKAVA

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ABSTRACT

Aim
To investigate the reasons for leaving the hospital and recommending the hospital among nurses employed at internal diseases and surgical departments.

Methods
A cross-sectional explorative design was employed. Eight general hospitals and two clinical centres participated in the study. All adult surgery and internal medicine departments were included. A total of 1010 registered nurses and healthcare assistants filled out the questionnaire. Demographic and job characteristics data were collected. Permission to conduct the study was obtained from the National Medical Ethics Committee.

Results
A total of 51.5% of respondents expressed the intent to leave the hospital within the next year and 14% of them considered leaving nursing. The "intention to leave the hospital" was explained in 37.7% – 50.3% by younger age ($p<0.001$), poor evaluation of the professional aspect of the work (status of nurses) ($p<0.001$), emotional exhaustion ($p<0.001$), non-resolution of problems by leaders and managers ($p<0.001$), dissatisfaction with the current work ($p<0.001$) and overtime hours ($p=0.005$).

Conclusions
Our study highlights the role of hospital management and leadership as an important factor in nurse retention. The most critical group showing the intention to leave the hospital are the younger employees. There is therefore a need to design strategies for their adequate introduction to work and to implement professional development in nursing in accordance with international recommendations.

Keywords
Nurses
Retention
Job satisfaction
Emotional exhaustion
managers
Career development
Status
Profession

IZVLEČEK

Namen
Raziskati razloge za namero zapuščanja delovnih mest v bolnišnicah s strani medicinskih sester, zaposlenih na internih in kirurških oddelkih.

Metode
Uporabljen je bil presečni raziskovalni načrt. V raziskavi je sodelovalo osem splošnih bolnišnic in dva klinična centra. Vključeni so bili vsi oddelki za kirurgijo odraslih in interno medicino. Vprašalnik je izpolnilo skupno 1010 diplomiranih medicinskih sester in tehnikov zdravstvene nege. Zbrani so bili demografski podatki in podatki o delovnih značilnostih. Dovoljenje za izvedbo raziskave je podala Komisija za medicinsko etiko v Sloveniji.

Rezultati
Skupaj 51,5 % anketirancev je izrazilo namen, da bodo v naslednjem letu zapustili bolnišnico, 14 % pa jih je razmišljalo o tem, da bi zapustili poklic v zdravstveni negi. »Namero odhoda iz bolnišnice« je v 37,7-50,3 % mogoče razložiti pri mlajših anketirancih ($p < 0,001$), s slabo oceno profesionalnega statusa medicinske sestre v bolnišnici ($p < 0,001$), čustveno izčrpanostjo ($p < 0,001$), slabo odzivnostjo vodij in managerjev pri reševanju težav pri delu ($p < 0,001$), nezadovoljstvom s trenutnim delom ($p < 0,001$) in nadurnim delom ($p = 0,005$).

Zaključki
Raziskava poudarja vlogo vodstva in vodenja bolnišnice kot pomembnega dejavnika pri ohranjanju medicinskih sester. Najbolj kritična skupina, ki izkaže namero po zapustitvi bolnišnice, so mlajši zaposleni, zato je potrebno pripraviti strategije za njihovo ustrezno uvajanje v delo in v skladu z mednarodnimi priporočili implementirati karierni razvoj v zdravstveni negi.

Ključne besede
medicinske sestre
ohranjanje kadra
zadovoljstvo na delovnem mestu
emocionalno izčrpavajoči vodje
razvoj kariere
status
profesija

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1 INTRODUCTION

The retention of qualified nurses is a global healthcare workforce problem that has been exacerbated by the COVID-19 epidemic (1). The Organisation for Economic Co-operation and Development (OECD) (2) reports a decline in interest in studying nursing in half of the member countries of the OECD community.

1.1 Background

A systematic study of evidence looking at intentions to leave and the determinants of retention among nurses found that job satisfaction, career development and work-life balance were the most important determinants of retention (3). Job satisfaction is an important pull factor, while lack of job satisfaction is a push factor (4, 5). Furthermore, emotional exhaustion and depersonalisation have been found to be negative factors for nurse retention (6-9). Advancement opportunities and decision-making authority in patient care were also rated as important in retaining nurses (3, 5, 10-13), as were training opportunities (14), the opportunity for renewal (15), and positive professional experiences (16). Nurses want to feel empowered, to have autonomy and control over their work, and to feel that their work aligns with their personal and professional standards (17, 18). De Vries et al. (9) investigated the intention to leave the workplace during the COVID-19 epidemic and found six themes of determinants affecting the intention to leave the workplace: personal characteristics, job demands, employment services, working conditions, working relationships and organisational culture. The meta-analysis found that the most important determinants of intention to leave the workplace were fear of COVID-19, age, experience, burnout symptoms and support. French et al. (19) have shown that nurses in hospitals and nursing homes reported poor working conditions, high burnout and poor patient safety and quality of care even before the COVID-19 pandemic.

Williamson et al. (20) noted the importance of leadership and staff support, continuing professional development, recognition of nurses' work, a positive work environment, and flexible work schedule. Effective local leaders who promote relationship building, professional autonomy and a positive workplace culture can positively influence nurse retention (21). In a study that looked at nurses who terminated their employment in healthcare between 2018 and 2021, Muir et al. (22) found that the factors that could improve nurse retention are reducing and preventing burnout, improving nurse staffing, and supporting nurse work-life balance, as these fall under the purview of employers.

Griffiths et al. (23) found in the pre-COVID era that European nurses working more than 12 hours and those working overtime in a shift were more likely to rate the quality of patient care on their ward as mediocre or poor, to rate patient safety as mediocre or poor, and to report more unfinished nursing tasks on their last shift than nurses working eight hours and no more than the contracted hours. Azzellino et al. (24) found that unfinished nursing tasks or missed care are closely associated with increased job dissatisfaction, which in turn significantly increases the likelihood that nurses will consider leaving their job. A meta-analysis on the prevalence of intention to leave among nurses during the COVID-19 pandemic found that 38% of nurses expressed the intention of leaving their current job (9). In Italy, Sasso et al. (8) found in the pre-COVID era that 35.5% of nurses intended to leave their current job due to job dissatisfaction and 33.1% of them intended to leave the nursing profession. Push factors included understaffing, emotional exhaustion, lack of patient safety, performing non-nursing tasks and being female. Pull factors included positive perceptions of quality and safety of care, and performing core nursing activities.

Demographic data is also important when it comes to the intention of leaving nursing. Length of experience in nursing is directly related to higher job satisfaction; nurses who have been in the profession longer have a higher level of intrinsic or learned ability to handle pressure, which enables them to cope better with working conditions (25). Younger and inexperienced nurses have been found to have limited personal resilience to cope with complex and stressful working conditions (26), which consequently negatively affects job satisfaction and increases the intention to quit. Park et al. (27) found in Korean nurses that satisfaction with salary level was the most visible and enduring predictor of turnover intention. Among other listed factors, satisfaction with salary was also found to be an important factor for intention to leave the hospital in less developed countries (28, 29). Wang et al. (30) found that both compensation and psychological rewards can influence turnover intention.

The Registered Nurse Forecasting (RN4CAST) study (31) was conducted in Slovenia in 2020. The variance in the working environment of nurses in the study can be explained by the following factors: promotion opportunities, educational opportunities, satisfaction with current job, professional status and educational leave. The average value determined for the work environment index in nursing was one of the lowest among the studies conducted to date (32).

1.2 The aim

The aim was to analyse the self-reported intentions and reasons for leaving a hospital due to job dissatisfaction by nurses in Slovenian hospitals. We included a range of reasons previously identified in meta-analyses of the evidence, covering demographic data as well as self-reported satisfaction with current job and career choice in nursing, job characteristics, workload and evaluation of hospital management performance.

2 METHODS

2.1 Study design

A cross-sectional study was conducted. We followed the RN4CAST research protocol (31).

2.2 Sample and settings

All Slovenian general hospitals (N = 10) and university hospitals (N=2) were invited to participate in the study. Of these, eight from the former group and two from the latter decided to participate. All employed nurses and healthcare assistants working in direct patient care and in adult surgery and internal medicine departments were included (31) (N=2813). The response rate was 35.91% (n=1010); 848 (83.96%) of respondents were female and 160 were male (15.84%). The sample included 403 nurses (40%) and 605 (60%) healthcare assistants (HCAs). On average, they had been employed for 21.42 years (SD=3.40). In nursing, the average length of employment was 15.34 years (SD=11.12). Respondents' average age was 37.02 years (SD=10.65).

2.3 Instrument

We employed the Emotional Exhaustion subscale of the Maslach Burnout Inventory for Human Services Survey (MBI-HSS) (33). The scale has seven response options (0–never, 1–a few times a year or less, 2–once a month or less, 3–a few times a month, 4–once a week, 5–a few times a week, 6–every day). A higher score implies a higher degree of emotional exhaustion. The use of the emotional exhaustion subscale is conceptually and empirically well justified, as it is considered a core element of burnout (34, 35). Good scale reliability was achieved (n=9; α=0.883).

Regarding the respondents' work characteristics, data was collected using the RN4CAST survey methodology (31): satisfaction with current work and professional aspects of work (1–very dissatisfied, 2–somewhat dissatisfied, 3–moderately satisfied, 4–very satisfied) (n=10; α=0.891). Various scales with one question were used to describe the conditions in the working environment (1–bad, 2–fair, 3–good, 4–excellent), intention to leave the hospital (1–yes, 2–no), and satisfaction with the decision to work in nursing (1–very dissatisfied, 2–somewhat dissatisfied, 3–fairly satisfied, 4–very satisfied). Various scales with one question were used to review the confidence of hospital management in resolving patient care issues, and patient readiness for discharge (1–not at all confident, 2–somewhat confident, 3–reliably confident, 4–very confident), the overall score for patient safety (1–failing, 2–poor, 3–acceptable, 4–very good, 5–excellent) and the overall quality of patient care on the ward/department (1–poor, 2–adequate, 3–good, 4–excellent) (31). Data on overtime in the last month was collected. We used the previously developed recommendations for the translation process (36).

2.4 Ethical approval and data collection

The Slovenian National Medical Ethics Committee approved the study (No. 0120-488/2019/6, January 7, 2020). The study was conducted in accordance with the Helsinki declaration (37). The participants gave their written consent to participate in the study and gave permission to publish the results of the study in scientific journals (online, open-access). The data was collected before the outbreak of the epidemic in Slovenia from 10 February to 7 March 2020. The period of data collection was two weeks for each hospital. The management appointed research coordinators who administered questionnaires printed on paper. The respondents returned them at the agreed collection point in a sealed envelope.

2.5 Data analysis

The statistical package SPSS 22 was used for data analysis. Univariate, bivariate statistical analyses and multivariate analyses were performed. Statistical significance was defined at $p<0.05$.

3 RESULTS

One in two respondents (n=515; 51.5%) expressed the intention of leaving the hospital within a year because they were dissatisfied with their current job, and 14% (n=139) of them intended to leave nursing. A total of 555 respondents (55.7%) would recommend the hospital as a good work place to other nurses. On the last working day before completing the questionnaire, the nurses' average daily working time was 9 hours and 42 minutes (SD=5.518). Table 1 describes the average satisfaction score with different job characteristics, emotional exhaustion, the results by variable, and the differences between respondent groups according to whether they intended to leave the hospital or stay, the relationship between the variables and the decision to recommend the hospital to other nurses as a good work place. For all observed variables in Table 1, we found significant differences between respondents who intend to leave the hospital and those who do not. We linked the observed independent variables with the variable "recommendation of the

hospital to a colleague as a good workplace" and found significant positive and negative correlations (Table 1). No differences were found between educational level and gender for the variables in Table 1.

Following the significant associations in Table 1, we performed a logistic regression (Enter method) to identify the factors for the variable "intention to leave the hospital" using the multivariate method. The model in Table 2 contains 11 independent variables that explain the variance of "intention to leave the hospital within a year because of job dissatisfaction". The full model of included factors was statistically significant (x^2 (10, N=582)=17.101, p<0.001), indicating that the constructed model identifies the differences between those who intend to leave the hospital and those who do not. Variance in 'intention to leave the hospital' was explained in 37.7% (Cox & Snell R-squared model) and 50.3% (Nagelkerke R-squared model). Six independent variables were found to be statistically significant and described the relationship with

Table 1. The results by variable and the differences between respondent groups in terms of the intention to leave the hospital or stay.

Independent variables	Dependent variables				
	n	M (SD)	Leave the hospital YES M (SD)	Leave the hospital NO M (SD)	t (p)
Burnout (ordinal 0-6)					
Emotional exhaustion	931	23.62 (10.589)	28.14 (9.479)	18.90 (9.544)	15.338 (<0.001)
Aspects of satisfaction (ordinal 1-4)					
Current job	1.003	2.96 (0.733)	2.64 (0.699)	3.29 (0.616)	-15.427 (<0.001)
Decision to work in nursing	988	2.89 (0.791)	2.62 (0.748)	3.11 (0.754)	-10.228 (<0.001)
Professional aspects of job (ordinal 1-4)	790	2.73 (0.675)	2.43 (0.630)	3.05 (0.552)	-14.983 (<0.001)
Management and patient safety					
Management resolve problems in patient care that I report. (ordinal 1-4)	998	2.57 (0.882)	2.26 (0.865)	2.89 (0.781)	-11.927 (<0.001)
Overall grade on patient safety in my department. (ordinal 1-5)	999	3.54 (0.858)	3.38 (0.897)	3.70 (0.780)	-5861 (<0.001)
Overtime hours per month (continues)	853	16.53 (15.237)	18.70 (15.652)	14.17 (14.359)	4.367 (<0.001)
Quality of nursing care in department (ordinal 1-4)	1005	3.03 (0.746)	2.88 (0.790)	3.19 (0.656)	-6.876 (<0.001)
Readiness of patients for discharge (ordinal 1-4)	1004	2.87 (0.664)	2.74 (0.706)	3.01 (0.583)	-6.546 (<0.001)
Undone necessary activities (continues)	1003	1.69 (0.244)	1.66 (0.245)	1.73 (0.233)	-4.958 (<0.001)

Note 1. n – Number of answers, M – Mean (4-point scale), SD – Standard deviation, t – t test, r – bivariate correlation coefficient, p - P-value. **Correlation is significant at the 0.01 level (2-tailed).
Note 2. The data on various aspects of the job have already been published (31).

Table 2. Logistic regression model for intention to leave the hospital for nurses in internal medicine and surgery departments of Slovenian hospitals.

"YES, I will leave the current hospital within a year because of job dissatisfaction."								
	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Satisfaction with current job	-1.020	0.265	14.874	1	**<0.001**	0.361	0.215	0.605
Management resolve problems in patient care	-0.604	0.155	15.181	1	**<0.001**	0.547	0.403	0.741
Overall grade on patient safety	0.210	0.164	1.638	1	0.201	1.234	0.894	1.703
Emotional exhaustion	0.452	0.115	15.486	1	**<0.001**	1.572	1.255	1.969
Professional aspects of job	-0.919	0.230	15.972	1	**<0.001**	0.399	0.254	0.626
Age	-0.047	0.011	18.789	1	**<0.001**	0.954	0.934	0.974
Overtime hours per month	0.021	0.007	8.047	1	**0.005**	1.021	1.007	1.037
Decision to work in nursing	-0.317	0.166	3.626	1	0.057	0.729	0.526	1.009
Quality of nursing care in department	0.060	0.190	0.101	1	0.750	1.062	0.732	1.541
Readiness of patients for discharge	-0.002	0.194	0.000	1	0.992	0.998	0.682	1.460
Undone necessary activities	0.262	0.297	0.774	1	0.379	1.299	0.725	2.327
Constant	7.020	1.280	30.071	1	<0.001	1119.11		

"intention to leave the hospital within a year because of job dissatisfaction". These include a younger age (OR=0.95, p<0.001), a lower evaluation of the professional aspects of the job (OR=0.39, p<0.001), a higher level of emotional exhaustion (OR=1.57, p<0.001), a lower ability of management to solve problems in patient care (OR=0.55, p<0.001), a lower level of satisfaction with the current job (OR=0.36, p<0.001) and a higher number of overtime hours per month (OR=1.02, p=0.005) (Table 2).

4 DISCUSSION

Our aim was to investigate the reasons for leaving the hospital due to job dissatisfaction among nurses working in the internal medicine and surgery departments of Slovenian hospitals. The data were collected before the outbreak of the epidemic in Slovenia. Compared to other European countries, the study in Slovenia revealed the highest proportion (51.5%) of respondents expressing an intention to leave their hospital within a year because of job dissatisfaction in the pre-COVID 19 period (8, 9, 26, 35). The most recent studies in Greece showed an intention to leave of 50.2% (38), and in Ireland 30% (39); the data for both studies was collected in 2023. De Vries et al. (9) calculated in a meta-analysis that the intention to leave the workplace in European studies at the time of COVID 19 was on average 38% and Aiken et al. (40) 33% in five EU countries. The Slovenian intention to leave the hospital at the beginning of 2020 was very high.

The nurses in our survey worked an average of 16 hours per month beyond the agreed one month working time of 174 hours. The excessive workload can lead to exhaustion, which reduces nurses' job satisfaction (40), and is the strongest predictor of intention to leave (38). In our study, nurses who intended to leave their hospital also felt significantly more exhausted. Some variables reported in international studies were not found to be typical in our study, such as education level (41) and gender (5, 8, 11, 42).

The variables observed in our study (Table 1) have also been associated with intention to leave the hospital in other studies and are also summarised by the authors for the period before (6-8, 10, 11, 14-18), during and after COVID-19 (9, 12, 13, 44, 45).

For the "intention to leave the hospital within a year because of job dissatisfaction", we identified six significant variables which explained the variable in a maximum 50%. The strongest factors in our model, also recognised in other pre-COVID studies and those during COVID 19 (6-9, 43), were younger age, professional aspect of job (status of nurses) and emotional exhaustion. The performance of management in solving problems at work and satisfaction with current job was the next level of factors for intention to leave the hospital. Previous studies showed that management that responds poorly or does not respond to problems raised by employees regarding patient work significantly encourages the departure of nurses from the hospital (20, 21, 41). Next, overtime hours were significant in our multivariate model and revealed a lot about the work-life balance as experienced by the respondent. In other studies, advancement opportunities and decision-making authority in patient care were also found to be important in retaining nurses in the profession (5, 17, 18, 42).

4.1 Implications for managers in healthcare system

Aiken et al. (44) pointed out that most hospitals have not made significant improvements in staffing or the working environment in the last decade; policy makers should require hospitals to meet safe minimum standards for nurse staffing. Continuing chronic understaffing and unacceptable working conditions in hospitals will not restore public and nurses' confidence in hospitals. The importance of the number of nurses employed for patient health outcomes appears to be an explanatory factor in the Slovenian study (46).

One of the most important tasks of managers and leaders is to create a favourable working environment for nurses with effective and qualified leaders. Managers need to understand that a salary increase for nurses is not enough to retain these workers; salary and adequate working conditions are important, their absence leads to dissatisfaction, while achievements and recognition increase job satisfaction and performance. Policies aimed at increasing nurse autonomy, allowing post-graduate specialisations, recognising Master of Nursing degrees in clinical settings, providing recognition and improving communication are effective in increasing job satisfaction and decreasing turnover.

4.2 Limitations

First, the results reflect the views and experiences of the nurses who participated in the survey. The response rate was relatively modest and may have led to response bias—especially if those with stronger opinions were more likely to respond. Secondly, the study focused exclusively on internal medicine and surgical departments and excluded other hospital areas that may have different organisational cultures and working conditions. Thirdly, the use of self-report data raises the possibility that certain responses may be both over- and under-reported because work environment and job satisfaction perceptions are inherently subjective and may vary over time and between individuals. Finally, the study is cross-sectional and thus narrows our capacity for drawing causal conclusions. While the regression models show significant relationships, they do not allow conclusions to be drawn on the direction or time course of these relationships.

5 CONCLUSIONS

This study highlights the variables of nurse retention which are in the domain of tasks and responsibilities of hospital managers and leaders. Factors for nurse retention that should be considered by management and national healthcare policy are preventing emotional exhaustion, creating conditions for a stimulating work environment, solving problems highlighted by staff and prioritising the professional development of nurses, thus improving their status at the hospital.

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INFORMED CONSENT

The participants gave their written informed consent to participate in the study and gave permission to publish the results of the study in scientific journals (online, open-access). The study was conducted in accordance with the Helsinki Declaration.

CONFLICTS OF INTEREST

The authors report no conflicts of interest. The manuscript has not been published and is not under consideration for publication elsewhere.

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ETHICAL APROVAL

The Slovenian National Medical Ethics Committee approved the study (No. 0120-488/2019/6, 7 January 2020).

AVAILABILITY OF DATA AND MATERIALS

The data sets used and/or analysed during the current study are available from the first author of this article.

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PSYCHOMETRIC VALIDATION OF THE ULTRASHORT SLOVENIAN (OHIP-SVN5) AND CROATIAN (OHIP-CRO5) ORAL HEALTH IMPACT PROFILE QUESTIONNAIRES

PSIHOMETRIČNA VALIDACIJA ULTRAKRATKE SLOVENSKE (OHIP-SVN5) IN HRVAŠKE RAZLIČICE (OHIP-CRO5) VPRAŠALNIKA ORAL HEALTH IMPACT PROFILE

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ABSTRACT

Aim
The study tested the validity, reliability and responsiveness of the ultrashort Slovenian and Croatian versions of the 5-item Oral Health Impact Profile (OHIP-5).

Methods
A total of 663 participants from the general population (400 from Slovenia and 223 from Croatia), 68 students (38 from Slovenia and 30 from Croatia), and 60 dental patients with treatment needs (30 from Slovenia and 30 from Croatia) were included in this investigation. Internal consistency was assessed using Cronbach's alpha, and test-retest reliability was evaluated with intraclass correlation coefficients (ICC). Exploratory factor analysis (EFA) was performed to test whether the data fit the unidimensional model, and two types of validity were assessed: concurrent validity and known-group validity.

Results
The internal consistency of the Slovenian and Croatian ultrashort OHIP versions was confirmed by Cronbach's alpha coefficients greater than 0.7 and the test-retest reliability, with sufficient ICC values. The factor analysis for both OHIP-5 versions showed a one-dimensional model and good factor loadings. Concurrent validity was confirmed through significant associations between self-reported oral health and the OHIP-5 summary scores. The OHIP-SVN5 and OHIP-CRO5 distinctly and significantly distinguished between different groups with differences in oral health impairment. Responsiveness to change of the OHIP-5 questionnaires showed that in Slovenian patients, three items decreased after treatment, while in Croatia, the scores of all OHIP-5 items and the summary score were significantly reduced after the treatment.

Conclusions
Slovenian and Croatian ultrashort OHIP-5 questionnaires are adequate one-dimensional instruments consistent with the four-dimensional model of oral health.

Keywords
Oral health
Quality of life
Questionnaire
Validity
Reliability
Slovenia
Croatia

IZVLEČEK

Namen
Študija je preverjala veljavnost, zanesljivost in odzivnost ultrakratke slovenske in hrvaške različice vprašalnikov Oral Health Impact Profile (OHIP-5).

Metode
V raziskavo je bilo vključenih 663 oseb iz splošne populacije (400 iz Slovenije, 223 iz Hrvaške), 68 študentov (38 slovenskih, 30 hrvaških) in 60 zobozdravstvenih pacientov s potrebo po zdravljenju (30 slovenskih, 30 hrvaških). Notranja skladnost je bila ocenjena s Cronbachovim alfo, ponovljivost meritev pa z intraklasnimi korelacijskimi koeficienti (ICC). Z eksploratorno faktorsko analizo (EFA) smo preverili, ali podatki ustrezajo enodimenzionalnemu modelu. Ocenjeni sta bili tudi dve vrsti veljavnosti: sočasna in diskriminativna.

Rezultati
Notranja skladnost obeh različic OHIP-5 je bila potrjena s Cronbachovimi alfa koeficienti > 0,7, test-retest zanesljivost pa z zadostnimi ICC vrednostmi. Faktorska analiza je potrdila enodimenzionalno strukturo. Sočasna veljavnost je bila potrjena s pomembnimi povezavami med samooceno ustnega zdravja in seštevki OHIP-5. Obe različici (OHIP-SVN5 in OHIP-CRO5) sta jasno in značilno ločili med skupinami z različnim stanjem ustnega zdravja. Občutljivost na spremembe je pokazala, da so se pri slovenskih pacientih po zdravljenju znižale vrednosti treh postavk, medtem ko so se pri hrvaških pacientih statistično značilno znižale vrednosti vseh postavk in skupna ocena.

Zaključki
Slovenska in hrvaška ultrakratka vprašalnika OHIP-5 sta ustrezni enodimenzionalni orodji, primerljivi z drugimi validiranimi različicami in skladni s štiridimenzionalnim modelom ustnega zdravja.

Ključne besede
ustno zdravje
kakovost življenja
vprašalniki
veljavnost
zanesljivost
Slovenija
Hrvaška

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1 INTRODUCTION

Dental patient-reported outcome measures are important psychometric instruments that enable patients to self-assess the impacts of oral diseases and evaluate dental treatment modalities. Among several psychometrically validated questionnaires assessing self-perceived oral health, the Oral Health Impact Profile (OHIP) is the most frequently used and methodologically investigated instrument. Oral Health-Related Quality of Life (OHRQoL) is typically assessed nowadays using one version of the OHIP questionnaire, which consists of 49, 14, or 5 items (1-3). Additionally, disease-specific OHIP instruments have also been developed, such as OHIP-EDENT for edentulous patients (4), OHIP-TMD (5) for patients whose problems originate from the temporomandibular joints (6), or OHIP-ESTHET for assessment of orofacial aesthetics (7). The questionnaires, consisting of multiple items, place a significant burden on the person completing them because a lot of time is required, and some items may be unintentionally omitted. However, the 5-item OHIP version represents a questionnaire with the lowest burden for the patient, as five responses can be chosen on a 5-point ordinal rating scale, still capturing at least one question from each of the four dimensions of OHRQoL, specifically, Oral Function, Orofacial Pain, Orofacial Appearance, and Psychosocial Impact (8-11). Recently, it was proposed to use the ultra-short version, i.e., the OHIP-5, to replace the more extended versions, because it has been proven that summary scores of the 5-, 14-, and 49-item versions are highly correlated (12, 13). Using the shortest version should have the greatest potential to facilitate the future clinical use of the OHIP instrument (14).

In Slovenia, the OHIP-49 and OHIP-14 have already been validated (15, 16). In Croatia, the OHIP-49, OHIP-14 and OHIP-EDENT have been validated through psychometric testing (16-18). However, the shorter, that is, the 14-item OHIP version, has been used more often in research and clinical settings than the original, longer 49-item version (18-32). To reduce respondents' and examiners' burden and time consumption, and to ensure that all questions are answered, many countries have already developed and validated ultra-short OHIP-5 versions (3, 33-40). In Chile, the ultra-short OHIP 7-item version was also validated (41).

This study aimed to validate the Slovenian and Croatian versions of the OHIP-5 questionnaire in a target population. We hypothesised that the Slovenian and Croatian versions of the OHIP-5 would demonstrate adequate internal consistency, construct validity, test-retest reliability and responsiveness.

2 METHODS

2.1 Forward-backward translations of the OHIP-5 questionnaire

The Slovenian and Croatian versions were translated from the English 5-item version (3) using established standards (42). In each country, a professional translator and a dentist fluent in English, with international experience in English-speaking countries, performed the initial translation into Slovenian or Croatian. After review by two English-fluent dentists, the final versions were back-translated into English by another professional translator in collaboration with another dentist fluent in English, separately in each country. Both back-translations were then independently evaluated and compared with the original English version by two native English speakers.

2.2 Patients and data collection

The institutional ethics committees in Slovenia and Croatia approved the study under reference numbers 0120-219/2017-3 and 05-PA-26-6/2015, respectively. The participants were selected from different populations. Their mean age, gender, age range and research purposes for psychometric validation of the OHIP-5 questionnaire in Slovenia and Croatia are presented in Table 1.

A total of 663 participants from the general population (400 in Slovenia and 223 in Croatia) were involved in the research, as well as 68 students (38 in Slovenia and 30 in Croatia), and 60 dental patients with treatment needs (30 in each country). Each participant received a thorough written explanation of the study's purposes and procedures and was assured of anonymity. In Slovenia, participants were recruited consecutively from among employees in educational or research institutions, while in Croatia, participants were recruited consecutively from among patients and their accompanying persons in the waiting room of their family practice doctors (Table 1). The responses to the OHIP-5 questions were made on a 5-point Likert scale (0=never; 1=hardly ever; 2=occasionally; 3=fairly often; and 4=very often) and referred to the period of the last 7 days (43). In addition to the OHIP-5 questions, the participants recruited from the Slovenian general population also answered questions about their age, gender, denture wear (either fixed or removable), and self-assessed their oral health and oral appearance on a 4-point scale (0=excellent; 1=good; 2=fair; 3=poor). In Croatia, the participants from the general population also answered questions about their age, gender and whether they wore a removable denture (yes or no), and assessed their self-perceived oral health, which was reported on a 5-point Likert scale as 0=excellent; 1=very good; 2=good; 3=fair; 4=poor. All participants completed the written forms, and no questionnaire had missing data in either country. Dental students in both countries also participated and completed the OHIP-5 questionnaire

Table 1. Age, gender and research purpose of the respondents answering five questions of the Oral Health Impact Profile (OHIP-5).

Sample	n (% female)	Mean age (standard deviation)	Age range (years)	Research purpose
General population SVN†	400 (72.8)	53.8 (9.7)	28-70	Internal consistency, EFA, Concurrent validity, Known group validity
General population CRO*	223 (65.5)	59.96 (14.6)	28-82	Internal consistency, EFA, Concurrent validity, Known group validity
Students SVN§	38 (68.4)	22.6 (1.7)	20-26	Test-retest reliability
Students CRO‡	30 (70.0)	22.0 (1.4)	19-25	Test-retest reliability
Patients with treatment needs SVN#	30 (54.0)	50.8 (14.2)	18-70	Responsiveness (sensitivity to change)
Patients with treatment needs CRO‡	30 (65.0)	65.5 (10.4)	37-81	Responsiveness (sensitivity to change)

Legend:
EFA - exploratory factor analysis
† Educational and research institutions in Ljubljana, Slovenia
* People in the general practice doctor's waiting room who came for a referral, examination, or due to sick leave for themselves or somebody else
§ University of Ljubljana, Medical Faculty, Department of Prosthodontics, Slovenia.
‡ University of Zagreb, School of Dental Medicine, Department of Prosthodontics, Croatia.
#University Medical Center of Ljubljana, Department of Oral and Maxillofacial Surgery, Slovenia.

twice within 2-week intervals without any changes that could influence their OHRQoL. For recruited patients who required treatment, a trained dentist in each country conducted an oral examination before the first administration of the OHIP-5 questionnaire.

2.3 Statistical analysis

2.3.1 Reliability

Two types of reliability were assessed: internal consistency and test-retest reliability. The internal consistency was evaluated by calculating the Cronbach's α reliability coefficient, the Cronbach's α reliability coefficient if the item was deleted, and the average inter-item correlation for the OHIP scores (44). The Cronbach's α values ≥0.70 were considered satisfactory (45), while values >0.20 were considered acceptable for the inter-item correlation (46). For the test-retest reliability of the OHIP-5 Questionnaire, a convenience sample of 38 dental students was selected in Slovenia, and a sample of 30 was chosen in Croatia. Subjects were not allowed to undergo oral/dental treatments for two weeks; if any oral problems occurred, they would be excluded. The intraclass correlation coefficients (ICC) were calculated based on the one-way repeated-measures analysis of variance (ANOVA) from the repeated administration of the same questionnaires within a two-week period (47). The ICC>0.80 indicated excellent agreement, 0.61-0.80 good agreement, 0.41-0.60 moderate agreement and <0.40 poor agreement.

2.3.2 Exploratory Factor Analysis

Exploratory factor analysis (EFA) was performed to test the dimensionality of the OHIP-SVN5 and OHIP-CRO5, aiming to determine whether the data fit a unidimensional model. Before the analysis, the Kaiser-Meyer-Olkin (KMO) statistic of sampling adequacy and Bartlett's test of sphericity were made. The Kaiser-Meyer-Olkin values should be above 0.6, and Bartlett's test of sphericity should have a significance of <0.0001 to perform the EFA. A minimum eigenvalue of 1 was assigned as the factor extraction criterion, and item loadings ≥0.4 were considered sufficient. A scree-plot was also designed, and the total variance was calculated.

2.3.3 Validity

Two types of validity were assessed: concurrent validity and known-group validity.

2.3.3.1 Concurrent validity

The association between self-reported oral health and the OHIP-5 summary scores was assessed by calculating the Spearman rank correlation. In the Slovenian sample from the general population, concurrent validity was evaluated using the Spearman rank correlation between the OHIP-SVN5 summary scores and self-perceived oral health, as well as between the OHIP-SVN5 summary scores and self-perceived orofacial aesthetics. In Slovenian participants, self-perceived oral health and self-perceived orofacial aesthetics were rated on a 4-point scale, ranging from zero to three (0=excellent; 1=good; 2=fair; 3=poor). Self-perceived

oral health in Croatia was assessed on a 5-point Likert scale (0=excellent; 1=very good; 2=good; 3=fair; 4=poor).

2.3.3.2 Known group validity

Tests were conducted to determine whether the OHIP-5 scores discriminate between two groups known to differ. This was assessed by testing the differences of each item and the OHIP-5 summary scores between the groups expected to have differences in OHRQoL impairment. In the Slovenian general population, validity was tested between participants with a denture (fixed or removable) and participants with natural teeth. In contrast, the validity of the Croatian general population sample was tested by comparing participants with removable dentures to those without them. The non-parametric Mann-Whitney U test was used for that purpose. Based on our previous research (15-32), we assumed that individuals with dentures would have worse oral health than those with natural teeth.

2.3.4 Responsiveness

Responsiveness of the OHIP-SVN5 and the OHIP-CRO5 was tested in 30 Slovenian and 30 Croatian patients with treatment needs (Table 1). Slovenian patients required tooth extraction following unsuccessful endodontic treatment in the posterior jaw regions, while Croatian patients needed new complete dentures. All patients completed the OHIP-5 questionnaires twice: first, immediately before treatment, and second, one month after treatment. We assumed that OHRQoL would improve after treatment, compared to the status before treatment. The significance of the differences in the OHIP-5 scores between the baseline and the follow-up administrations was tested using the Wilcoxon Rank Sign non-parametric test and by calculating the standardised effect size (48) using the formula: (Baseline OHIP score - follow-up OHIP score)/(Standard deviation of baseline OHIP score). According to Cohen, effect sizes are classified as small (0.2), medium (0.5), or large (0.8) (49).

3 RESULTS

3.1 Reliability

3.1.1 Internal consistency

The Cronbach's α coefficients were 0.766 for the OHIP-SVN5 and 0.706 for the OHIP-CRO5 questionnaire. Table 2 presents the mean values, standard deviations, and Cronbach's alpha coefficients for the Slovenian and Croatian OHIP-5 versions after one item was deleted. Table 3 shows inter-item correlation matrices of the Slovenian and Croatian OHIP-5 Questionnaires. All inter-item correlations were greater than 0.20 in the Slovenian and Croatian OHIP-5 questionnaires and were considered acceptable (46).

3.1.2 Exploratory factor analysis

The Kaiser-Meyer-Olkin (KMO) statistic for sampling adequacy was 0.783 for the OHIP-SVN5 and 0.768 for the OHIP-CRO5. The Bartlett's test for sphericity was 537.76, with $p<0.0001$ in the Slovenian OHIP-5 version, while the Bartlett's test for sphericity was 232.68, with $p<0.0001$ in the Croatian OHIP-5 version. The results of the EFA for the Slovenian and Croatian versions of the OHIP-5 questionnaire revealed a one-dimensional model, as all items loaded onto a single latent factor. The OHIP-SVN5 explained 52% of the variance, while the OHIP-CRO5 explained 50%. The scree plot also shows a one-factorial model for both language versions. The results of factor loadings are presented in Table 4. The Scree plots are presented in Figure 1.

3.1.3 Test-retest reliability

The test-retest reliability results of the Slovenian and Croatian students are presented in Table 5. The ICCs indicated very good to excellent reliability. There were no significant differences between the questionnaires completed within two weeks, either for each item or for the OHIP summary scores ($p>0.05$). In the Slovenian version, the ICC was not computed for the item: 'Less flavour in food', as the difference was zero.

Table 2. Means, standard deviations and Cronbach's alpha when the item was deleted from the OHIP-SVN5 and OHIP-CRO5 questionnaires.

OHIP-5 item	OHIP-SVN5			OHIP-CRO5		
	Mean	Standard deviation	Cronbach's alpha if the item is deleted	Mean	Standard deviation	Cronbach's alpha if the item is deleted
Difficulty chewing	0.97	1.10	0.69	0.87	1.04	0.60
Painful aching	0.67	0.85	0.74	0.41	0.76	0.67
Uncomfortable with appearance	0.70	1.08	0.71	0.82	1.03	0.70
Less flavour in food	0.24	0.64	0.73	0.25	0.53	0.64
Difficulty doing usual jobs	0.18	0.56	0.74	0.17	0.49	0.68

Table 3. Inter-item correlation matrix of the OHIP-SVN5 and the OHIP-CRO5.

OHIP-SVN5 Inter-item Correlation Matrix	Difficulty chewing	Painful aching	Uncomfortable with appearance	Less flavour in food	Difficulty doing usual jobs
Difficulty chewing	1.000				
Painful aching	0.464	1.000			
Uncomfortable with appearance	0.536	0.361	1.000		
Less flavour in food	0.447	0.280	0.428	1.000	
Difficulty doing usual jobs	0.409	0.356	0.388	0.556	1.000
OHIP-CRO5 Inter-item Correlation Matrix					
Difficulty chewing	1.000				
Painful aching	0.424	1.000			
Uncomfortable about appearance	0.412	0.231	1.000		
Less flavour in food	0.469	0.339	0.351	1.000	
Difficulty doing usual jobs	0.369	0.315	0.240	0.516	1.000

Table 4. Factor loadings of one dimension of the OHIP-5 questionnaire.

Item	OHIP-SVN5	OHIP-CRO5
	One component	
Difficulty chewing	0.787	0.774
Painful aching	0.651	0.642
Uncomfortable about appearance	0.744	0.611
Less flavour in food	0.744	0.780
Difficulty doing usual jobs	0.740	0.699

Extraction Method: Principal Component Analysis. One component extracted.

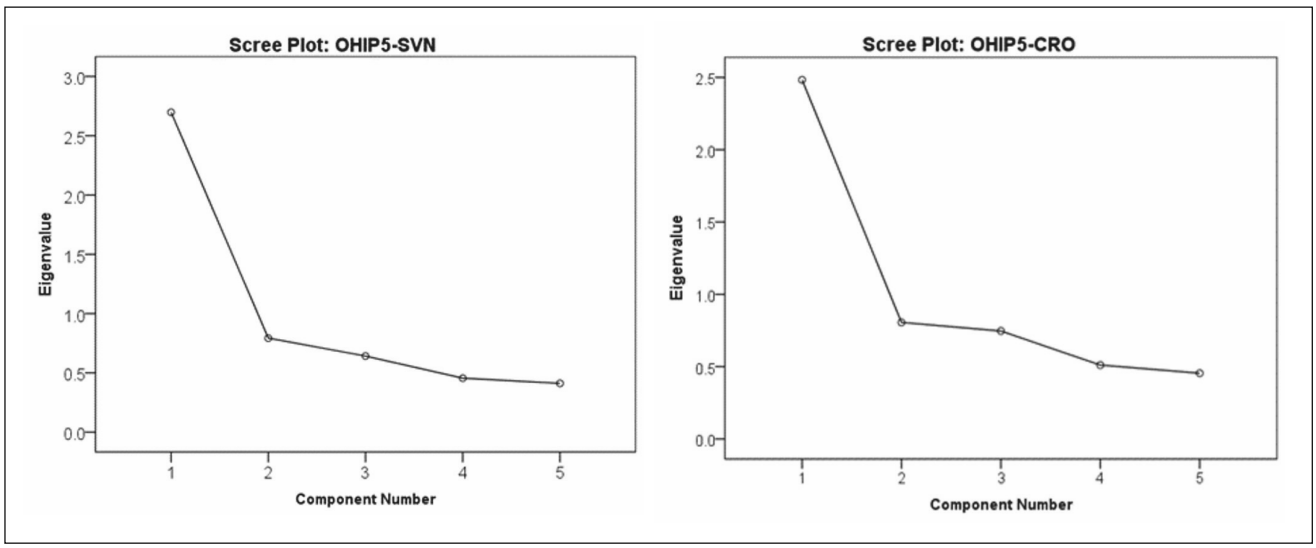

Figure 1. Scree-plots of the OHIP-SVN5 and OHIP-CRO5.

Table 5. Test-retest reliability measured by intraclass correlation coefficients (ICC) of the Slovenian and Croatian versions of the 5-item Oral Health Impact Profile (OHIP-SVN5 and OHIP-CRO5).

OHIP-SVN5: Students (n=38)	**ICC**	**Mean difference (standard deviation)**	**95% confidence interval**	**p**
Difficulty chewing	0.74	-0.03 (0.43)	-0.169 – 0.12	0.711 N.S.
Painful aching	0.65	0.105 (0.61)	-0.093 – 0.30	0.291 N.S.
Uncomfortable about appearance	0.82	0.105 (0.45)	-0.043 – 0.25	0.160 N.S.
Less flavour in food	N.C.	0 (0)	N.C.	N.C.
Difficulty doing usual jobs	0.70	-0.026 (0.60)	-.080 - 0.03	0.324 N.S.
Summary score	**0.82**	**0.157 (0.89)**	**-0.133 - 0.45**	**0.279 N.S.**
OHIP-CRO5 Students (n=30)	**ICC**	**Mean difference (standard deviation)**	**95% confidence interval**	**p**
Difficulty chewing	0.84	0.033 (0.32)	-0.086 – 0.153	0.537 N.S.
Painful aching	0.70	0.033 (0.18)	-0.035 – 0.10	0.326 N.S.
Uncomfortable about appearance	0.76	0.067 (0.37)	-0.070 – 0.20	0.326 N.S.
Less flavour in food	0.70	0.033 (0.18)	-0.035 – 0.10	0.326 N.S.
Difficulty doing usual jobs	0.70	0.033 (0.18)	-0.035 – 0.10	0.326 N.S.
Summary score	**0.70**	**0.20 (0.664)**	**-0-048 - 0.45**	**0.110 N.S.**

Legend:
ICC=Intraclass correlation coefficient
p=p-value
N.S.=p>0.05
N.C.=not computed because the standard error of the difference was 0

3.2 Concurrent validity

The results of the concurrent validity of the Slovenian and Croatian versions of the OHIP-5 questionnaires are presented in Table 6. The associations between self-reported oral health and the OHIP-5 summary scores, as assessed using the Spearman rank correlation, were positive and significant in both versions of the OHIP-5. Additionally, a significant association was found between self-reported orofacial aesthetics and the OHIP-5 summary scores in the Slovenian version.

3.3 Known-groups validity

The known-groups validity (i.e., divergent validity) was assessed by testing the significance of the differences in the OHIP-SVN5 and OHIP-CRO5 summary scores between groups, which were expected to have differences in OHRQoL impairment, and are presented in Table 7. The non-parametric Mann-Whitney U test was applied. It revealed significantly more impaired OHRQoL, as indicated by higher scores on each of the OHIP-5 items and higher summary scores for both OHIP-5 versions, in individuals wearing dentures.

3.4 Responsiveness (sensitivity to change)

Means and standard deviations of the pre- and post-treatment scores, mean differences, Z values, significance of the differences, effect sizes for each item, and OHIP-5 summary scores in Slovenian and Croatian patients are presented in Table 8.

Table 6. Concurrent validity of the Slovenian and Croatian OHIP-5 Questionnaires.

General population SVN (n=400)			
Self-reported oral health	**n**	**OHIP-5 summary score**	**Spearman's rho**
excellent	51	0.69 (1.16)	0.601**
good	224	1.86 (2.06)	
fair	94	4.33 (3.38)	
poor	31	7.77 (3.81)	
Self-reported oral aesthetics	**n**	**OHIP-5 summary score**	**Spearman's rho**
excellent	52	1.12 (1.71)	0.510**
good	213	1.83 (2.12)	
fair	106	3.99 (3.17)	
poor	29	7.90 (4.29)	
General population CRO (n=223)			
Self-reported oral health	**n**	**OHIP-5 summary score**	**Spearman's rho**
excellent	85	0.31 (0.64)	0.892**
very good	48	1.93 (1.11)	
good	53	4.36 (1.06)	
fair	23	6.61 (2.27)	
poor	4	10.25 (0.96)	

Legend: ** p<0.01

Table 7. Known-groups validity, assessed by the Mann-Whitney U test.

OHIP-SVN5	**Denture (Fixed and Removable)**	**N**	**Mean**	**Standard Deviation**	**Z**	**P**
Difficulty chewing	no	304	0.74	0.93	-7.020	<0.001**
	yes	96	1.70	1.24		
Painful aching	no	304	0.57	0.79	-4.174	<0.001**
	yes	96	0.98	0.94		
Uncomfortable about appearance	no	304	0.53	0.93	-4.910	<0.001**
	yes	96	1.23	1.34		
Less flavour in food	no	304	0.14	0.49	-5.262	<0.001**
	yes	96	0.54	0.92		
Difficulty doing usual jobs	no	304	0.12	0.46	-3.214	<0.001**
	yes	96	0.34	0.80		
OHIP-SVN5 summary score	no	304	2.10	2.56	-7.080	<0.001**
	yes	96	4.80	3.86		
OHIP-CRO5	**Removable denture**	**N**	**Mean**	**Standard Deviation**	**Z**	**P**
Difficulty chewing	no	128	0.30	0.57	-10.031	<0.001**
	yes	95	1.65	1.03		
Painful aching	no	128	0.20	0.55	-4.754	<0.001**
	yes	95	0.68	0.90		
Uncomfortable about appearance	no	128	0.54	0.79	-4.534	<0.001**
	yes	95	1.20	1.18		
Less flavour in food	no	128	0.07	0.31	-6.153	<0.001**
	yes	95	0.48	0.67		
Difficulty doing usual jobs	no	128	0.05	0.29	-4.476	<0.001**
	yes	95	0.32	0.64		
OHIP-CRO5 summary score	no	128	1.17	1.67	-9.103	<0.001**
	yes	95	4.34	2.84		

Legend: ** p<0.01

Table 8. Sensitivity to change (responsiveness) of the OHIP-SVN5 (N=30) and OHIP-CRO5 (N=30), pre- versus post-treatment.

	Pre-treatment x±SD	Post-treatment x±SD	Mean difference x±SD	Z	*P*	Effect size
OHIP-SVN5						
Difficulty chewing	2.33±0.96	1.87±0.82	0.47±0.68	-2.64	0.008**	0.48
Painful aching	2.70±1.02	1.90±0.71	0.80±0.99	-3.67	0.001**	0.78
Uncomfortable about appearance	1.90±0.84	1.96±0.98	0.06±0.69	-0.58	0.564 N.S.	0.07
Less flavour in food	1.43±0.73	1.23±0.50	0.20±0.55	-1.90	0.056 N.S.	0.28
Difficulty doing usual jobs	1.47±0.63	1.20±0.41	0.27±0.58	-2.31	0.021*	0.43
Summary score	**9.83±2.29**	**8.03±1.73**	**1.80±1.40**	**-4.53**	**<0.001****	**0.79**
OHIP-CRO5						
Difficulty chewing	2.67±1.23	1.57±1.33	1.10±1.44	-3.35	0.001**	0.89
Painful aching	0.53±1.04	0.17±0.38	0.37±0.89	-2.31	0.021*	0.35
Uncomfortable about appearance	2.60±1.40	0.87±1.17	1.73±1.55	-4.10	<0.001**	1.24
Less flavour in food	0.80±1.19	0.40±0.89	0.40±0.81	-2.44	0.015*	0.34
Difficulty doing usual jobs	0.77±1.10	0.20±0.61	0.57±0.94	-2.85	0.004**	0.52
Summary score	**7.37±4.06**	**3.20±3.28**	**4.17±0.74**	**-4.25**	**<0.001****	**1.03**

Legend: * $p<0.05$; ** $p<0.01$; N.S. $p>0.05$

4 DISCUSSION

This study assessed the psychometric properties of the two ultrashort OHIP versions, specifically the OHIP-5 instrument for the Slovenian and Croatian language-speaking populations. The results revealed satisfactory psychometric characteristics for both instruments (OHIP-SVN5 and OHIP-CRO5), which may be used in clinical and research settings to assess OHRQoL and to distinguish between individuals with different levels of perceived oral health. Although other versions of the OHIP instrument already existed in Slovenia and Croatia (15-18), the 5-item OHIP had to be psychometrically validated for both language versions, since it has the least burden for the respondents among the various OHRQoL questionnaires. Internal consistency of the Slovenian and Croatian OHIP-5 instruments was confirmed by the Cronbach's α coefficients >0.7, and the test-retest reliability had excellent ICC values. No significant difference was observed in the two-week period between the completion of the same questionnaire ($p<0.05$).

The factor analysis of the Slovenian and Croatian versions of the OHIP-5 questionnaire showed a one-dimensional model and good factor loadings. In clinical and public health studies, a unidimensional structure simplifies the use of the ultrashort OHIP version, as it allows simple scoring and interpretation. For this reason, the ultrashort 5-item OHIP version has gained increasing popularity worldwide over the past five years. Scree plots also indicated a one-factor solution, as all items loaded onto a single latent factor. The one-dimensional model of the OHIP-5 questionnaire was also determined in other language versions where factor analysis was performed (34, 35, 37).

Concurrent validity was confirmed by significant associations between self-reported oral health, self-reported orofacial aesthetics and the OHIP-SVN5 summary scores, as well as between self-reported oral health and OHIP-5 summary scores in the Croatian population. Both the OHIP-SVN5 and OHIP-CRO5 distinctly and significantly distinguished between different groups with differences in oral health impairment, i.e., between denture wearers and individuals with teeth. It is well-known that individuals wearing dentures have more problems during masticatory function, perceive more pain in function, have more psycho-social problems due to denture instability than individuals with natural teeth (23, 26, 50-54), and even cognitive decline has been attributed to lower chewing forces (55, 56).

Responsiveness to change of the OHIP-5 questionnaires was investigated to find out whether the instrument is sensitive to measuring changes elicited by a treatment. In Slovenian patients whose therapy involved a posterior tooth extraction after unsuccessful endodontic treatment, only the items 'Difficulty chewing', 'Painful aching', and 'Difficulty doing usual jobs' decreased, as well as the OHIP-5 summary score, indicating less impaired oral health after the treatment. The effect size of the treatment of 0.78 was medium (almost large). However, orofacial appearance did not change significantly after tooth extractions, as all were done in the posterior regions. Additionally, the item 'Less flavour in food' did not change significantly, which was an expected result following such treatment. In Croatia, the scores of all OHIP-5 items and the summary score were significantly reduced after treatment, indicating improvement in OHRQoL one month

after the delivery of new complete dentures, with a large treatment effect size. The improvement observed reflects an intra-individual change, that is, a patient's OHRQoL improves after receiving new dentures. This does not contradict our previous assumption that, on an inter-individual level, people with complete dentures generally report poorer OHRQoL compared to those with natural teeth. All listed results indicated that the OHIP-5 questionnaire, although one-dimensional, is consistent with the four-dimensional model of oral health, similar to other ultrashort OHIP versions (34, 35, 37, 57).

This study also has some limitations that should be acknowledged. The test-retest reliability was assessed in student subsamples, which may limit the generalisability of our reliability findings to the broader adult population. In addition, although our patient samples provided valuable insights into the responsiveness of the two validated OHIP-5 language versions in patients with oral health problems, they may not fully represent the general population in terms of sociodemographic and health-related characteristics. Future studies could address these aspects by including more diverse study samples and by establishing normative values for the OHIP-SVN5 and OHIP-CRO5.

5 CONCLUSION

The results of this study revealed good psychometric properties for both the Slovenian and Croatian ultrashort OHIP versions (i.e., the OHIP-SVN5 and OHIP-CRO5), with minimal burden on the respondents. This contributes to the international alignment of OHRQoL measurement by supporting the use of a standardised, cross-culturally adapted OHIP-5 instrument in Slovenian and Croatian populations. The one-dimensional structures of both language versions are similar to other ultrashort OHIP versions, consisting of five items.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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ETHICAL APPROVAL

The institutional ethics committees in Slovenia and Croatia approved the study under reference numbers 0120-219/2017-3 and 05-PA-26-6/2015, respectively.

INFORMED CONSENT

Written informed consent was obtained from all individual participants included in the study.

AVAILABILITY OF DATA AND MATERIALS

Yes, upon reasonable request.

AI USAGE STATEMENT

The authors used the software Grammarly to check for grammatical errors.

PREPRINT STATEMENT

There is no preprint of this manuscript.

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Erratum to Mlakar-Mastnak D, Blaž Kovač M, Terčelj M, Uhan S, Majdič N, Rotovnik Kozjek N. Effectiveness of nutritional intervention led by clinical dietitian in patients at risk of malnutrition at the primary healthcare level in Slovenia - evaluation study. Zdr Varst. 2024;63(2):81-88. doi: 10.2478/sjph-2024-0012

The authors regret that there was an error in the third column of Table 4 published in the final version of the article 10.2478/sjph-2024-0012. The correct Table 4 is provided below.

Table 4. Comparison of changes in nutritional status, nutritional intake and functional status in a subgroup of patients with MUST≥1 (n=77).

Nutritional status values	1st assessment	2nd assessment	3rd assessment	4th assessment	Improvement (p value*)
BM (kg)	60.9 (56.50) [14.9] (39.1, 100.0)	62.1 (57.0) [15.5] (38.0, 100.0)	63.3 (59.0) [15.4] (39.5, 102.3)	64.0 (60.0) [15.3] (40.0, 103.7)	<0.001
BMI (kg/m^2)	22.0 (20.7) [4.9] (14.5, 41.1)	22.4 (21.1) [4.9] (14.1, 41.1)	22.8 (21.3) [4.8] (14.1, 39.0)	23.1 (21.9) [4.7] (14.3, 39.0)	<0.001
FFM (kg)	41.5 (38.6) [11.4] (19.8, 73.0)	42.0 (38.9) [11.5] (17.1, 73.0)	42.7 (39.7) [11.8] (20.2, 77.2)	42.8 (39.2) [11.7] (20.4, 76.1)	<0.001
FFMI (kg/m^2)	14.8 (14.5) [3.0] (9.2, 22.5)	15.0 (14.5) [3.0] (7.9, 22.5)	15.3 (14.8) [3.0] (7.9, 23.8)	15.3 (14.8) [3.0] (8.1, 23.5)	<0.001
Nutritional intake					
Energy (kcal/kg TM)	20.7 (20.3) [7.6] (5.6, 41.0)	27.0 (26.7) [8.7] (10.9, 53.3)	28.1 (28.7) [7.7] (3.1, 46.7)	30.3 (30.0) [7.1] (13.3, 53.3)	<0.001
Energy (kcal/d)	1217 (1121) [415] (369, 2339)	1598 (1577) [403] (591, 2659)	1722 (1744) [438] (155, 3176)	1876 (1945) [377] (850, 2749)	<0.001
Protein (g/kg TM)	0.9 (0.9) [0.4] (0.1, 2.3)	1.2 (1.2) [0.4] (0.4, 2.2)	1.3 (1.3) [0.4] (0.3, 2.6)	1.4 (1.4) [0.4] (0.5, 2.5)	<0.001
Functional status					
PA (°)	4.7 (4.7) [1.0] (2.4, 7.6)	4.9 (4.9) [1.0] (2.5, 7.8)	5.0 (4.9) [1.0] (2.5, 8.8)	5.0 (4.9) [0.9] (2.8, 7.5)	<0.001
Grip strength (kg)	24 (23) [11] (1, 62)	26 (24) [12] (1, 59)	26 (24) [12] (1, 64)	26 (24) [12] (1, 64)	0.080

Note: Values are mean (median) [SD] (minimum-maximum). *Wilcoxon signed rank test.
Legend: BM=Body Mass, BMI=Body Mass Index, FFM=Fat-Free Mass, FFMI=Fat-Free Mass Index, TM=Total Body Mass, kcal/kg TM=energy intake per kilogram of total body mass, kcal/d=daily energy intake, g/kg TM=daily protein intake per kilogram of total mass, PA=Phase Angle

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Slovenian Journal of Public Health (SJPH)
ISSN 1854-2476 (electronic edition)

SLOVENIAN JOURNAL OF PUBLIC HEALTH INSTRUCTIONS FOR AUTHORS

June 2025

These instructions are in accordance with the ICMJE recommendations for the conduct, reporting, editing and publication of scholarly work in medical journals. Complete instructions can be found in the following PDF: http://www.icmje.org/icmje-recommendations.pdf.

SHORT DESCRIPTION OF THE SLOVENIAN JOURNAL OF PUBLIC HEALTH

The Slovenian Journal of Public Health has been published since 1962 by the National Institute of Public Health in Slovenia. Since 2003, the journal has been a peer-reviewed scientific journal with English abstracts, and since 2014, an international scientific public health journal in English only. The journal's mission is to promote new achievements in the broad field of public health in Slovenia and Central and South-East Europe. The Slovenian Journal of Public Health publishes internationally oriented articles and encourages an interdisciplinary approach to public health. The journal is a source for exchanging new public health concepts and solutions among researchers. The journal mainly publishes original scientific articles, and on occasion also systematic reviews, methodological articles, and invited editorials. It is published four times a year, with up to 35 articles each year, and has an average annual rejection rate of around 80%. The journal is indexed in major international databases, such as PubMed, Web of Science, and Scopus, and has had an impact factor since 2011, ranging from 0.16 to 2.4. As an open-access journal it is available online on De Gruyter, Sciendo https://sciendo.com/journal/SJPH.

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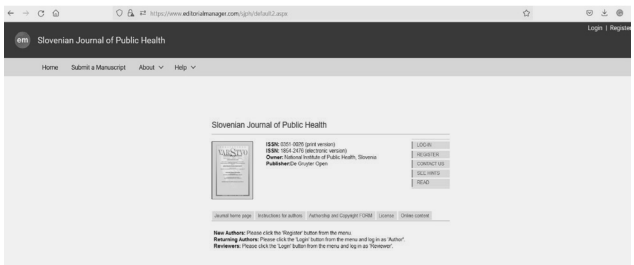

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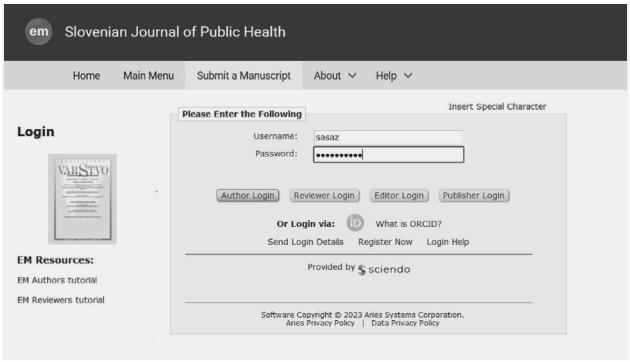

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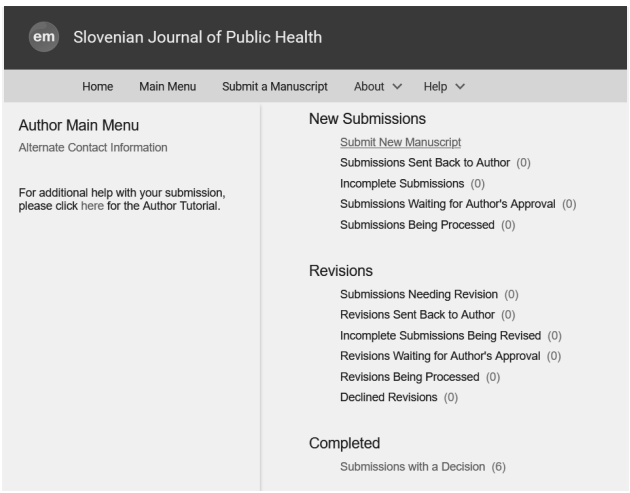

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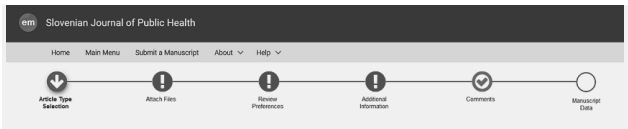

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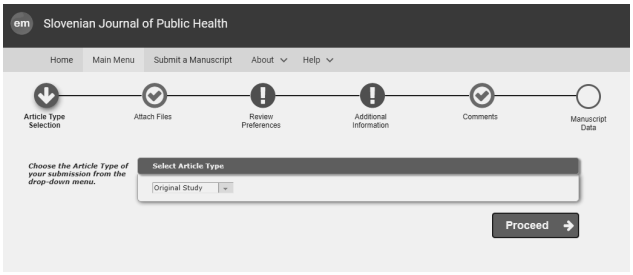

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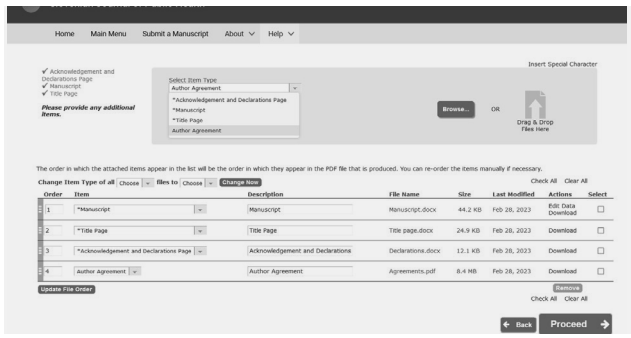

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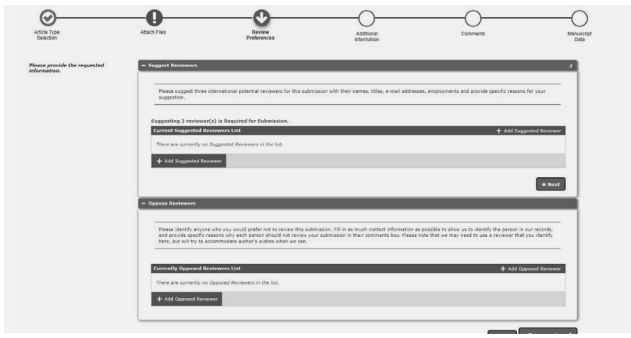

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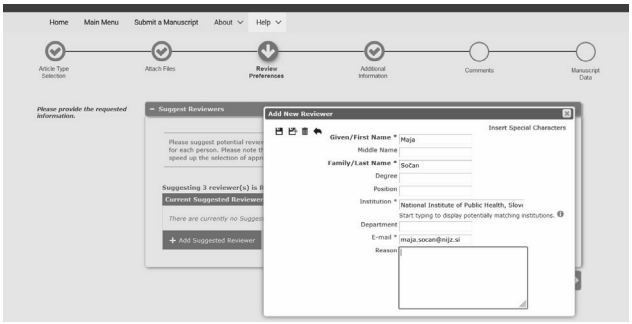

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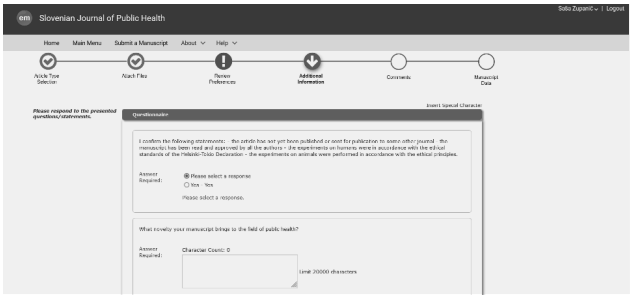

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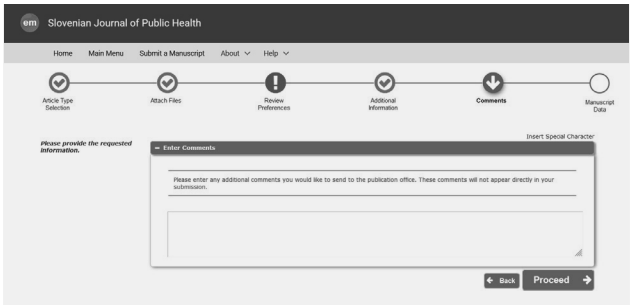

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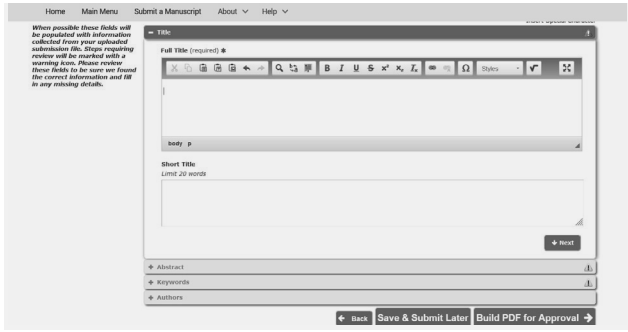

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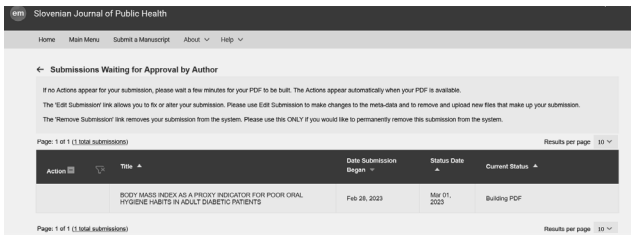

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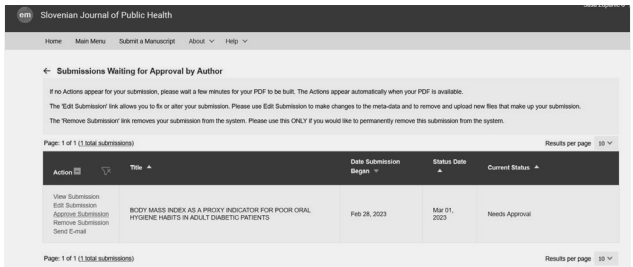

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>
> Kaplan SJ. Post-hospital home health care: the elderly's access and utilization [dissertation]. St. Louis (MO): Washington University; 1995.

Book chapter

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Website

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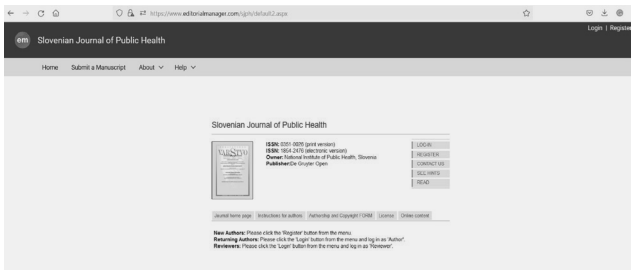
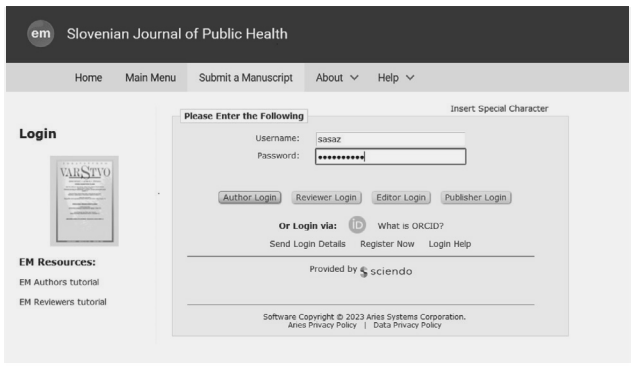
Rokopise oddajte v elektronski obliki v spletno uredniško aplikacijo Editorial Manager (EM), ki se nahaja na spletnem naslovu http://www.editorialmanager.com/sjph/.



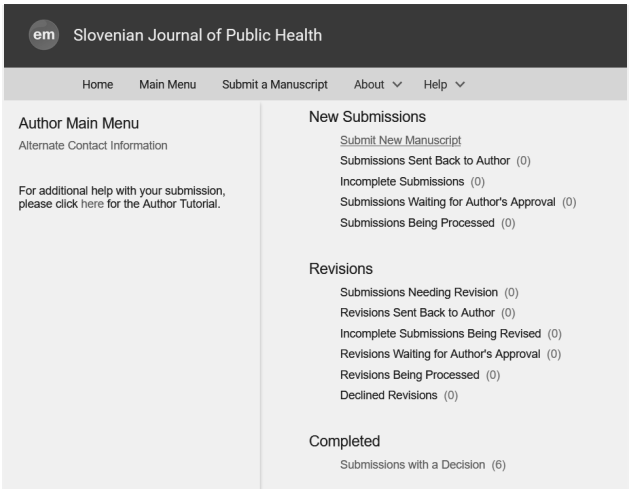
PRIJAVA V EM SISTEM

V uredniško aplikacijo se prijavite kot avtor (Author Login). Prva prijava – registracija zahteva vnos podatkov o avtorju, vse nadaljnje prijave pa le še vnos podatkov za prijavo, ki jih na svoj elektronski naslov prejmete po prvi prijavi v sistem.



ODDAJA NOVEGA ROKOPISA

Po uspešni prijavi se pojavi ta meni. Za oddajo novega rokopisa kliknete na Submit New Manuscript.



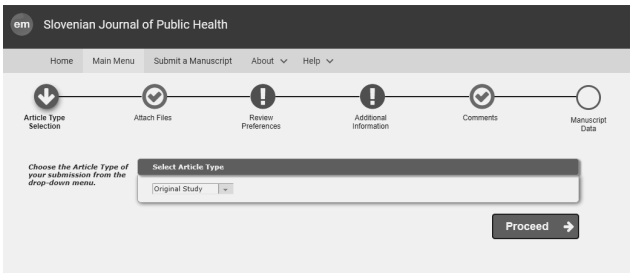
VNOS PODATKOV

Oddaja rokopisa zahteva zaporeden vnos več podatkov, ki si jih bomo ogledali v nadaljevanju: Article Type Selection, Attach Files, Review Preferences, Additional Information, Comments in Manuscript Data.

KATEGORIJA ROKOPISA (Article Type Selection)

Kategorijo rokopisa določite z izborom vrste rokopisa.

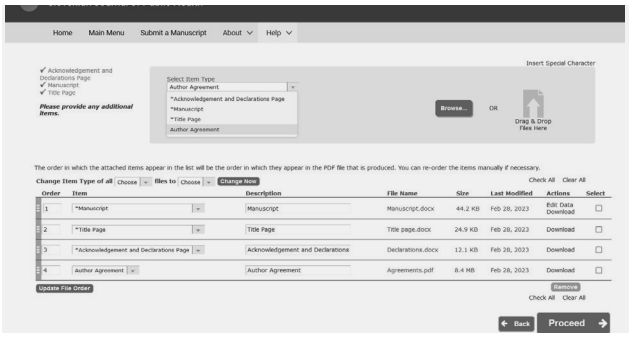
Objavljamo izvirne znanstvene članke in metodološke članke (izberete Original Study), sistematične pregledne znanstvene članke (izberete Systematic Review) in vabljene uvodnike (izberete Invited Editorial). Po izboru kliknete na gumb Proceed.



PRIPONKE (Attach Files)

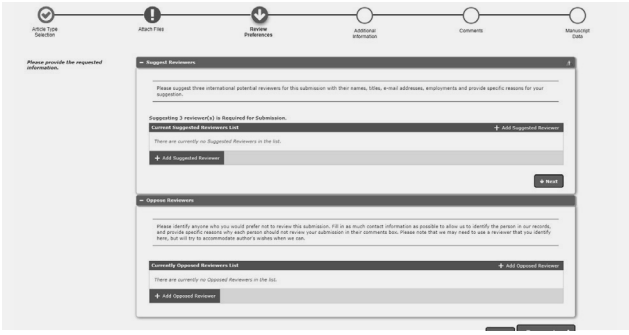
Sledi vnos priponk: rokopisa, naslovne strani, izjav z morebitno zahvalo in avtorskih pogodb. Obvezno oddate tri Wordove priponke: Manuscript, Title Page, Acknowledgement and Declaration Page. Podpisane pogodbe Authorship and Copyright Transfer Agreements za vse soavtorje združite v en PDF dokument. Oddaja v tej fazi je zaželena, a ni obvezna. Podpisane pogodbe so pogoj za objavo članka. V uredništvo jih lahko oddate tudi naknadno po sprejemu članka v objavo po e-pošti zdrav.var@nijz.si.

S klikom na gumb Browse vstopite v svoj računalnik in naložite rokopis. Enako naredite za naslovno stran, izjave z morebitno zahvalo in avtorske pogodbe. Nato kliknite na gumb Proceed.

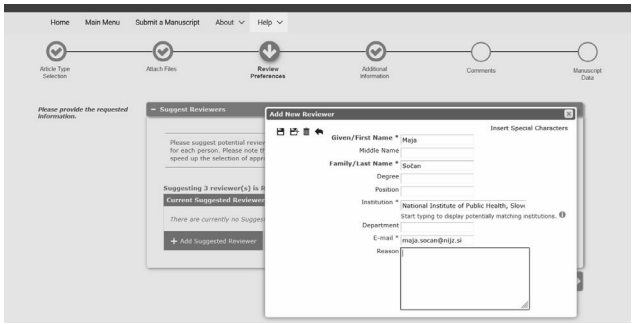


RECENZENTI (Review Preferences)

Vnesite prosim predlog treh mednarodno priznanih recenzentov. Pribeležite lahko tudi do dva neželena recenzenta.

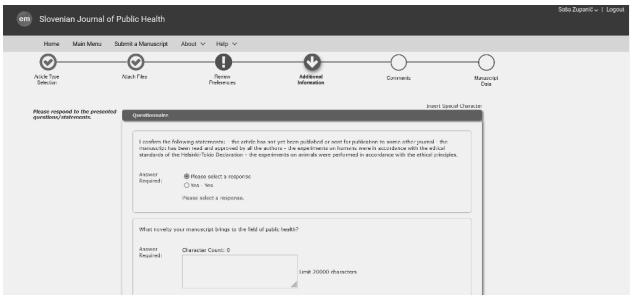


Nujni podatki so ime, priimek, zaposlitev in e-naslov. Razlog za izbor je zaželen podatek.



DODATNE INFORMACIJE (Additional Information)

Ta del je namenjen potrditvi dodatnih izjav avtorjev in opisu novosti vašega rokopisa.

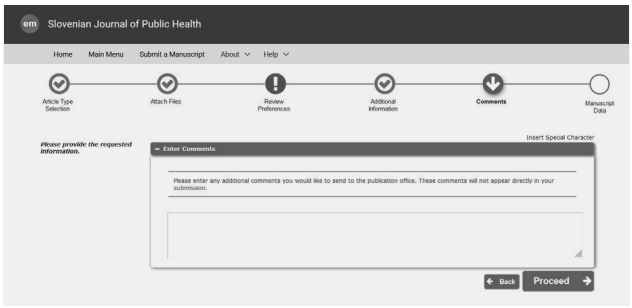


Potrdite izjavo, da vaš prispevek še ni bil objavljen ali poslan v objavo kakšni drugi reviji, da so prispevek prebrali in se z njim strinjajo vsi soavtorji, in da so raziskave na ljudeh oz. živalih opravljene v skladu z načeli Helsinško-Tokijske deklaracije oz. v skladu z etičnimi načeli.

V drugo okno zapišite novosti, ki jih vaš rokopis prinaša področju javnega zdravja.

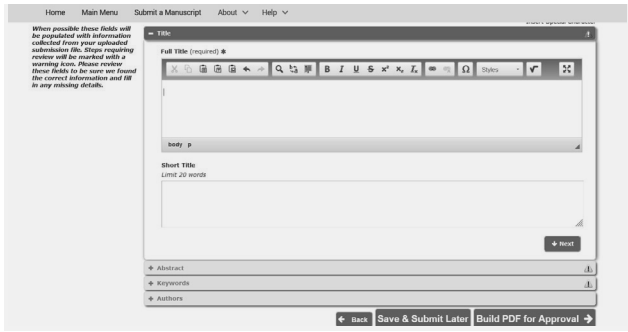
KOMENTARJI (Comments)

Polje Comments je namenjeno vnosu komentarjev, ki bi jih avtorji želeli dodatno posredovati uredništvu revije.



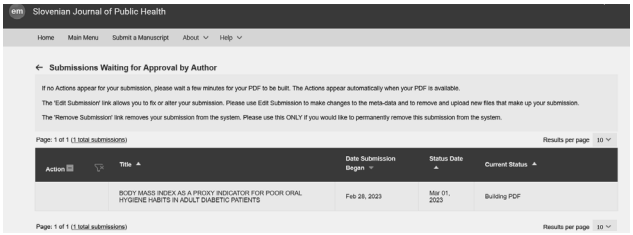
METAPODATKI (Manuscript Data)

Metapodatki so naslov, izvleček, ključne besede in avtorstvo. Naslov, izvleček in ključne besede se oddajajo dvojezično v angleščini in v slovenščini (ne velja za tuje avtorje) v strukturirana polja. Posebno polje za zapis v drugem jeziku obstaja le za izvleček, preostale podatke vnesite v obeh jezikih v ustrezno isto polje v drugo vrstico. Prvi izvleček je vselej v angleškem jeziku (do 250 besed - sistem vam besede sproti šteje), drugi pa v slovenskem jeziku (razširjen izvleček - do 400 besed). Zapišite še 4 do 6 ključnih besed v množini in v obeh jezikih; če se le da, naj bodo usklajene s tezavrom MeSH. Podatke o avtorju in soavtorjih vnesite kar se da natančno in popolno. Naveden naj bo korespondenčni avtor (s polnim naslovom, telefonsko številko in elektronskim naslovom), ki bo skrbel za komunikacijo z uredništvom in ostalimi avtorji.

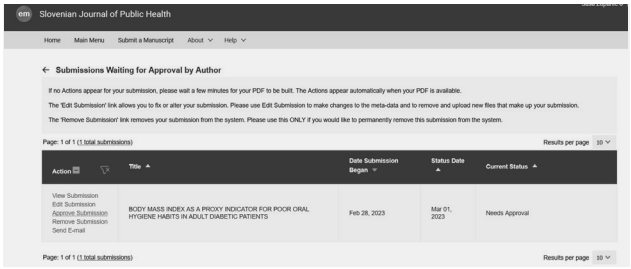


PDF ROKOPISA

Zadnji korak pri oddaji rokopisa je izgradnja PDF rokopisa.



Postopek malo traja, zato počakajte, da sistem PDF zgradi, PDF odprite, preglejte in potrdite s klikom na gumb Approve Submission.



Tako ste rokopis oddali v uredništvo, sledi uredniški postopek. Hvala, da ste za oddajo svojega rokopisa izbrali revijo Zdravstveno varstvo. V primeru težav se prosim obrnite na uredništvo.

NATANČEN OPIS ZAHTEV ZA VSE PRIPONKE

ROKOPIS

Jezik rokopisa je angleščina. Ime datoteke z rokopisom ne sme zajemati avtorjevih osebnih podatkov, prav tako ne imen ustanov, vključenih v pripravo rokopisa. Besedila naj bodo napisana z urejevalnikom besedil Word for Windows. Robovi naj bodo široki 25 mm, izberite črke Ariel in velikost črk 12. V Wordu uporabite možnost Postavitev strani/Številke vrstic/Zaporedno (tako bo na robu vsake vrstice rokopisa dodana številka vrstice, na katero se lahko referirajo recenzenti pri pisanju recenzij).

Rokopis naj ima naslednja poglavja: uvod, metode, rezultati, razprava, zaključek in reference. Vabljeni uvodniki so lahko zasnovani drugače, vendar naj bo razdelitev na poglavja in podpoglavja jasno razvidna iz odebelitve črk v naslovih. Poglavja in podpoglavja naj bodo številčena dekadno po standardu SIST ISO 2145 in SIST ISO 690 (npr. 1, 1.1, 1.1.1 itd.).

Kraticam in okrajšavam se izogibajte, izjema so mednarodno veljavne oznake merskih enot. Na mestu, kjer se kratica prvič pojavi v besedilu, naj bo izraz, ki ga nadomešča, polno izpisan, v nadaljnjem besedilu uporabljano kratico navajajte v oklepaju.

Grafično in slikovno gradivo vključite v besedilo na mesto, kamor le-to sodi in ga opremite z naslovi in legendami, v katerih pojasnite okrajšave. Uporabite črno-bele prikaze, ozadje naj bo vselej belo. Črke, številke ali simboli na slikah naj bodo jasni, enotni in dovolj veliki, da so berljivi tudi na pomanjšanem prikazu.

Merske enote naj bodo v skladu z mednarodnim sistemom enot (SI).

Zahtevana dolžina rokopisa je za vabljeni uvodnik od 250 do 2000 besed, za ostale vrste rokopisov pa od 2000 do 4500 besed s slikovnim gradivom in literaturo vred. Revizija sme obsegati 5000 besed.

Reference: Zdravstveno varstvo uporablja Vancouverski numerični stil citiranja in navajanja literature, ki je v biomedicini splošno v uporabi. Urejeni citati si v seznamu literature na koncu rokopisa sledijo zaporedno, kot so zapisani v besedilu rokopisa. V to zaporedje vključite tudi citate, ki se pojavljajo v tabelah, njihovih legendah ali v slikovnem gradivu. Za citiranje in navajanje literature ne uporabljajte opomb pod črto. Izogibajte se citiranju osebnih pogovorov, neobjavljenih podatkov in rokopisov, ki so v uredniškem postopku.

Citiranje v besedilu: Vsako navajanje trditev ali dognanj drugih avtorjev morate podpreti s citatom. Številka reference naj bo navedena v običajni velikosti na koncu citirane trditve v okroglih oklepajih. Uporbljajte arabske številke, navedete lahko tudi stran citata:

> Adam et al. state that the data is 'unreliable' (1, p. 122).
> This argument is increasingly relevant to the topic (2, 3) …
> Several studies (1, 4-8, 12) …

Seznam literature: Numerično urejen seznam literature poimenujte z besedo "References" in ga postavite na konec rokopisa. Avtorje beležite s priimkom in kraticami imena, med posameznimi avtorji postavite vejico.

Navedite imena vseh avtorjev; v primeru, da je avtorjev šest ali več, navedite prvih šest avtorjev in dodajte kratico et al. Naslov in podnaslov pišite z malimi začetnicami z izjemo prve besede in lastnih imen. Uporabljajte običajno pisavo in se izogibajte ležeči pisavi ali zapisu v navednicah. Naslove revij krajšajte tako kot baza Medline/PubMed. Popoln seznam kratic revij najdete na naslovu National Library of Medicine's List of Journals Indexed for Medline. Naslovov revij, katerih kratic v seznamu ni, ne krajšajte. Če ima objava DOI številko, jo navedite na koncu reference. Primeri navajanja najbolj pogosto uporabljanih vrst objav:

Članek v reviji

> Vodička S, Zelko E. Remote consultations in general practice: A systematic review. Zdr Varst. 2022 Sep 28;61(4):224-230. doi: 10.2478/sjph-2022-0030.
>
> de Villiers TJ. The role of menopausal hormone therapy in the management of osteoporosis. Climacteric. 2015;18 Suppl 2:19-21. doi: 10.3109/13697137.2015.1099806.

Knjiga

> Wilkinson IB, Raine T, Wiles K, Goodhart A, Hall C, O'Neill H, et al. Oxford handbook of clinical medicine. 10th ed. Oxford: Oxford University Press; 2017. 123 p.
>
> Kaplan SJ. Post-hospital home health care: the elderly's access and utilization [dissertation]. St. Louis (MO): Washington University; 1995.

Poglavje v knjigi

> Goldberg BW. Population-based health care. In: Taylor RB, Robin S, editors. Family medicine. 5th ed. Cambridge: Cambridge University Press; 1999. p. 32-36.

Spletna stran

> Cancer Research UK. Current research into breast cancer [Internet]. 2020 [cited 2022 Dec 14]. Available from: https://www.cancerresearchuk.org/our-research/our-research-by-cancer-type/our-research-into-breast-cancer/current-breast-cancer-research
>
> McNeil DG. Vaccines against HIV, malaria and tuberculosis unlikely, study says. New York Times. 2018 Sep 7. [cited 2018 Nov 14]. Available from: https://www.nytimes.com/2018/09/07/health/vaccines-hiv-malaria-tuberculosis.html

Primere navajanja redkeje uporabljanih vrst objav lahko najdete na spletni strani NLM knjižnice. Uredništvo pred objavo članka v reviji Zdravstveno varstvo seznam literature pregleda in ga po potrebi popravi v skladu z navodili. Za navajanje literature lahko uporabljate urejevalnike referenc, pri čemer izberete Vancouverski stil citiranja. Avtorjem priporočamo, da ob pripravi rokopisa pregledajo slovensko literaturo na temo svojega rokopisa, objavljeno v obdobju zadnjih petih let.

NASLOVNA STRAN

Naslovna stran naj zajema sledeče podatke: title / naslov, avtorji, zaposlitve, ORCID številke avtorjev, e-poštni naslov korespondenčnega avtorja, abstract / izvleček, keywords / ključne besede.

Naslov v angleškem in slovenskem jeziku naj bo informativen in natančen, opisen in ne trdilen (povedi v naslovih niso dopustne). V naslovu naj ne bo kratic.

Imena avtorjev naj bodo navedena v želenem zaporedju, dodani naj bodo popolni naslovi ustanov, kjer so avtorji zaposleni. Avtorji morajo izpolnjevati pogoje za avtorstvo. Prispevati morajo k zasnovi in oblikovanju oz. analizi in interpretaciji podatkov, rokopis morajo intelektualno zasnovati in ga kritično pregledati, strinjati se morajo s končno različico rokopisa. Zgolj zbiranje podatkov ne zadostuje za avtorstvo. Deljeno prvo avtorstvo je dovoljeno za največ dva avtorja. Dopišite ORCID številke avtorjev in e-poštni naslov korespondenčnega avtorja.

Izvleček v angleškem in slovenskem jeziku naj bo strukturiran v IMRC strukturi in naj ne bo daljši od 250 besed v angleščini in 400 besed v slovenščini. Izvleček pri vabljenih uvodnikih je lahko nestrukturiran. Izvleček naj vsebinsko povzema in ne le našteva bistvene vsebine rokopisa. Napisan naj bo v 3. osebi. Izogibajte se kraticam in okrajšavam.

Navedenih naj bo med 3 in 6 ključnih besed, ki bodo v pomoč pri indeksiranju.

ZAHVALA IN IZJAVE

Zahvala se naj nahaja na prvem mestu v dokumentu. Vsebuje naj zahvalo vsem sodelujočim pri rokopisu, ki niso prejeli avtorstva rokopisa.

Dokument naj nato zajema še sledeče izjave:

CONFLICTS OF INTEREST

(The authors declare that no conflicts of interest exist.)

FUNDING

(The study was financed by ...)

ETHICAL APPROVAL

(Received from the… ali opis etičnega vidika raziskave)

INFORMED CONSENT

(Written informed consent was obtained from all individual participants included in the study. The study was conducted in accordance with the Declaration of Helsinki.)

AVAILABILITY OF DATA AND MATERIALS

(All data and materials used in this study were collected from publicly available sources and are available upon reasonable request.
ali
Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.)

AI USAGE STATEMENT

(V AI izjavi morajo avtorji obvezno navesti morebitno uporabo generativnih jezikovnih modelov (kot je ChatGTP) za izboljšanje jezika in berljivosti rokopisa. Primer: During the preparation of this work the author(s) used [NAME TOOL /SERVICE] in order to [REASON]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.)

PREPRINT STATEMENT

Shranjevanje preprintov v priznanih repozitorijih preprintov, kot so bioRxiv, medRxiv in drugi akademski repozitoriji preprintov, je dovoljeno pred oddajo rokopisa v SJPH, vendar ne smejo biti objavljeni ali oddani v postopek še kje drugje.
Avtorji morajo v Izjavi o preprintih navesti obstoj preprinta. Navedite ime strežnika preprintov in DOI ali URL preprinta. Primer: The preprint has been deposited in a preprint server Research Square, and is available from https://www.researchsquare.com/article/rs-2351315/v2.
Priporočljivo je tudi citirati preprint v seznamu referenc.
Za SJPH javni komentarji o preprintih niso sprejemljivi kot recenzije.
Po sprejemu rokopisa v objavo v naši reviji in pred samo objavo morajo avtorji povezati preprint s sprejetim člankom z DOI številko.
Priporočljivo je, da avtorji citirajo končno objavljeno različico dela, ne preprinta.

Raziskave na ljudeh (vključno s človeškimi materiali in osebnimi podatki) morajo biti izpeljane v skladu s Helsinško deklaracijo in potrjene s strani nacionalne etične komisije. V izjavi o etiki morajo avtorji podati izjavo o etiki raziskav na ljudeh, ki mora vsebovati ime etične komisije in referenčno številko obravnave. Poročanje o raziskavah na ljudeh brez potrdila etične komisije zahteva dodatno razlago v poglavju o metodah dela. Na zahtevo Uredništva je avtor dolžan predložiti vso dokumentacijo o obravnavi raziskovalne etike njegovega rokopisa. Uredništvo si pridržuje pravico, da kontaktira etično komisijo.

Prav tako morajo avtorji, ki poročajo o ljudeh ali posredujejo javnosti njihovo slikovno gradivo, pridobiti dovoljenja vseh sodelujočih, da se z vključitvijo v raziskavo strinjajo (v primeru otrok so to starši ali skrbniki). Izjavo o pridobitvi teh dovoljenj morajo avtorji podati v poglavju o metodah dela. Uredništvo si pridržuje pravico vpogleda v to dokumentacijo.

Raziskave na živalih morajo biti izpeljane v skladu z navodili “Animal Research: Reporting in Vivo Experiments”-(ARRIVE) in potrjene s strani nacionalne etične komisije. V poglavju o metodah dela in med izjavami morajo avtorji podati izjavo o etiki raziskav na živalih z veljavno številko dovoljenja.

V izjavah morajo biti zapisani morebitni finančni ali drugi interesi farmacevtske industrije ali proizvajalcev opreme ter inštitucij, povezanih z rokopisom.

Primere priponk najdete na spletni strani revije.

UREDNIŠKO DELO

Vse prejete rokopise uredništvo najprej pregleda glede skladnosti s področjem revije (javnozdravstvene vsebine iz Srednje in JV Evrope) in tehnične ustreznosti. Preveri tudi plagiatorstvo z orodjem Crossref iThenticate. Če je ugotovljeno plagiatorstvo v rezultatih, je rokopis izključen iz uredniškega postopka, sicer imajo avtorji možnost predelave. Indeks podobnosti brez referenc ne sme presegati 20 %.

Rokopisi z mednarodno ali pomembno regionalno javnozdravstveno tematiko so predani v presojo dvema urednikoma. Rokopisi, ki izpolnjujejo znanstvene in etične standarde, so nato vključeni v recenzentski postopek.

Revija uporablja dvojno slepi recenzentski postopek. Vsak rokopis pošljemo trem neodvisnim mednarodno uveljavljenim recenzentom, od katerih mora biti vsaj eden iz tujine. Recenzente izberemo na podlagi strokovnosti in odsotnosti nasprotja interesov z avtorji ali raziskavo. Avtorji morajo ob oddaji rokopisa predlagati 3 recenzente, dodajo lahko še 2 neželena recenzenta. Uredniki (člani uredniškega odbora), se odločijo, ali bodo povabili koga od predlaganih recenzentov.

Urednik lahko sodeluje kot recenzent le, kadar je njegovo specifično strokovno znanje ustrezno in ni mogoče zagotoviti treh zunanjih recenzij dlje časa. V takih primerih odgovorni urednik zagotovi, da ni nasprotja interesov in da urednik, član uredniškega odbora, ni vključen v končno odločitev o rokopisu.

Uredniški postopek je neodvisen, zaupen in poteka v skladu z najvišjimi etičnimi standardi ter smernicami ICMJE in COPE. Vsi rokopisi so obravnavani nepristransko, ne glede na institucijo ali državo izvora avtorjev.
Časovni okvirji recenzentskega postopka:

Recenzenti imajo za pripravo recenzije 28 dni časa.

Prva uredniška odločitev je avtorjem geografsko neustreznih rokopisov sporočena v roku nekaj dni. Čas od oddaje rokopisa do prve uredniške odločitve pri rokopisih, ki gredo skozi recenzentski postopek, je običajno okoli 3 mesece, čas do končne uredniške odločitve (vključno z revizijami) pa med 5 in 6 mesecev.

Avtorji morajo prvo popravljeno verzijo oddati v 2 mesecih, vse naslednje revizije pa v roku enega meseca. V kolikor se mudi s pripravo nove številke revije, lahko uredništvo te roke skrajša.

Dovoljene so največ tri revizije. Če tudi po tretji reviziji vse pripombe niso upoštevane, je rokopis zavrnjen.

Po sprejemu rokopisa sledi jezikovni pregled angleškega in slovenskega jezika. Avtorji prejmejo krtačne odtise vzgolj za popravke tipkarskih napak, ki jih morajo vrniti v treh dneh.

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Za vsa vprašanja ali težave pri oddaji rokopisa pišite na zdrav.var@nijz.si. Glavna kontaktna oseba je Saša Zupanič, izvršna urednica.

Pripravila Saša Zupanič, izvršna urednica

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