COVID-19 vaccination knowledge, attitudes and practices among residents of Bosnia and Herzegovina during the third wave of COVID-19 outbreak

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Abstract

Background. *Bosnia and Herzegovina hasn't still developed and started any vaccination programs to contain the current COVID-19 outbreak and prevent further spreading and death from this disease. The aim of this study was to assess current knowledge, attitudes and practices towards COVID-19 vaccination during the third wave of the outbreak when the healthcare system is facing a collapse and to create a paradigm for developing vaccination programs in the country.*

Methods. *This cross-sectional study was conducted by an anonymous online questionnaire based on a Congo study and Center for Disease Control and Prevention facts regarding COVID-19 vaccination during the third wave of the COVID-19 outbreak in the country.*

Results. *In total, 570 subjects, mostly female 474 (83.1%), with a high school degree or lower 230 (40.3%), married 305 (53.5%), engaged in intellectual labor 302 (53.0%), from urban environment 531 (93.1%) and with a mean age of 35.28±11.35, were included in the study. The mean COVID-19 vaccination knowledge test score was 11.29±1.91. Being single (OR= 1.88, 95% 1.20-2.94) or in a relationship (OR=1.87, 95% 1.12-3.11), being engaged in intellectual labor (OR=1.59, 95% CI 1.06-2.37) and having a Master's degree or higher (OR=1.65, 95% CI 1.10-2.46) were associated with higher knowledge test scores. Only 264 (46.3%) subjects agreed that COVID-19 vaccination programs will prevail in a battle versus COVID-19 and only 36 (6.3%) were currently vaccinated against COVID-19. Higher knowledge regarding COVID-19 and its vaccination was determined as an independent predictor for vaccinating itself against COVID-19 (OR=23.09, 95% CI 11.94-44.68), as well as respecting socio-epidemiological measures such as avoidance of crowded places (OR=2.07, 95% CI 1.28-3.35) and wearing face mask (OR=6.95, 95% CI 2.07-23.29).*

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Conclusions. Our study shows that Bosnia and Herzegovina population has poor knowledge, relatively pessimistic attitudes and a very low vaccinal rate against COVID-19 during the third wave of the outbreak which promotes COVID-19 vaccination hesitancy and further COVID-19 spreading and death toll. By activating proper socioepidemiological measures and educating population about COVID-19 and COVID-19 vaccination, as well as vaccination against COVID-19, the current situation could be changed.

Introduction

Coronavirus disease 2019 (COVID-19) caused by the newly discovered β-coronavirus named Sars-CoV-2 (1) is a highly infectious disease whose spread is primarily airborne via respiratory droplets when a symptomatic or an asymptomatic (2) infected person sneezes or coughs (3). After the median incubation period of 5.1 days (4), COVID-19 usually presents with anosmia, dysgeusia (5), fever, sore throat, cough, dyspnea, headache, abdominal pain and diarrhea (6). Severe COVID-19 can lead to development of acute respiratory syndrome (ARDS), septic shock, metabolic acidosis, coagulation dysfunction, multiorgan failure or even death (7, 8).

The first case of COVID-19 in Bosnia and Herzegovina was on March 5th 2020 (9), after which uncompromising epidemiological restrictions such as forbidding social gatherings, limiting population movement through the country, mandatory 10-day isolation for people who have COVID-19 symptoms or have been in contact with positive cases, police and healthcare monitoring of COVID-19 suspect cases, mandatory wearing of mask and reducing working hours for various services have been undertaken to minimize COVID-19 transmission and death toll in the country (10, 11). After one year from the first COVID-19 case, and the development of various vaccines versus COVID-19, the country hasn't developed and started yet any vaccinal program to contain the current outbreak and prevent further spreading and death from COVID-19. We feel that current people's adherence to control measures, such as wearing face masks while being outside of their home, regular washing and disinfection of hands, avoiding social gathering and performing rapid and mass vaccination, will assure the final success versus COVID-19. These actions are affected by populations knowledge, attitudes and practices (KAP) towards the COVID-19 and vaccination programs against this disease. KAP studies provide necessary information needed to change current misconceptions regarding COVID-19 vaccination and thus intervene in these times to improve knowledge regarding COVID-19 vaccines, minimize vaccination hesitancy and avoidance, and help development of vaccination programs and strategies in order to finally contain the disease (12, 13).

The aim of this paper is to present KAP towards COVID-19 vaccination during the third wave from the beginning of the outbreak in Bosnia and Herzegovina, when the spreading of COVID-19 in uncontrolled and the country is facing an Italian-like COVID-19 scenario, with high morbidity and high mortality during the beginning of the pandemic (14). If current knowledge, attitudes and appropriate behaviors will promptly change, the situation could promptly come back under control. The findings of this study are expected to appeal and provide useful information to policymakers at these challenging times.

Methods

Subjects

This observational cross-sectional study was conducted between March 8th and 12th 2021, during the third wave of COVID-19 outbreak in Bosnia and Herzegovina, among the general population of Canton Sarajevo. Subjects completed an anonymous online questionnaire based on a Congo study (15) and Center for Disease Control and Prevention facts regarding vaccination (16) which was translated to B/C/S language and distributed via online social media platforms using the Google forms survey administration app. The questionnaire and the study were validated and approved in advance by the University Bioethical Committee (0101-2364/21). Convenience sampling method was used and the minimum sample size calculated by Cochran formula for the population of Canton Sarajevo was 384 subjects (z=384, 95% CI, E=5%). The respondents were informed about the objectives of the study, their voluntary participation, about the online informed consent and details on how to fill up the questionnaire. Exclusion criteria were (i) being younger then 18 years and (ii) not being a citizen of Bosnia and Herzegovina.

Study instruments

The survey questionnaire, which took approximately 3-5 minutes to complete, was divided into two sections: (i) demographic profile and (ii) KAP questions towards COVID-19 vaccination. The demographic profile of the sample included gender, age, marital status, education level, current profession, place of residence, COVID-19 history such as testing, symptoms and being COVID-19 infected. The second section of the questionnaire consisted of 15 questions regarding knowledge, 2 questions regarding attitudes and 3 current behavior statements regarding practices towards COVID-19 vaccination which is shown in Table 1. The knowledge test score ranged from 0 to 15, with higher score indicating better knowledge of COVID-19 vaccination. Questions in the knowledge test assessed COVID-19 clinical presentation, transmission route and current therapeutic options (K1-K4), vaccination avoidance reasons (K5-K8), possible COVID-19 vaccine safety issues and side effects (K9-K13) and COVID-19 vaccines misconceptions (K14-K15) on which respondents could answer on a true/false basis with an additional "I don't know" option. The internal consistency, Cronbach's alpha coefficient of the knowledge test was 0.851, indicating very good level of reliability. Questions regarding attitudes towards COVID-19 vaccination (A1-A2), were about agreeing that everyone should be vaccinated and the confidence in winning the battle against COVID-19. The 3 behavior statements towards COVID-19 (P1-P3) were about visiting crowded places, wearing face masks and being vaccinated against COVID-19.

Statistical analysis

Collected data were analyzed with the Statistical Package for Social Sciences (SPSS) IBM Statistics v26.0. and presented as simple frequencies and cross tabulations of correct knowledge test answers, various attitudes and behaviors towards COVID-19 vaccination. Overall knowledge test scores, attitudes and practices of the sample in accordance to demographic variables were compared with the independent sample t test and one way analysis of variance (ANOVA) as appropriate. To identify factors associated with knowledge test scores, multiple linear regression analysis was conducted. Binary logistic regression was conducted to investigate independent predictors in association with various attitudes and practices towards COVID-19 vaccination. Multivariable analysis was implemented in order to determine possible confounding variables to prevent bias. Unstandardized

Table 1 - Knowledge, attitudes and practices towards COVID-19 vaccination questionnaire structure

	N	Questions	Answers	Correct answer rate
Knowledge test	**1.**	The main COVID-19 symptoms are fever, fatigue, dry cough, muscle pain, loss of smell and taste, abdominal pain and diarrhea.	True, False, I don't know	89.1%
	2.	COVID-19 is spread airborne via respiratory droplets from the infected individual.	True, False, I don't know	88.0%
	3.	Currently, there is no effective cure for COVID-19, but early symptomatic and supportive treatment can help most of the infected to recover.	True, False, I don't know	48.2%
	4.	Vaccination against COVID-19 is the only effective way to prevent of getting infected.	True, False, I don't know	66.5%
	5.	Patients who currently have antibodies due to previous COVID-19 infection, don't need to be vaccinated.	True, False, I don't know	17.9%
	6.	Patients who had COVID-19 infection, don't need to be vaccinated.	True, False, I don't know	11.0%
	7.	My blood type is less susceptible to COVID-19, so I don't need to be vaccinated.	True, False, I don't know	4.7%
	8.	Patients who are not at risk for severe and critical forms of COVID-19 don't need to be vaccinated.	True, False, I don't know	16.1%
	9.	COVID-19 vaccine is not safe due to the fact that its development was so fast.	True, False, I don't know	33.3%
	10.	Getting the vaccine against COVID-19, makes people more prone for other infections and diseases	True, False, I don't know	7.7%
	11.	COVID-19 vaccines cause infertility.	True, False, I don't know	7.3%
	12.	COVID-19 vaccines have a lot of side effects and can cause death.	True, False, I don't know	79.6%
	13.	You can get COVID-19 from the vaccine against COVID-19.	True, False, I don't know	85.1%
	14.	COVID-19 vaccines have tracking chips.	True, False, I don't know	3.8%
	15.	COVID-19 vaccines alter DNA.	True, False, I don't know	5.1%
Attitudes	**1.**	Do you agree that vaccination programs will win the fight vs COVID-19?	Agree, Disagree, I don't know	46.3%, 21.2%, 32.5%
	2.	Do you agree that everyone should be vaccinated against COVID-19?	Agree, Disagree, I don't know	49.6%, 34.2%, 16.2%
Practices	**1.**	In recent days, have you visited crowded places or were in contact with a lot of people?	Yes, No	20.5%, 79.5%
	2.	In recent days, have you worn a mask while leaving your home?	Yes, No	91.9%, 8.1%
	3.	Have you already been vaccinated against COVID-19?	Yes, No	6.3%, 93.7%

coefficients (β), odds ratios (ORs) and 95% confidence interval were used to quantify the association between KAP and different variables.

Results

In total, 584 subjects filled the survey questionnaire and after eliminating 14 subjects, due to exclusion criteria, the final study sample consisted of 570 subjects. Our sample was mostly female 474 (83.1%), held a high school degree or lower 230 (40.3%), married 305 (53.5%), were engaged in intellectual labor 302 (53.0%) and came from an urban environment 531 (93.1%).

Mean age of the subjects was 35.28±11.35 and it ranged from 18 to 73 years. COVID-19 symptoms such as fever, cough, dyspnea, diarrhea, abdominal pain and myalgia have been reported by 267 (46.8%) individuals in the last 30 days. In the same period, over the last 30 days, 313 (54.9%) subjects have been tested for COVID-19, out of whom 159 (27.9%) resulted positive. Positive willingness to be vaccinated was reported by 378 (66.4%) subjects, from whom 221 (58.5%) preferred Pfizer-BioNTech®, 71 (18.8%) Sputnik V®, 33 (8.7%) Sinovac®, 29 (7.6%) Oxford Uni-AstraZeneca® and 24 (6.4%) Moderna® as an option for vaccination. Only 36 (6.3%) subjects were currently vaccinated against COVID-19. All

Table 2 - Demographic characteristics of the sample in comparison with knowledge scores

Characteristics		Number of participants N (%)	Knowledge score
Gender	Male	96 (16.9%)	11.27±1.81
	Female	474 (83.1%)	11.29±1.94
Age	18-29	209 (36.6%)	11.25±1.97
	30-49	278 (48.8%)	11.32±1.80
	>50	83 (14.6%)	11.27±2.19
Marital status	Single	135 (23.7%)	11.43±1.80
	In a relationship	92 (16.1%)	11.78±1.48
	Married	305 (53.5%)	11.06±2.06
	Divorced	38 (6.7%)	11.41±1.79
Education	High school or lower	230 (40.3%)	10.84±2.01
	Bachelor's degree	141 (24.7%)	11.38±1.93
	Master's degree	182 (31.9%)	11.72±1.68
	PhD degree	17 (3.1%)	11.53±2.25
Occupation	Unemployed	105 (18.4%)	10.71±2.12
	Student	98 (17.2%)	11.54±1.71
	Physical labor	65 (11.4%)	10.66±2.09
	Intellectual labor	302 (53.0%)	11.51±1.82
Place of residence	Rural environment	39 (6.9%)	10.87±1.91
	Urban environment	531 (93.1%)	11.32±1.91
COVID-19 related information	COVID-19 positive	159 (27.9%)	8.73±4.26
	COVID-19 tested	313 (54.9%)	10.00±3.97
	COVID-19 symptoms	267 (46.8%)	9.28±4.22
	COVID-19 vaccinated	36 (6.3%)	12.58±3.26

demographic characteristics of the study sample are displayed in Table 2.

COVID-19 vaccination knowledge test results

The mean knowledge test score for our sample was 11.29±1.91 with correct answer rates on questions ranging from 3.8% to 89.1%, which are displayed in Table 1. Only 2 (0.3%) subjects scored maximum points (15 points) on the questionnaire. Knowledge test scores differed across marital categories, education levels and occupation of the subjects (p<0.05) which are presented in Table 2. The binary logistic regression model showed that being single (OR=1.88, 95% CI 1.20-2.94, p=0.005) or in a relationship (OR=1.87, 95% CI 1.12-3.11, p=0.016), being engaged in intellectual labor (OR=1.59, 95% CI 1.06-2.37, p=0.023) and having a Master's degree or higher (OR=1.65, 95% CI 1.10-2.46, p=0.014) were associated with higher knowledge test scores (Table 3).

Attitudes towards COVID-19 vaccination

Only 264 (46.3%) subjects agreed that COVID-19 vaccination programs will prevail in a battle versus COVID-19, while 283 (49.6%) agreed that everyone should be vaccinated against COVID-19. From 378 (66.4%) subjects who agreed that they would like to be vaccinated, 221 (58.5%) said Pfizer-BioNTech®, 71 (18.8%) Sputnik V®, 33 (8.7%) Sinovac®, 29 (7.6%) Oxford Uni-AstraZeneca® and 24 (6.4%) Moderna® would be their option for vaccination. Binary logistic regression model showed that subjects who were COVID-19 positive (OR=1.52, 95% CI 1.00-2.31, p=0.050) and had higher knowledge test scores (>12 points); (OR=7.43, 95% 5.07-10.90, p<0.001) were more likely to agree that vaccination programs shall conquer COVID-19. Higher knowledge test scores (>12 points) (OR=8.88, 95% CI 5.89-13.40, p<0.001) was also a positive independent

predictor for agreeing that everyone should get the vaccine, while unemployment (OR=0.42, 95% CI 0.25-0.72, p=0.002) decreased the level of agreement for the same statement (Table 3).

Practices towards COVID-19 and COVID-19 vaccination

A significant proportion of subjects 117 (0.5%) still visited places of mass social gatherings. The majority of the subjects 453 (79.5%) didn't visit these places and 524 (91.9%) wore masks while being outside their home. Regarding the vaccination rates, only 36 (6.3%) subjects were currently vaccinated against COVID-19. Binary logistic regression model showed that subjects who had higher knowledge test score were more prone to respect socio-epidemiological measures, such as avoidance of crowded places (OR=2.07, 95% CI 1.28-3.35, p=0.003), wearing a mask while outside the home (OR=6.95, 95% CI 2.07-23.29, p=0.002) and vaccinating themselves against COVID-19 (OR=23.09, 95% CI 11.94-44.68, p<0.001). All other independent predictors, in association with various practices towards COVID-19 and COVID-19 vaccination, are presented in Table 3.

Discussion and conclusions

To our knowledge, this is the first study not only in Bosnia and Herzegovina, but also in the region of West Balkan that is assessing current COVID-19 vaccination KAP and associated demographic characteristics. It provided new information about the socio-demographic characteristics regarding an ongoing public health problem and their impact on the behaviour of the population during the pandemic.

The majority of the participants in this study were female, age group of 30 to 49 years, married, with a high school degree or lower, engaged in intellectual labor and

Table 3 - Binary logistic regression models in association with having high knowledge test scores, various attitudes and practices towards COVID-19 vaccination

K: Independent predictors for having high knowledge test scores (>12 points) regarding COVID-19 vaccination

Independent predictors	OR	95% CI	p value
Education (Master's degree and above vs other)	1.65	1.10-2.46	0.014
Marital status (single vs other)	1.88	1.20-2.94	0.005
Marital status (in a relationship vs other)	1.87	1.12-3.11	0.016
Profession (intellectual labor vs other)	1.59	1.06-2.37	0.023

The model was not statistically significant $X^2=3.04$, p=0.694; it explained 5.7% (Nagelkerke R2) and correctly classified 72.3% of cases.

A1: Independent predictors for agreeing that vaccination programs are going to win against COVID-19

Independent predictors	OR	95% CI	p value
COVID-19 positive (yes vs no)	1.52	1.00-2.31	0.050
Higher knowledge test scores (>12)	7.43	5.07-10.90	<0.001

The model was not statistically significant $X^2=2.36$, p=0.306; it explained 26.9% (Nagelkerke R2) and correctly classified 72.3% of cases.

A2: Independent predictors for agreeing that everyone should get the vaccine.

Independent predictors	OR	95% CI	p value
Profession (unemployed vs other)	0.42	0.25-0.72	0.002
Higher knowledge test scores (>12)	8.88	5.89-13.40	<0.001

The model was not statistically significant $X^2=1.19$, p=0.551; it explained 31.6% (Nagelkerke R2) and correctly classified 74.1% of cases.

P1: Independent predictors for visiting crowded places in last days

Independent predictors	OR	95% CI	p value
Higher knowledge test scores (>12)	2.07	1.28-3.35	0.003
Marital status (married vs other)	1.84	1.18-2.87	0.007
Wearing a mask in public	4.56	2.24-9.26	<0.001

The model was not statistically significant $X^2=0.573$, p=0.903; it explained 10.4% (Nagelkerke R2) and correctly classified 79.7% of cases.

P2: Independent predictors for wearing a mask in crowded places

Independent predictors	OR	95% CI	p value
Profession (physical labor vs other)	2.82	1.18-6.70	0.019
Higher knowledge test scores (>12)	6.95	2.07-23.29	0.002
Avoidance of crowded places (yes vs no)	4.41	2.16-8.99	<0.001

The model was not statistically significant $X^2=1.67$, p=0.643; it explained 19.7% (Nagelkerke R2) and correctly classified 92.9% of cases.

P3: Independent predictors for vaccination against COVID-19

Independent predictors	OR	95% CI	p value
Higher knowledge test scores (>12)	23.09	11.94-44.68	<0.001
Older age (30+)	1.05	1.03-1.08	<0.001
Marital status (single vs other)	3.58	1.89-6.78	<0.001
Marital status (in a relationship vs. other)	3.39	1.67-6.85	0.001

The model was not statistically significant $X^2=3.88$, p=0.867; it explained 41.9% (Nagelkerke R2) and correctly classified 75.4% of cases.

living in the urban environment. Our study showed that the vast majority of the subjects was not knowledgeable about the COVID-19 vaccination with correct answer rates going as low as 3.8% on some questions. Being single or in a relationship, being engaged in intellectual labor and having a Master's degree or higher, were associated with higher knowledge test scores. Subjects held a rather pessimistic attitude towards final COVID-19 disease containment and vaccination, with 53.7% subjects not agreeing that vaccination programs are going to win the fight versus COVID-19 and 50.4% of subjects not agreeing that everyone should be vaccinated. Only 66.4% agreed that they would like to be vaccinated against COVID-19. Residents of Bosnia and Herzegovina showed cautious practices with 79.5% of subjects avoiding places of mass social gatherings and 91.9% were wearing a face mask while being outside of their home. On the contrary, only 6.3% of the subjects were currently vaccinated against COVID-19.

Compared to other studies that assessed COVID-19 vaccination (17), our population had a similar negative response rate regarding the willingness to vaccinate against COVID-19. This trend is fueled by poor knowledge regarding vaccination as a preventive measure towards infectious diseases, as well as current COVID-19 vaccination misconception (16) that are well incorporated in the society and governmental incompetence for supplying health institutions with vaccines. A Russian study (18) points that the above-mentioned criteria highly influences COVID-19 vaccination acceptance rate and should be targeted by policymakers and stakeholders to improve further vaccination rates. Furthermore, even though this study (17) was conducted in a different period of the outbreak, beginning vs one year after, there is no dissimilarity between the attitudes towards vaccination which is a striking fact. Several predictors that imply COVID-19 vaccination hesitancy such as

low education attainment, followed by not having had a recent influenza vaccination and an estimated personal risk of getting infected, were determined in this US study (17). Higher knowledge regarding COVID-19 vaccines which was seen more among those who were engaged in intellectual labor and had high academic education in our study, was determined as tremendous predictor for vaccination against this disease and correlates with the finding of US study (17). The same point has been shown in a Vietnamese (19) and a Chinese study (20). In addition to that, the results showed that the subjects who were tested positive had better test scores, were significantly more supportive about vaccination programs and their role in ending the pandemic. A research in China also showed that participants who were aware that they belong to a higher risk of getting infected were more likely to get vaccinated as soon as the vaccine gets developed instead of delaying it (21). Also, knowing that the vaccine reduces the risk of virus infection or relieves complications of the disease increased the COVID-19 vaccination acceptance (18). Our study found no difference in gender or marital status categories regarding knowledge test scores and attitudes towards COVID–19 vaccination, whereas male or married participants in China were predominant in accepting immediate vaccination (21). An Italian study showed a similar pattern of vaccination hesitancy among women, younger and less educated individuals (22).

Correct answer rates on questions presented in the knowledge test varied from 3.8% to 89.1%, which is unsatisfactory and showed insufficient knowledge not only regarding vaccination, but also about the COVID–19. These findings, which are alarming and not in accordance with similar studies conducted in Nigeria (23), Pakistan (24) and Vietnam (25), could further fuel the spreading of the disease, and the rise of death toll of COVID-19 in the country. In order to

achieve herd immunity, approximately 50% of the population should get vaccinated (26) which is currently unreachable with only 6.3% of the population being vaccinated. According to some studies, 25% of Americans and 20% of Canadians wouldn't undergo the vaccination program, which makes herd immunity unreachable in these countries as well (27). Because of the aforementioned, vaccination hesitancy is a growing problem and is inevitably connected to insufficient knowledge about the novel coronavirus and the vaccine itself.

There are several limitations in this study. Firstly, the cross-sectional study type makes it difficult to infer causality due to lack of prospective follow up of the sample, as well as examining the changes of specific behavioral patterns of COVID-19. Secondly, our study was also limited only to subjects who had internet access, thus decreasing the response rate from vulnerable groups of population.

In conclusion, the population of Bosnia and Herzegovina has had poor knowledge, a relatively pessimistic attitudes and some appropriate practices towards COVID-19 vaccination during the third wave of COVID-19 outbreak. The situation in the country is reaching the point where the collapse of the healthcare system is inevitable. By activating proper socioepidemiological measures, as well as constant education of the population regarding COVID-19 and COVID-19 vaccination and vaccination against COVID-19, the current situation could be changed. Results presented in this study imply that a more profound education has to take place in order to achieve satisfying results and protect the population from the spread of COVID - 19. Governmental health institutions should act promptly to prevent the ongoing COVID-19 catastrophe. These results serve as a good baseline for the future research about the acceptance of the COVID-19 vaccine by the public.

Riassunto

Conoscenze, atteggiamenti e comportamenti di residenti in Bosnia Herzegovina nel corso della terza ondata dell'epidemia di COVID-19

Premessa. La Bosnia-Herzegovina, ad oggi, non ha ancora programmato né dato inizio ad alcuna iniziativa vaccinale per contrastare l'attuale epidemia di COVID-19 ed evitarne la diffusione e le morti che ne conseguono. Scopo del presente studio è stato di definire lo stato attuale di conoscenza, atteggiamento e operatività della popolazione nei confronti della vaccinazione contro il SARS-CoV-2 durante la terza ondata dell'epidemia, quando cioè il sistema sanitario è sull'orlo del collasso; altro scopo è stato di creare un paradigma per sviluppare un programma di vaccinazione nel Paese.

Metodi. Lo studio trasversale è stato condotto impiegando un questionario online utilizzato in Congo e documenti del *Center for Disease Control and Prevention* USA relativi alla vaccinazione anti SARS-CoV-2 durante la terza ondata dell'epidemia in quel Paese.

Risultati. Sono stati inclusi nello studio 570 soggetti in totale, prevalentemente di sesso femminile (474 o 83,1%), con un titolo di studio pari al diploma di scuola media o meno (40,3%), coniugati (305 o 53,5%), impiegati in un'attività intellettuale (302 o 53,0%), residenti in area urbana (531 o 93,1%), d'età media di anni 35,3+/-11,3. La media dei risultati del test di conoscenza della vaccinazione per la COVID-19 è stata pari a 11,29+/-1,9. L'essere celibi (OR=1,88, 95% CI 1,20-2,94) o con una relazione (OR=1,879, 95% CI 1,12-3,11), svolgere un lavoro intellettuale (OR=1,59, 95% CI 1,06-2,37), possedere in Master universitario o titolo superiore (OR=1.65, 95% CI 1,10-1,556) erano situazioni associate con un punteggio superiore al test di conoscenza. Solo 264 soggetti (46,3%) concordavano sulla previsione che i programmi di vaccinazione anti-SARS-CoV-2 avrebbero vinto la battaglia contro la Covid-19. Una più elevata conoscenza di COVID-19 e relativa vaccinazione è stata identificata come un predittore indipendenze della decisione di vaccinarsi (OR=23,099, 95% CI 11,94-44,68) o di rispettare le misure socio-epidemiologiche come l'evitare la frequenza di luoghi affollati (OR=2,07, 95% CI 1,28-3,35) e l'indossare la mascherina (OR=6,95, 95% CI 2,07-23,29).

Conclusioni. La nostra indagine dimostra che la popolazione della Bosnia Herzegovina ha conoscenze limitate, atteggiamenti relativamente pessimistici, ed un tasso di scelta vaccinale anti-COVID-19 bassissimo

durante la terza ondata dell'epidemia, responsabile pertanto dell'esitazione vaccinale e quindi di un'ulteriore diffusione della malattia e relativi decessi. Esprimiamo la convinzione che l'attuale situazione possa venir capovolta attivando opportune misure socio-epidemiologiche, istruendo la popolazione su COVID-19 e relativa vaccinazione, e praticando sistematicamente la vaccinazione stessa.

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