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Factors influencing nursing students' intention to accept COVID-19 vaccination: A pooled analysis of seven European countries

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ABSTRACT

Background: Experiencing the third wave of COVID-19 pandemic, high vaccination coverage by a safe and effective vaccine globally would be a great achievement. Acceptance of vaccination by nursing students is an important issue as they play a decisive role as future professionals in educating patients, counselling, and guiding them to the right clinical decision.
Objectives: To explore the intention of nursing students to get vaccinated for SARS-CoV-2 infection and the factors acting either as motivators or as barriers towards vaccination.
Design: A multicenter cross-sectional design.
Participants: In total 2249 undergraduate nursing students participated.
Methods: The study was conducted in 7 universities in participating countries (Greece, Albania, Cyprus, Spain, Italy, Czech Republic, and Kosovo) through a web survey. Data was collected during December 2020–January 2021 in all countries.
Results: Forty three point 8% of students agreed to accept a safe and effective COVID-19 vaccine, while the acceptance was higher among Italian students. The factors for intention to get vaccinated were male gender ($p = 0.008$), no working experience in healthcare facilities during the pandemic ($p = 0.001$), vaccination for influenza in 2019 and 2020 ($p < 0.001$), trust in doctors ($p < 0.001$), governments and experts ($p = 0.012$), high level of knowledge ($p < 0.001$) and fear of COVID-19 ($p < 0.001$).

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Conclusions: Understanding of factors that influence students' decision to accept COVID-19 vaccination could increase the acceptance rate contributing to a management of the pandemic.

1. Introduction

Vaccine hesitancy has been considered by the World Health Organization (WHO) as "one of the top-ten threats to global health" causing serious problems in achieving coverage for population immunity (Godlee, 2019). As nursing students play a key role as future professionals who will enter the profession and provide evidence-based healthcare, it is necessary to achieve high COVID-19 vaccination acceptance rates but as a first step there is an urgent need to indicate nursing students concerns, obstacles and predictors regarding vaccination acceptance. The researchers stress the importance of illustrating the student's concerns and attitude upon the COVID-19 vaccine and state that this is an essential step for planning a successful post-pandemic strategy (Qiao et al., 2020a, 2020b). Nevertheless, there is a lack of existing studies among nursing students exploring their intention to get vaccinated for SARS-CoV-2 infection and the factors affecting the attitude of this specific population.

A recent study among nursing faculty and nursing students revealed that 45% of the students reported intention to get vaccinated and the major reasons of hesitancy were concerns regarding vaccine safety and side effects (Manning et al., 2021). To this direction the researchers suggest that the academic leaders need consider the vaccine concerns of the academic members and take into account the low level of knowledge related to vaccine development providing further education in this field (Manning et al., 2021). Additionally, recent findings suggest that nursing students and academic staff vary in their opinions regarding the mandatory vaccination as a condition of employment in clinical sectors, while the majority opposed to this issue as requirement. The same study in Egyptian nursing students and clinical faculty revealed concerns main related to the safety and side effects of the vaccine and it is important to note that 35% of the Egyptian students accepted the COVID-19 vaccination, 46% were hesitant, and 19% refused (Saied et al., 2021). The same study revealed that higher academic year and graduates, good perceived COVID-19 knowledge level, and confirmed COVID-19 case among close contacts were the significant predictors of COVID-19 vaccine acceptance among health science students (Saied et al., 2021).

Another study in 735 Italian students showed that there are no significant differences comparing healthcare students versus non-healthcare students and the results revealed that 633 (86.1%) students reported that they accept the COVID-19 vaccination, while 102 (13.9%) students reported vaccination hesitancy (Barello et al., 2020). Saied et al. (2021) highlight that the high level of hesitancy was surprisingly associated with a similarly high level of self-perceived risk of getting infected by the COVID-19 virus, but this finding contract previous results showing that the key driver of vaccination intentions was the perceived own risk. Notably, Italian researchers concluded that the level of vaccination acceptance and students' attitude is linked with their knowledge regarding health issues (Barello et al., 2020).

2. Background

SARS-CoV-2 (COVID-19) infection was declared as a pandemic by the World Health Organization (WHO) on March 12, 2020 (WHO, 2020). The second wave of COVID-19 pandemic is now hitting European countries with the total number of confirmed cases exceeding 87 million and 1.9 million deaths (Looi, 2020). The impact of the pandemic is far more than a health crisis as it is affecting society and economy and although it varies from country to country it will definitely increase poverty, unemployment, social distancing, self- isolation, inequalities globally with serious psychosocial impact (Nicola et al., 2020; Patelarou et al., 2020; Patelarou et al., 2021). As a result, responding swiftly to the pandemic and beat COVID-19 has now become the most important thing for humanity. It is believed that with the availability of a safe and effective vaccine for COVID-19, high vaccination coverage globally will be achieved, and a great progress will be made in controlling the pandemic (WHO, 2021).

Towards this direction, studies on COVID-19 vaccine are ongoing and several vaccines have already been launched into the market for the control of COVID-19. However, vaccines availability doesn't guarantee population vaccination due to the increase of the antivaccination movement and vaccine hesitancy which consists the next challenge in the fight against COVID-19 (Dror et al., 2020). Vaccine hesitancy is a chronic public health threat that may undermine efforts to achieve herd immunity by vaccination (Dubé et al., 2013). Despite the overwhelming volume of evidence on the benefits of immunization, widespread misconceptions and mistrust of information about vaccine efficacy and safety remain (Dubé et al., 2013). Key barriers to vaccination include lack of knowledge and confidence, lack of access to vaccines, concerns about the efficacy and safety of vaccines, and religious beliefs (WHO, 2017). These barriers are also empowered by different conspiracy theories that circulate mainly in the social media.

Surprisingly, vaccine hesitancy phenomenon is present even among healthcare professionals (ECDC, 2015). Vaccination of healthcare professionals is of utmost importance to prevent the spread of viruses as they are in the best position to understand patients doubts and concerns, to respond to their questions, and to explain in simple words to them the importance and positives of vaccination (ECDC, 2015). However, more and more studies report low acceptance levels and high hesitancy level to COVID vaccination among healthcare professionals (medical doctors, nurses, dentists etc.), including those who provide vaccination to patients (Wang et al., 2020; WHO, 2017). The international literature in this field is focused on healthcare professionals' attitudes and concerns related to insufficient knowledge, efficacy and effectiveness of the vaccine, and its potential long-term side effects. On the other hand, there is limited evidence regarding the acceptance of vaccination by the specific population of nursing students, in spite of the fact that this is an issue of paramount importance, as they act as information providers to patients and as the most trusted profession they will play a decisive role at vaccination campaigns. Given that to date only few studies have addressed the important issue of students' COVID-19 vaccination acceptance, this study aimed to explore the intention of nursing students to get vaccinated for SARS-CoV-2 infection and indicate the factors acting either as motivators or as barriers towards COVID-19 vaccination.

3. Method

3.1. Design and participants

A multicenter cross-sectional study was conducted in seven countries (Greece, Albania, Cyprus, Spain, Italy, Czech Republic, and Kosovo) during the so-called second wave of the COVID-19 pandemic. Particularly, in all countries data was collected during December 2020–January 2021. Our sample consisted of undergraduate nursing students who were attending classes through online or face-to-face classes organized by 7 universities in participating countries (Greece- Hellenic Mediterranean University, Albania- University of Vlora, Cyprus-Frederick University, Spain- University of Castilla-La Mancha & University of Toledo, Italy- University of Modena and Reggio Emilia, Czech Republic-University of Ostrava, Kosovo- AAB College). We included in total 2249 participants from Kosovo (n = 1020), Albania (n = 313), Greece (n

= 275), Spain (n = 181), Italy (n = 170), Czech Republic (n = 159), and Cyprus (n = 131). We did not perform a power analysis due to the exploratory nature of the study.

3.2. Procedure

Students during their online or face-to-face lessons were invited by the educators to participate in the study through a web survey, which included general information regarding the purpose and the process of the study and an informed consent as well. Response rate could not be calculated since it was a web survey. No personal data was recorded, the questionnaire was anonymous and an informed consent was obtained at the beginning of the questionnaire from each student confirming his or her willingness to participate. Participation in the study was voluntary and they could withdraw at any moment they preferred. The study protocol was reviewed and approved by all the participated universities (Hellenic Mediterranean University - Research and Ethics Committee No 42/12.14.20, University of Vlora - Faculty of Health Deanery No 174/5/11.30.2020, Frederick University-Research of Ethics and Integrity Committee No EI-2001, University of Castilla la Mancha-Research Ethics Committee of the Integral Health Area of Talavera de la Reina No 24/2020, AAB College-Deanery of Faculty of Nursing FM-1568/21/11.30.2020, University of Modena and Reggio Emilia- Ethics Committee 01.27.21, University of Ostrava-Ethics Committee R1/2021) (Greece, Albania, Cyprus, Spain, Kosovo, Italy, and Czech Republic).

The questionnaire comprised 29 items, with a mean duration 6–8 min to complete. The first part of the study questionnaire included questions about demographic characteristics, perceived knowledge and beliefs regarding coronavirus and COVID-19 vaccine, trust towards the experts, doctors and government and factors influencing the students' intention to vaccinate against the COVID-19 virus. The questions of the first part were developed initially in English, translated, and adapted in local languages by the local research team. The second part of the instrument included the Fear of COVID-19 Scale (FCV-19S) which was used to measure the fear against the coronavirus (Ahorsu et al., 2020). FCV-19S is a self-reported scale which comprises seven items rated on a 5-point Likert-type scale (1 = strongly disagree to 5 = strongly agree). A total individual score can be calculated ranging from 7 to 35 with higher scores representing higher level of fear against the coronavirus disease. FCV-19S has been translated and validated into Greek, Spanish and Italian and has been used in previous studies to measure fear of COVID-19 levels (Martínez-Lorca et al., 2020; Soraci et al., 2020; Tsipropoulou et al., 2020). For the purposes of the present study, the Albanian and Czech research teams translated and validated the FCV-19S in their local language. The internal consistency for FCV-19S was excellent (Cronbach's alpha = 0.87). Cronbach's alpha for the Greek version of the FCV-19S was 0.84, for the Spanish version 0.86, for the Cypriot version 0.92, for the Czech version 0.82, for the Italian version 0.85, for the Albanian version 0.88, and for the Kosovar version 0.87.

3.3. Statistical analysis

Continuous variables are presented as mean, standard deviation, median, and range, while categorical variables are presented as numbers (percentages). We considered demographic data and students' answers regarding the COVID-19 and vaccination as the independent variables and intention to accept COVID-19 a safe and effective vaccine as the dependent variable.

We also converted age in a dichotomous variable according to median value. Responses that were recorded on a five-point Likert scale ("completely disagree", "somewhat disagree", "neutral", "somewhat agree" and "completely agree") were categorized in three categories; disagree ("completely disagree" and "somewhat disagree"), neutral, and agree ("somewhat agree" and "completely agree"). We used quantiles to convert the score on fear of COVID-19 scale into an ordinal variable with five categories; very low fear, low, medium, high, and very high fear. Since there were data from seven countries, we grouped them according to the deaths per million population. For deaths per million population (mortality), we categorized the continuous values into categories of low (fewer than 400 deaths per million population), medium (between 400 and 800 deaths per million population) and high (more than 800 deaths per million population) (COVID-19 map, 2021). Low mortality group included Cyprus, medium mortality group included Greece, Kosovo and Albania, and high mortality group included Spain, Czech Republic and Italy.

We used multivariable logistic regression to eliminate confounding. In that case, we defined the outcome as 1 if a participant answered "somewhat agree" or "completely agree" and 0 for any other response. First, we conducted univariate logistic regression analysis and then variables that were significantly different ($p < 0.20$) were entered into the backward stepwise multivariate logistic regression analysis. We estimated adjusted odds ratios (OR) with 95% confidence intervals and p-values.

All tests of statistical significance were two-tailed, and p-values<0.05 were considered significant. Statistical analysis was performed with the Statistical Package for Social Sciences software (IBM SPSS Statistics for Windows, Version 21.0.).

3.4. Ethical issues

All ethical issues were followed during the study. Participation was voluntary and participants could withdraw at any moment. No personal data was recorded. Participants were assured that all data collected will be used only for the current study. Universities' ethical committees approved the study. Additionally, before completing the questionnaire, participants were asked to give their consent to participate in the study by ticking the associated box. Approval was also received from the developer of FCV-19S instrument.

4. Results

4.1. Sample characteristics

Study population included 2249 nursing students in total and demographic characteristics of the students according to the country residence are shown in Table 1. Mean age was 21.6 years, and the majority of the students were females, singles and without a chronic disease.

4.2. COVID-19 and vaccination characteristics

Students' answers regarding the COVID-19 and vaccination are listed in Table 2. Only 5.8% of the students have been vaccinated for influenza in 2019 and 2020. The 43.8% of participants somewhat or completely agreed to accept a safe and effective COVID-19 vaccine, while 22.2% somewhat or completely disagreed to accept this vaccine. The most important reason for refusal of a COVID-19 vaccine was doubts about the safety, efficacy and effectiveness of the vaccine (72.4%). Mean score on fear of COVID-19 scale was 14.7 (standard deviation = 5.9), while the median score was 14 (range = 28). Detailed students' answers in fear of COVID-19 scale are shown in Table 3.

Students from Italy gave the highest proportion of positive responses ("somewhat agree" and "completely agree") regarding COVID-19 vaccination (121 of 170 students, 71.2%), and then students from Spain (117 of 181, 64.6%), Greece (161 of 275, 58.5%), Cyprus (57 of 131, 43.5%), Kosovo (393 of 1020, 38.5%), Albania (102 of 313, 32.6%) and Czech Republic (34 of 159, 21.4%).

4.3. Regression analysis

Univariate and multivariate logistic regression analysis with intention to accept a safe and effective COVID-19 vaccine as the dependent

Table 1
Demographic characteristics of the students.

Characteristics	N	%
Gender		
Male	344	15.3
Female	1902	84.7
Age (years), mean, standard deviation	21.6	5.6
Country of origin		
Greece	275	12.2
Spain	181	8.0
Cyprus	131	5.8
Czech Republic	159	7.1
Italy	170	7.6
Albania	313	13.9
Kosovo	1020	45.4
Marital status		
Single	1978	88.6
Married	233	10.4
Widowed	4	0.2
Divorced	18	0.8
Chronic disease		
Yes	136	6.1
No	2110	93.9
Living with vulnerable groups during the COVID-19 pandemic		
Yes	906	40.3
No	1341	59.7
Clinical practice in healthcare facilities during the COVID-19 pandemic		
Yes	752	33.6
No	1486	66.4
Working in healthcare facilities during the COVID-19 pandemic		
Yes	320	14.2
No	1926	85.8

Table 2
Students' answers regarding the COVID-19 and vaccination.

	N	%
Contact with a confirmed or a suspected case of COVID-19		
Yes	1142	50.9
No	1103	49.1
Infected with COVID-19		
Yes	266	11.8
No	1981	88.2
Family/friends infected with COVID-19		
Yes	1354	60.4
No	888	39.6
Self-perceived likelihood of getting infected with the COVID-19 in the future		
Very low	80	3.8
Low	470	22.4
Moderate	999	47.7
High	397	18.9
Very high	150	7.2
Self-perceived knowledge about the COVID-19		
Very low	16	0.7
Low	63	2.8
Moderate	820	36.5
High	1070	47.6
Very high	279	12.4
Self-perceived knowledge about COVID-19 vaccines		
Very low	403	17.9
Low	833	37.0
Moderate	800	35.6
High	161	7.2
Very high	52	2.3
Influenza vaccination in 2019 and 2020		
Yes	130	5.8
No	2114	94.2
Accept a safe and effective COVID-19 vaccine		
Completely disagree	269	12.0
Somewhat disagree	230	10.2
Neutral	765	34.0
Somewhat agree	545	24.2
Completely agree	440	19.6
Trust in government		
Yes	794	35.5
No	1445	64.5
Trust in doctors regarding the information about the COVID-19		
Yes	1604	71.4
No	641	28.6
Trust in government experts regarding the information about the COVID-19		
Yes	1432	63.8
No	814	36.2
Reasons for refusal of a COVID-19 vaccine		
I have doubts about the safety, efficacy and effectiveness of the vaccine	1129	72.4
I believe that even if I get infected with COVID-19, nothing bad will happen to me	99	6.3
I believe that the vaccine is not necessary	84	5.4
I do not believe in the necessity of vaccines	76	4.9
I believe that I will not be infected by COVID-19	35	2.2
I believe that the COVID-19 virus is not particularly dangerous	29	1.3

variable is shown in Table 4. Multivariable analysis showed that males (OR = 1.41, p = 0.008) and students that did not work in healthcare facilities during the COVID-19 pandemic (OR = 1.58, p = 0.001) were more willing to accept COVID-19 vaccination in comparison to females and students that worked in healthcare facilities during the pandemic. In addition, students that were vaccinated against influenza in 2019 and 2020 were more amenable to get vaccinated against COVID-19 (OR = 2.38, p < 0.001) in comparison to those not vaccinated. Trust in government (OR = 1.85, p < 0.001), in doctors regarding the information about the COVID-19 (OR = 2.13, p < 0.001), and in government experts regarding the information about the COVID-19 (OR = 1.40, p = 0.012) increased the probability of getting vaccinated against COVID-19. Increased self-perceived knowledge about COVID-19 vaccines (moderate vs. very low/low; OR = 1.39, p = 0.001, high/very high vs. very low/low; OR = 1.86, p < 0.001), and increased fear of COVID-19 were related with increased likelihood of COVID-19 vaccination (low vs. very low; OR = 1.73, p < 0.001, medium vs. very low; OR = 2.02, p < 0.001, high vs. very low; OR = 2.15, p < 0.001, very high vs. very low; OR = 1.75, p < 0.001).

5. Discussion

According to our best knowledge, this is the first study worldwide that attempts to explore the intentions of nursing students to get vaccinated for SARS-CoV-2 infection in seven European countries. With several vaccines having been approved by the respective agencies in USA, Europe and other countries the main challenge now for health policy makers worldwide is the acceptance and vaccination of the population. According to the results of the current study, key reasons for willingness to get vaccinated were male gender, having not worked in healthcare facilities during the pandemic, getting vaccinated for influenza in 2019 and 2020, trust in doctors, governments and experts and higher level of knowledge and fear about COVID-19.

Less than half of the study participants reported that would get vaccinated if a vaccine results as safe and effective. We expected acceptance rates of a safe and effective vaccine could be higher among nursing students. Due to their future profession, they have more knowledge about benefits of vaccines and are more awareness about their need. These results are an alarming bell for health authorities to undertake more concrete and effective measures for rising vaccination uptake rates among this population. The young age, the overestimation of health status and the low mortality rates due to COVID-19 in this population are most probably key reasons for these results.

In a study that evaluated the attitude of population regarding future vaccination, half of them (49.7%) reported a positive willingness with students and healthcare personnel being more willingness in comparison to other occupational groups (Akarsu et al., 2021). An Italian study among students concluded that 86.1% are willing to get vaccinated for COVID-19 (Barello et al., 2020) and a study among medical students reported willingness to receive a vaccine after getting approval at 77.0%

Table 3
Students' answers in fear of COVID-19 scale.

Items	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
I am most afraid of COVID-19	515 (22.9)	669 (29.7)	469 (20.9)	458 (20.4)	138 (6.1)
It makes me uncomfortable to think about COVID-19	643 (28.6)	594 (26.4)	320 (14.2)	523 (23.3)	169 (7.5)
My hands become clammy when I think about COVID-19	1311 (58.3)	679 (30.2)	153 (6.8)	71 (3.2)	35 (1.6)
I am afraid of losing my life because of COVID-19	992 (44.1)	628 (27.9)	316 (14.1)	203 (9.0)	110 (4.9)
When watching news and stories about COVID-19 on social media, I become nervous or anxious	603 (26.8)	608 (27.0)	351 (15.6)	504 (22.4)	183 (8.1)
I cannot sleep because I'm worrying about getting COVID-19	1362 (60.6)	621 (27.6)	143 (6.4)	84 (3.7)	39 (1.7)
My heart races or palpitates when I think about getting COVID-19	1233 (54.8)	593 (26.4)	200 (8.9)	169 (7.5)	54 (2.4)

Values are expressed as n (%).

while a study in Malta among healthcare students reported acceptance rates at a level of 44.2%. A study among medical students reported willingness to receive a vaccine after getting approval at 77.0% (Lucia et al., 2020). Differences in the sample, data collection, morbidity and mortality rates due to COVID-19 and different periods of studies conduction are most probably the reasons for these inconsistences. Additionally, the intense of the pandemic differs between and within countries and this could most probably affect these results. Another possible explanation for this is that students are of young age and the disease affect more seriously older ages. Youngsters usually overpass COVID-19 with few and mild symptoms in comparison to the elderly. Another possible explanation for this is the information source. Receiving information from non-trusted sources has most probably an impact in the low rates. In a study among college students in South Carolina, only 57.7% received information about vaccines from health agencies with social media and personal networks being also the two other main sources (Qiao et al., 2020a, 2020b). Another study among medical and healthcare students reported that social media are a key source for them to receive information about COVID-19 (Gohel et al., 2021). Receiving information from unreliable and insecure sources most likely increase students doubts about vaccines. Additionally, the presence of antivaccination movement especially in the social media could have contributed in low willingness of getting vaccinated.

However, in the current study most of the participants who refuse to get vaccinated reported as the main reason the doubts about safety, efficacy and effectiveness. Other barriers against vaccination included beliefs that even if they get infected nothing bad will happen, beliefs that vaccines are not necessary, beliefs that will not get infected with the virus etc.

Men are more likely to get vaccinated than women. Similar results are presented also in other studies with women being more reluctant to get vaccinated in comparison to men (Akarsu et al., 2021; Detoc et al., 2020). Biological and lifestyle factors and immune response differs among men and women. In general, women take into consideration COVID-19 more seriously and respect more the prevention and public health rules (Galasso et al., 2020). In contrast, female students are more

Table 4
Univariate and multivariate logistic regression analysis with intention to accept a safe and effective COVID-19 vaccine as the dependent variable.

	Unadjusted OR (95% CI)	p-Value	Adjusted OR (95% CI)[a]	p-Value
Gender (males vs. females)	1.48 (1.17–1.86)	0.001	1.41 (1.09–1.82)	0.008
Age (>20 vs. age ≤20 years)	1.08 (0.91–1.29)	0.38	NS	
Mortality per million population			NS	
Low	1.00 (reference)			
Middle	0.89 (0.62–1.28)	0.54		
High	1.48 (1.01–2.18)	0.04		
Marital status (singles/ widowed/divorced vs. married)	1.02 (0.78–135)	0.87	NS	
Chronic disease (yes vs. no)	1.30 (0.92–1.84)	0.13	NS	
Living with vulnerable groups during the COVID-19 pandemic (yes vs. no)	0.96 (0.81–1.13)	0.62	NS	
Clinical practice in healthcare facilities during the COVID-19 pandemic (yes vs. no)	1.20 (1.01–1.43)	0.04	NS	
Working in healthcare facilities during the COVID-19 pandemic (yes vs. no)	0.73 (0.57–0.92)	0.01	0.63 (0.48–0.82)	0.001
Contact with a confirmed or a suspected case of COVID-19 (yes vs. no)	0.99 (0.84–1.17)	0.96	NS	
Infected with COVID-19 (yes vs. no)	0.99 (0.76–1.28)	0.94	NS	
Family/friends infected with COVID-19 (yes vs. no)	1.12 (0.94–1.32)	0.21	NS	
Self-perceived likelihood of getting infected with the COVID-19 in the future				
Very low/low	1.00 (reference)			
Moderate	1.56 (1.26–1.93)	<0.001	NS	
High/very high	1.49 (1.17–1.89)	0.001	NS	
Self-perceived knowledge about the COVID-19				
Very low/low	1.00 (reference)			
Moderate	1.72 (1.04–2.84)	0.036	NS	
High/very high	2.09 (1.27–2.43)	0.004	NS	
Self-perceived knowledge about COVID-19 vaccines				
Very low/low	1.00 (reference)		1.00 (reference)	
Moderate	1.64 (1.37–1.95)	<0.001	1.39 (1.15–1.69)	0.001
High/very high	2.17 (1.62–2.91)	<0.001	1.86 (1.35–2.56)	<0.001
Influenza vaccination in 2019 and 2020 (yes vs. no)	2.65 (1.83–3.85)	<0.001	2.38 (1.57–3.59)	<0.001
Trust in government (yes vs. no)	3.09 (2.58–3.69)	<0.001	1.85 (1.49–2.29)	<0.001
Trust in doctors regarding the information about the COVID-19 (yes vs. no)	3.92 (3.17–4.84)	<0.001	2.13 (1.61–2.81)	<0.001
Trust in government experts regarding the information	3.18 (2.64–3.84)	<0.001	1.40 (1.08–1.82)	0.012

(continued on next page)

Table 4 (*continued*)

	Unadjusted OR (95% CI)	p-Value	Adjusted OR (95% CI)[a]	p-Value
about the COVID-19 (yes vs. no)				
Fear of COVID-19				
Very low	1.00 (reference)		1.00 (reference)	
Low	1.63 (1.24–2.14)	<0.001	1.73 (1.28–2.32)	<0.001
Medium	1.83 (1.41–2.38)	<0.001	2.02 (1.52–2.68)	<0.001
High	2.10 (1.63–2.71)	<0.001	2.15 (1.62–2.84)	<0.001
Very high	1.83 (1.39–2.41)	<0.001	1.75 (1.29–2.35)	<0.001

CI: confidence interval, OR: odds ratio.
NS: not selected by the backward elimination procedure in the multivariable logistic regression analysis with a significance level set at 0.05.
[a] R^2 for the final multivariable model was 18.

likely to believe in conspiracy theories (Sallam et al., 2020). However, even though prevalence of the disease is similar to both sexes, the outcome and death rates are higher for men than women (Jin et al., 2020). Most probably, this makes women more confident for the outcome and more reluctant to get vaccinated, but this should be interpreted with caution. On the other side, fears about a possible negative outcome after a COVID-19 infection most probably make men more willingness to get vaccinated. Additionally, the rumors in different websites and social media about fertility issues after a COVID-19 vaccination could be another explanation for women reluctance.

Participants who have worked in healthcare facilities are less positive in getting vaccinated in comparison to those who haven't worked. The intention of getting vaccinated for COVID-19 ranged from 50.0% to 93.3% (depending on vaccine effectiveness) among Indonesian healthcare personnel (Harapan et al., 2020). A study among healthcare personnel in USA reaches the conclusion that around half of them (57.6%) are intending to get vaccinated (Fisher et al., 2020). A meta-analysis showed that healthcare personnel intention for getting vaccinated for COVID-19 ranges from 43.6%–67.9% (Galanis et al., 2020). This result is much lower than expected by authors in general. Working in a hospital environment and having frequent contact with COVID-19 patients most probably make them feel less feared about possible infection. Even though people who work in healthcare facilities usually are in higher risk of getting infected, this doesn't seem to make them more aware about this need. Other possible explanations for low rates are fear of side effects and thoughts about importance of vaccination. A study among healthcare workers in China shows that the high possibility of getting infected increases the chances of vaccination (Fu et al., 2020). Vaccination rates for influenza have been reported low in nurses' population (Alicino et al., 2015; Toska et al., 2012). Additionally, a study has reported a negative connection between nursing profession and vaccination (Petek and Kamnik-Jug, 2018). Focusing on this population to get vaccinated is of paramount significance and specific strategies should be developed from healthcare authorities at both national and local level. Having a healthy future healthcare personnel can contribute to the better management of the pandemic but also can serve as a role model for general population to follow the same attitude.

The attitude towards general vaccination contributes significantly to vaccine hesitancy (Qiao et al., 2020a, 2020b). In our study, students that have been vaccinated for common influenza in 2019 and 2020 were more likely to have intentions to get vaccinated with a safe and effective COVID-19 vaccine. Despite the well-established knowledge about benefits of influenza vaccination, the rates among nursing students remain low (Ghandora et al., 2019; Hernández-García et al., 2015; Kałucka et al., 2020). To authors view, people who have created a culture of vaccination since childhood are more likely to have a more positive attitude towards vaccination. Additionally, availability of vaccines differs between countries and this probably is another explanation. However, influenza is not considered as a dangerous disease (in contrast to SARS-CoV-2) with the number of severe cases and fatalities being very low. Development of vaccine policies, organization of campaigns for raising awareness of students and provision of vaccine out of charge could help in increasing the vaccination rates.

According to the results of the current study, people who trust the governments, the experts and the doctors were more willing to get vaccinated. In a recent study conducted in 19 countries, people that trusted information provided from government sources have higher probability to accept a COVID-19 vaccine (Lazarus et al., 2020). Students who trust the public health experts were reported to be more likely to get vaccinated in another study (Lucia et al., 2020). Receiving information from scientists was significantly correlated with high vaccine acceptance (Qiao et al., 2020a, 2020b). The last period different conspiracy theories about the virus, the public health measures and the vaccines exist. People who tend to believe these theories are more likely to be resistant to preventive measures and vaccination (Romer and Jamieson, 2020). A study concluded that people who believe in conspiracy theories have 3.9 times less intention not to get vaccinated and not to support the public health preventive measures (Earnshaw et al., 2020). It is of paramount significance to identify those who tend to believe these theories and to provide reliable information. In general, people tend to believe more experts and doctors than politicians. Provision of simple and frequent information from health experts could significantly increase the vaccination rates. In many countries, increase of populistic parties and demagogues' politicians has made population to lose their faith and trust in politicians. Additionally, politicians try to exploit the situation for political gains something that experts usually do not do that.

Doctors in general can play an important role in enhancing trust and addressing conspiracy theories (Earnshaw et al., 2020). Vaccine recommendation from a healthcare provider increases the chances of getting vaccinated (Reiter et al., 2020). Collaboration and synergies between policymakers, stakeholders, civil society and local communities could help in trust establishment. Additionally, a minimum consensus from political parties in a bipartisan management of the pandemic could also help.

Participants with higher level of knowledge about COVID-19 vaccines were more likely to get vaccinated in contrast to those with low level. Studies have shown that students with high level of vaccine knowledge are more likely to vaccinate themselves than those with lower levels (Kamimura et al., 2017; Oliver et al., 2020). Increasing the knowledge of target population about vaccines could improve uptake rates. Additionally, inclusion of the vaccination benefits should be a regular part for healthcare professions curricula (Walker et al., 2016). Higher education level is directly connected with increase in knowledge. The lower health literacy is, the higher the possibility of following health institution directives. Decrease of safety concerns and increase of vaccination importance knowledge could help. Education of population about vaccination should be part of regular edification of general population and not sporadic.

Participants who were more feared about COVID-19 were more likely to get vaccinated than those with low levels of fear. Similar results are reported in a study among college students in USA (Qiao et al., 2020a, 2020b) and general population (Detoc et al., 2020). Level of fear has been reported high in different studies among University students (Elsharkawy and Abdelaziz, 2020). In general, mental health status of nursing students has deteriorated during the pandemic. Many studies have reported high level of depression and anxiety during the COVID-19 period (Mechili et al., 2020; Patelarou et al., 2021). The measures undertaken by national governments (such as quarantine), the regular discussion in traditional and modern media have probably contributed

in fear increase. However, possible infection of a close person has contributed in this result. Public health emergencies have a significant impact on student's mental health status. Provision of support by authorities (governmental and universities) could decrease these symptoms (Cao et al., 2020).

5.1. Strengths and limitations

Our study suffers from some limitations. This was a cross-sectional study and extraction of causalities is difficult. Additionally, the sample is not totally representative of the seven countries that participated mainly due to the on-line data collection method. In this study participated only nursing students and generalization of the results to other students is difficult. Also, self-reported questionnaires could always result on information bias. Moreover, we did not run power analysis since the study was exploratory but we tried to increase the number of participants as much as possible. Moreover, we could not estimate the response rate since questionnaire was distributed through the web.

However, to our best knowledge, this is the first study that assessed factors that influence nursing students' intention to accept COVID-19 vaccination in seven European countries with a large geographic coverage. This study identifies key factors that should be addressed in order to increase COVID-19 vaccine uptake rates. These results could be very useful and helpful for policy makers who develop vaccine promotion strategies.

6. Conclusions

In the current study, 2249 nursing students participated from seven European countries. This study aimed to explore the intention of nursing students to get vaccinated for SARS-CoV-2 infection and the factors acting either as motivators or as barriers towards vaccination. The results of the current research concluded that key factors that act as motivators and enablers for nursing students to get vaccinated were male gender, not having worked in healthcare facilities during the pandemic, being vaccinated for influenza in 2019 and 2020, trusting doctors, governments and experts, having high level of knowledge and fear about COVID-19. Additionally, key barriers and resistance factors for not willing to get vaccinated with a COVID-19 vaccine were doubts about safety, efficacy and effectiveness. Future research should focus more on these factors and ways how to overcome these barriers.

Implementation of vaccination policies, organization of awareness campaigns and increasing knowledge about vaccine benefits are some key recommendations to be followed. Synergies and collaboration between policymakers and university authorities is of paramount significance. Politicians should be less involved in vaccination campaigns with doctors and healthcare experts having the main role. Regular assessment of mental health status and provision of support could decrease the fear levels for this population.

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Declaration of competing interest

There is no conflict of interest.

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