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Attitudes and perceptions of Italian Students in Healthcare Settings on COVID-19 vaccines and vaccinations strategies, one year after the immunization campaign

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Abstract

Background. *The topic of vaccine confidence is increasingly relevant, particularly due to the COVID-19 pandemic and the global distribution of COVID-19 vaccines. This issue is even more critical for students in healthcare settings, given their future role not only as vaccine recipients but also as advocates for vaccination. In light of this, achieving a good level of vaccine acceptance is crucial. Hence, the aim of our study was to evaluate the attitudes and perceptions of healthcare students regarding vaccines and COVID-19 vaccination.*

Methods. *Medical and pharmaceutical area students attended an Elective Teaching Activity on COVID-19 vaccines and vaccination campaign, organized at the University of Florence (Italy) and participated in filling two anonymous questionnaires. The first questionnaire was submitted before the Elective Teaching Activity was focused on students' attitudes and perceptions toward vaccines. The second questionnaire was designed to evaluate the students' satisfaction with the course topics. Both descriptive and inferential analyses were performed on the results. In addition, the Vaccine Confidence Index was calculated to evaluate the propensity of students toward vaccinations.*

Results. *A total of 423 students attended the Elective Teaching Activity in the early beginnings of 2022. Overall, students have shown greater confidence in vaccines, compared to COVID-19 vaccines, especially as regards the safety profile. Students' Vaccine Confidence Index was very close to 0.25 value, which indicates being in favor of vaccinations. Nevertheless, in the satisfaction questionnaire filled in at the end of the*

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course, the percentage of students in favor of COVID-19 vaccination increased for both medical (from 94% to 99%) and pharmaceutical area students (from 81% to 97%).
Conclusions. *Our study suggests that educational activities such as this Elective Teaching Activity, could be considered an effective teaching strategy to improve vaccine acceptance rates among students in healthcare settings.*

Introduction

The coronavirus disease of 2019, caused by SARS-CoV-2, has resulted in a major impact on global health and economics since its emergence at the end of 2019. Less than 1 year after the World Health Organization (WHO) announced the COVID-19 global pandemic, in March 2020, many countries began applying mass vaccination programs (1). Several COVID-19 vaccines have been authorized for use and distributed globally. In addition, nearly 200 vaccine candidates are currently in clinical development (2). Healthcare workers (HCWs) (including students in healthcare settings) and individuals at higher risk of COVID-19 complications and death, were the first to become eligible for vaccination (3).

The most effective strategy for addressing the COVID-19 pandemic is through vaccination, and the guidance provided by healthcare professionals may have a significant impact on the willingness of the general population to get vaccinated (4). The success of vaccination efforts also relies on the involvement of HCWs around the world in the way they are trained about vaccines and vaccinations (5), and ultimately on their levels of vaccine acceptance or hesitancy, with the latter that might reach even 15% in some cases (6). Relevant factors were found to influence vaccine acceptance in this group, and are: awareness of the importance of vaccines and vaccination to prevent infectious diseases and trust in vaccines, government, and health authorities (7).

Due to their limited professional experience, healthcare students may be less aware than medical professionals regarding the risks of infections that can be contracted and transmitted to others, including patients in hospitals and medical centers (8).

Considering the above, since medical and pharmacy students will be future HCWs, our aim was to assess the impact of an Elective Teaching Activity (ETA) at the University level regarding COVID-19 vaccines on the attitudes and perceptions of these students. Another objective of the study was to evaluate the student's level of satisfaction with the course.

Material and methods

An Elective Teaching Activity (ETA) on the COVID-19 vaccines and the vaccination campaign was held at the University of Florence (Italy) between January and February 2022, right after the booster vaccination campaign that took place in Italy, in September 2021, during the fourth wave of COVID-19 pandemic. The lessons were conducted via the online platform Webex, utilizing Moodle (Modular Object-Oriented Dynamic Learning Environment), an open-source Learning management system (LMS). Medical students, as well as pharmaceutical area's students, decided to attend this extracurricular activity voluntarily to achieve University credits, which was one of many occasions that the University of Florence offers every academic year. The ETA (8 hours) included lectures on all different types of vaccines developed through traditional

methods and the new technologies used for COVID-19 vaccines (mRNA vaccines) (9, 10). The methods are similar to those that have been used in previous editions of the ETA and described in previous papers (11, 12). At the beginning of the course, the students were requested to complete a questionnaire that aimed to measure their attitudes toward COVID-19 vaccines. The questionnaire included multiple-choice questions that investigated the respondents' attitudes towards various aspects of COVID-19 vaccines, including safety profile, clinical development, pharmacovigilance management, and any concerns they may have had. Furthermore, the questionnaire asked about the sources that the respondents consulted most frequently for information on COVID-19 vaccines. Vaccine confidence rates were assessed to investigate the students' general tendency towards vaccines (see 'statistical analysis'). At the conclusion of the course, a satisfaction questionnaire was also administered through the same method ìincluding multiple-choice questions focused on the students' satisfaction with the course topics, the quality of teaching, and the knowledge acquired. Additionally, the questionnaire asked for the participants' opinions on vaccines in general and on COVID-19 vaccines, and whether their opinions had changed after taking the course. A Likert scale was used to evaluate the satisfaction of the topics discussed. The questionnaires were conducted in Italian and ensured complete anonymity (see Supplementary Materials 1 and Supplementary Materials 2).

After being presented with a summary of the survey's objective, every student consented to participate: specifically, students provided their consent to participate in the tests by selecting the "I agree" option presented alongside the online informed consent provided with each test. The study employed an online-based questionnaire available on Moodle platform (with laccess reserved for enrolled students) that did not seek any private health information from the respondents, and as a result, it was not possible to link the data to any specific individual. Given that the survey did not violate the students' confidentiality and the research subject was openly accessible, no ethical approval was necessary to carry out the investigation. The research was carried out in accordance with the Declaration of Helsinki's principles. Additionally, data were collected and managed in a consolidated format, following compliance with the European Union Regulation 2016/679 and the Italian Legislative Decree 2018/101.

Vaccine Confidence Index

The Vaccine Confidence Index (VCI) (13) is a fairly new tool to measure vaccine confidence. This methodology has been developed to assess vaccine confidence in an objective manner, and the findings indicate the effectiveness of this approach in measuring attitudes and perceptions that influence vaccination behaviors.

VCI was calculated, considering eight Likert-type statements included in the attitude questionnaire to which the students were asked to declare their agreement or disagreement**.** The options were: "totally agree" = 1; "partially agree" = 2; "partially disagree" = 3; "totally disagree" = 4. Higher scores on the first four statements indicate a lower inclination toward vaccines, whereas higher scores on the second four statements indicate a higher inclination toward vaccines. The vaccine confidence index was calculated as follows:

$VCI = [(A1+A2+A3+A4)/4]/[(B1+B2+B3+B4)/4]$, where A1, A2, A3, and A4 were the scores to the first four statements while B1, B2, B3, and B4 were those of the second four. Therefore, the VCI ranged between 0.25 and 4. A higher value of VCI shows higher hesitancy towards vaccinations (14).

Statistical analysis

The results obtained from the two questionnaires were analysed through descriptive statistical analysis. Categorical data were reported as numbers and percentages and were compared using the Chi-square test. Continuous data were reported as mean and standard deviation (SD) and were compared using the Student's t-test. Results were considered statistically significant at a p-value of 0.05. The data were analysed using SPSS (IBM SPSS Statistics 28.0.0.0).

Results

Students' attitudes and perceptions (pre-ETA questionnaire)

Overall, 423 students took the pre-ETA questionnaire; among them, 326 (77.1%) were students enrolled in the single-cycle degree in Medicine, while 97 (22.9%) in Pharmaceutical area degrees. Most students were females (n= 267; 63.1%) (Table 1), and among them, the majority were attending the 5th year of study of Medicine (n=73; 27.3%).

In the first part of the test, the perception of the safety and efficacy of vaccines, in general, was assessed (Table 2).

Based on the answers provided, it was possible to calculate the Vaccine Confidence Index (VCI) for the two groups of students. The estimation of the index shows a propensity toward vaccination in general for both medical and pharmaceutical area students, but slightly higher for the first ones (VCI Medicine = 0.34 vs VCI Pharmaceutical area= 0.41) ($p<0.001$). Students' VCI are very close to the VCI=0.25, which indicates being in favor of vaccinations. Being completely unfavorable is expressed by a VCI of value 4. To confirm the above reported data above, 99% of the medical students responded that they were in favor of vaccines, while among the pharmaceutical area students only 95%.

The second part of the questionnaire focused on attitudes, perceptions, and health information seeking behavior regarding COVID-19 vaccines. Independently from the school, students have shown confidence in the safety profile of COVID-19 vaccines. In fact, almost the totality of them (98.7% for Medicine and 93.8% for the Pharmaceutical Area), have agreed on the fact that subunit vaccines against COVID-19 are safe in terms of formulation and composition (Table 3). Moreover, other questions with the highest number of favorable responses were: "Do you think that COVID-19 vaccines are properly

Table 1. Student's characteristics (for attitudes and perceptions pre-ETA questionnaire)

	Gender			Year of study				
	Females *n* (% in Row)	Males *n* (% in Row)	Prefers not to answer n (% in Row)	II *n* (% in Row)	III *n* (% in Row)	IV *n* (% in Row)	V *n* (% in Row)	VI *n* (% in Row)
Medicine *n*= 326	189 (58%)	132 (40.5%)	5 (1.5%)	-	-	110 (33.7)	114 (35%)	102 (31.3%)
Pharmaceutical Area *n*=97	78 (80.4%)	18 (18.6%)	1 (1%)	27 (27.8%)	10 (10.3%)	6 (6.2%)	54 (55.7%)	-
Overall *n*= 423	267 (63.1%)	150 (35.5%)	6 (1.4%)	27 (6.4%)	10 (2.4%)	116 (27.4%)	168 (39.7%)	102 (24.1%)

Table 2. Student's attitudes about vaccine confidence.

Statements	Medicine N=326		Pharmaceutical area N=97		p-value
	Mean (± SD)	Median	Mean (± SD)	Median	
Vaccines are important for human health.	1.1 (±0.2)	1	1.2 (±0.4)	1	<0,001
Vaccines are effective.	1.2 (±0.4)	1	1.4 (±0.5)	1	<0,001
Vaccines are safe.	1.4 (±0.5)	1	1.6 (±0.6)	2	<0,001
Vaccines are in line with my beliefs.	1.2 (±0.4)	1	1.4 (±0.5)	1	<0,001
Vaccines are dangerous for human health.	3.6 (±0.7)	4	3.5 (±0.7)	4	0,1
Vaccines are not properly studied during clinical trials.	3.4 (±0.9)	4	3.4 (±0.8)	4	0,8
Vaccines are not properly controlled during the production.	3.5 (±0.9)	4	3.4 (±0.9)	4	0,3
Vaccines are produced and recommended just for the economic interest of pharmaceutical companies.	3.6 (±0.6)	4	3.5 (±0.7)	4	0,5

* $p < 0.05$

monitored by pharmacovigilance?" (85.8% for Medicine; 76.3% for the Pharmaceutical Area), "Do you agree with the decision to introduce COVID-19 mandatory vaccination for people over 50 years of age?" (82.8% for Medicine; 80.4% for the Pharmaceutical Area) and "In your opinion, how much does COVID-19 vaccination matter in the fight against SARS-CoV-2 pandemic?" (90% for Medicine; 77% for the Pharmaceutical Area).

As for the level of reported knowledge about COVID-19 vaccines, 45% of medical students said they had sufficient, and 33% good kwnoledge. Also, most of the students in the pharmaceutical area claim to have sufficient (49%) and good (22%) knowledge.

In addition, to assess the trend for seeking health information, students were asked which sources they consulted the most to obtain information on COVID-19 vaccination (it was possible to indicate more than one option). Regardless of the school, it was observed that among students who claim to be in favor of COVID-19 vaccination (94% for Medicine and 81% for the Pharmaceutical Area), 79.4% consulted institutional websites as a source of information; 78.9% obtained information through the University; 59.5% through mass media (TV, radio, newspapers); 47.9% consulted books and scientific papers; 26.0 % obtained information through family and friends; 25.5% from the family doctor; 19.8% on blog, forums and not-institutional websites; 14.2% from doctors of the vaccination service; 6.4% from a doctor they trusted; 1.3% from a pediatrician; 1% in school; 0.5% from a gynecologist/ obstetrician; 4.9% from other sources.

Students' satisfaction (post-ETA questionnaire)

At the end of the course, students were offered a satisfaction questionnaire with the aim of assessing the perceived quality of teaching and the propensity for vaccinations. A brief description of the participants is reported in Table 4. Overall, 399 students completed the satisfaction questionnaire and among them, 308 (77.1%) were students enrolled in the single-cycle degree in Medicine, while 91 (22.8%) in Pharmaceutical degrees. As in the previous case, most students were females (n= 258;

Table 3. Students' attitudes and perceptions on COVID-19 vaccines

Statements	Medicine N=326 (%)		Pharmaceutical Area N=97 (%)	
Topic: "COVID-19 vaccines safety"				
Do you think that the vaccine vials may contain microorganisms (from which the vaccines are obtained) not adequately treated to make them harmless and unable to cause disease?	Yes No Don't know	n= 17 (5.2) n= 283(86.8) n= 26 (8.0)	Yes No Don't know	n=10 (10.3) n= 69 (71.1) n= 18 (18.6)
Do you think that COVID-19 vaccine vials may contain harmful components?	Yes No Don't know	n= 7 (2.2) n= 273 (83.7) n= 46 (14.1)	Yes No Don't know	n= 2 (2.1) n= 80 (82.4) n= 15 (15.5)
Do you think mRNA vaccines for the prevention of disease caused by SARS-CoV-2 disease, as they are made, are safe?	Yes No Don't know	n= 305 (93.6) n= 3 (0.9) n= 18 (5.5)	Yes No Don't know	n= 76 (78.4) n= 1 (1.0) n= 20 (20.6)
Do you think that the viral vector vaccines for the prevention of disease caused by SARS-CoV-2, as they are made, are safe?	Yes No Don't know	n= 273 (83.7) n= 5 (1.5) n= 48 (14.7)	Yes No Don't know	n=63 (64.9) n=2 (2.1) n=32 (33.0)
Do you think that subunit vaccines for the prevention of disease caused by SARS-CoV-2, as they are made, are safe?	Yes No	n= 322 (98.8) n= 4 (1.2)	Yes No	n=91 (93.8) n=6 (6.2)
Topic: "COVID-19 vaccines development"				
Do you think that the development of the SARS-CoV-2 vaccines already on the market has been too fast to the detriment of their safety and/or their effectiveness?	Yes No Don't know	n= 16 (5.0) n= 244 (74.8) n= 66 (20.2)	Yes No Don't know	n=16 (16.5) n=56 (57.7) n=25 (25.8)
Do you think that the procedure for evaluating clinical trials for marketing authorization by the regulatory agencies for the now available SARS-CoV-2 vaccines was too fast to the detriment of their safety and/or efficacy	Yes No Don't know	n= 20 (6.1) n= 247 (75.8) n= 59 (18.1)	Yes No Don't know	n=13 (13.4) n=61 (62.9) n=23 (23.7)
Topic: "Vaccine vigilance"				
Do you think that COVID-19 vaccines are properly monitored by pharmacovigilance?	Yes No Don't know	n= 280 (85.9) n= 10 (3.1) n= 36 (11.0)	Yes No Don't know	n=74 (76.3) n=5 (5.15) n=18 (18.6)
In your opinion, do you think that the COVID-19 vaccines pharmacovigilance ensures their safety?	Yes No Don't know	n= 257 (78.8) n= 12 (3.7) n= 57 (17.5)	Yes No Don't know	n=69 (71.1) n=7 (7.2) n=21 (21.7)
Topic: "COVID-19 Vaccination plan"				
Do you agree with the decision to introduce COVID-19 mandatory vaccination for people over 50 year of age?	Yes No Don't know	n= 270 (82.8) n= 31 (9.5) n= 25 (7.7)	Yes No Don't know	n=78 (80.4) n=9 (9.3) n=10 (10.3)
Would you recommend a COVID-19 vaccination to a pregnant woman?	Yes No Don't know	n= 230 (70.5) n= 10 (3.1) n= 86 (26.4)	Yes No Don't know	n=44 (45.4) n=8 (8.2) n=45 (46.4)
In your opinion, how much does COVID-19 vaccination matter in the fight against SARS-CoV-2 pandemic?	Very relevant Quite relevant	n= 293 (89.9) n= 33 (10.1)	Very relevant Quite relevant Little Not relevant	n=77 (77.0) n=15 (15.0) n=4 (4.0) n=1 (1.0)

Table 4. Student's characteristics (for satisfaction questionnaire)

	Gender			Year of study				
	Females *n* (% in Row)	**Males** *n* (% in Row)	**Prefers not to answer** n (% in Row)	**II** *n* (% in Row)	III *n* (% in Row)	IV *n* (% in Row)	**V** *n* (% in Row)	**VI** *n* (% in Row)
Medicine *n*= 308	184 (59.7%)	122 (39.6%)	2 (0.7%)	-	-	108 (35.1%)	102 (33.1%)	98 (31.8%)
Pharmaceutical Area *n*=91	74 (81.3%)	16 (17.6%)	1 (1.1%)	8 (8.8%)	24 (26.4%)	5 (5.5%)	54 (59.3%)	-
Overall *n*= 399	258 (64.7%)	138 (34.6%)	3 (0.7%)	8 (2%)	24 (6%)	113 (28.3%)	156 (39.1%)	98 (24.6%)

64.4%) (Table 4), attending the V year of Medicine (n=67; 16.8%).

Almost all students expressed a favorable opinion on the course: 55% of medical students considered it "very positive" while for the pharmaceutical area 45% considered it "very positive" (Figure 1).

Also regarding the utility of this ETA, students expressed favorable opinions: "very useful" was indicated by 50% of medicine students; "very useful" was reported by 42% and "useful" by 58% of pharmaceutical area students, proving that the course was highly appreciated by most of the students.

Furthermore, a 4/4 Likert scale was used to evaluate the satisfaction of the topics discussed, where "really useful" is 1 and "really useless" 4. The students have shown that they particularly appreciated the following topics: the different types of COVID-19 vaccines (1.4); the postmarketing surveillance of COVID-19 vaccines (1.4) and those concerning professional insights: the role of the public health specialist in the

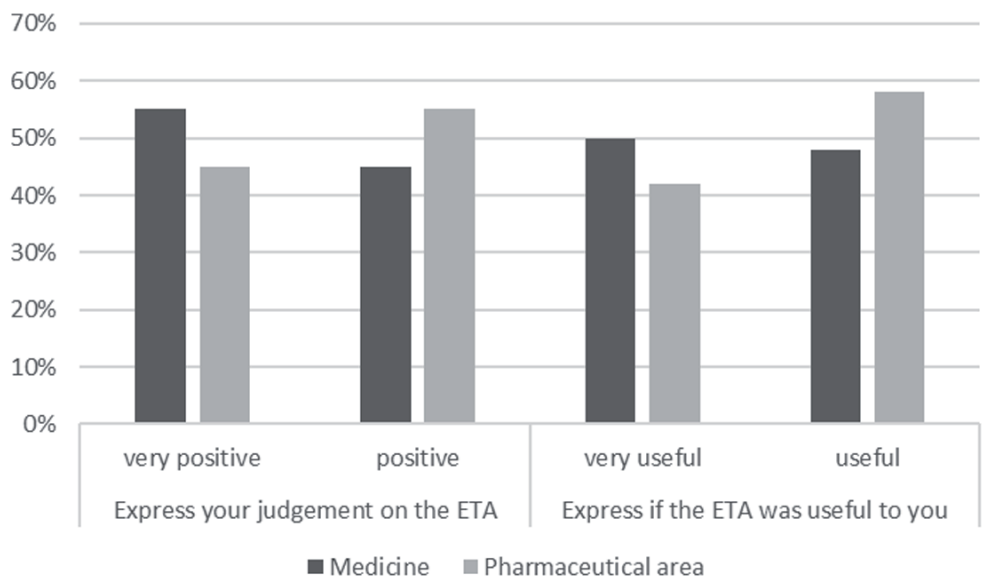

Figure 1. Level of satisfaction expressed by students (%)

COVID-19 vaccination (1.6), the role of the pharmacist in the COVID-19 vaccination (1.5).

Among topics that should be addressed, students suggested mainly the long-term side effects and vaccine hesitancy counseling. After attending the course, the percentage of students in favor of COVID-19 vaccines increased for both medical (from 94% to 99%) and pharmaceutical area (from 81% to 97%) students. In addition, a possible change in the general perception of vaccines after attending the course, was evaluated. The majority (84% for Medicine and 77% for the Pharmaceutical Area) said they remained in favor of vaccines as before, while 11% of medical students and 19% of pharmaceutical area students became more favorable to vaccines.

Discussion

The main goal of the study was to assess the impact of an ETA, regarding COVID-19 vaccines, on the attitudes and perceptions of students in healthcare settings. A secondary objective of the study was to evaluate the students' level of satisfaction with the course. Regardless of the degree attended, a general feeling of confidence in vaccines was observed, a figure confirmed by the VCI, based on the averages for each answer given. The estimation of the index confirmed a propensity toward vaccination for both medical and pharmaceutical area students but slightly higher for the former ones (VCI medicine students = 0.34 vs VCI pharmaceutical area students = 0.41). Compared to vaccines in general, a lower propensity and confidence towards COVID-19 vaccines was reported among students in the pharmaceutical area. This result is likely due to the lesser knowledge of COVID-19 vaccines compared to those already known when the study was performed. In addition, a recent survey carried out in Italy showed that pharmacists' primary apprehension regarding vaccination was vaccine safety, which also served as the main factor behind vaccine hesitancy. Worries about safety primarily revolved around possible side effects, particularly those that may occur over a long period. The accelerated development and Emergency Use Authorization of COVID-19 vaccines might have generated uncertainty and diminished trust (15).

There is also a different opinion on the safety of the various types of COVID-19 vaccines. Medical students seemed to prefer mRNA vaccines in terms of safety (93%), while students in the pharmaceutical area have shown a greater propensity towards subunit vaccines (97%). In the case of medical students, the preference for mRNA vaccines could be due to the fact that severe adverse events reported for mRNA vaccines seem to be very rare (i.e., anaphylaxis 2.5 to 4.8 cases per million doses among adults) (16). A possible explanation for the greater propensity of pharmaceutical area students towards subunit COVID-19 vaccines could be due to their greater familiarity with this technology for vaccine production, which could also influence their perception of the safety profile. However, after attending the ETA, the percentage of students in favor of COVID-19 vaccines increased for both medical (99%) and pharmaceutical area (97%) students, a high acceptance which is in line with the proportion of healthcare workers that declared they would get vaccinated, as reported by a study conducted in Italy (17) and with the current uptake in this population group, also considering the mandatory vaccination for this category (18).

At international level, a similar survey was conducted by Tavolacci et al. (19) among students at a French university in January 2021 (at the beginning of the world's first COVID-19 vaccination campaign) to investigate attitudes and feelings toward

vaccine acceptance. In the study by Tavolacci et al. healthcare students were the most likely to want to be vaccinated (75.9%) and among these healthcare students, medical and pharmacy students were the most likely, and nursing students the least likely. The main reasons for vaccine acceptance were "I don't want to transmit COVID-19 to others", "I want to return to normal life as soon as possible", and "I want to be an actor in the fight against COVID-19".

A more recent study by Ciliberti et al. (20) assessed medical students' attitudes toward COVID-19 vaccination and reports close results to those of our study. They conducted an anonymous online survey on a sample of undergraduate medical students from the University of Genoa, recruited in December 2021; at that time, the third round of vaccination had started in Italy and vaccination had been made mandatory for health professionals. The questions were aimed at exploring their attitudes toward vaccination to prevent COVID-19, their perceptions of the risk/threat, and the factors associated with their attitudes toward COVID-19 vaccination. A high percentage of students stated that they had been vaccinated or that they intended to be vaccinated against SARS-CoV-2. The Likert-type questions revealed high agreement on the importance of vaccination and whether it should be made mandatory ("indispensable tool" and "ethical duty" were cited to explain this position). The results showed a high level of acceptance of COVID-19 vaccination among these medical undergraduates (20).

Regarding the tendency to search for health information, it appears that students who claimed to be in favor of COVID-19 vaccines have consulted more frequently institutional websites (79.4% of the participants) and 78.9% obtained information through the University. On the other hand, an Italian study found that those who relied on social media as a primary source of information were more likely to have a lower perception of the risk posed by COVID-19 and expressed doubts about the effectiveness of vaccines (21).

Limitations

This study has several limitations that must be considered. Firstly, the results obtained from interviews with healthcare students may not be generalizable to other populations, as these students possess high levels of literacy and specialized training in vaccines and vaccinations. Additionally, the students who participated in the study's elective activity may have had a greater interest in vaccines and vaccinations, making them more likely to accept and promote these interventions. Furthermore, the lack of demographic data, such as age, limits the study's ability to provide a detailed understanding of the phenomenon under investigation. It should be noted that not all the respondents who filled out the attitude questionnaire completed later the satisfaction questionnaire, and conversely, there were variations in the number of participants for each questionnaire. Despite these limitations, the study's findings could be useful for future research that employs different methodologies, such as administering a survey to a nationally representative group of students, to further explore this topic. Additionally, the use of VCI facilitated a straightforward and effective estimation of vaccine confidence. Even though the study involved a small and specific group of individuals who received specialized vaccine training, the VCI remains a suitable instrument for analyzing vaccine confidence in larger and more different populations.

Conclusions

The results of our study confirmed that activities such as this ETA held during the academic courses, could be considered

an effective teaching strategy to improve vaccine acceptance rates among students in healthcare settings. Improving access to accurate information on vaccines and vaccination, increasing trust in reliable information sources, and counteracting misinformation can go a long way toward improving vaccination decision-making (22, 23).

Conflicts of Interest: The authors declare no conflict of interest.

Ethical Statement: The research was carried out in accordance with the Declaration of Helsinki's principles. As the data presented were de-identified, ethical approval was not required for this study.

Riassunto

Attitudini e percezioni degli studenti italiani in ambito sanitario riguardo ai vaccini anti-COVID-19 ed alle strategie di vaccinazione, un anno dopo la campagna di immunizzazione

Premessa. Il tema della confidenza vaccinale è sempre più rilevante, in particolare a causa della pandemia da COVID-19 e della distribuzione globale dei vaccini contro il COVID-19. Questa problematica è ancora più critica per gli studenti negli ambiti sanitari, dato il loro futuro ruolo non solo come destinatari dei vaccini, ma anche come sostenitori della vaccinazione. Alla luce di ciò, raggiungere un buon livello di accettazione vaccinale è cruciale. Pertanto, l'obiettivo del nostro studio è stato quello di valutare le attitudini e le percezioni degli studenti di area sanitaria riguardo ai vaccini e alla vaccinazione contro il COVID-19.

Metodi. Gli studenti dell'area medica e farmaceutica hanno partecipato ad un'Attività Didattica Elettiva sui vaccini COVID-19 e sulla campagna di vaccinazione, organizzata presso l'Università di Firenze (Italia) e hanno compilato due questionari anonimi. Il primo questionario, condotto prima dell'Attività Didattica Elettiva, era incentrato sulle attitudini e le percezioni degli studenti nei confronti dei vaccini. Il secondo questionario era stato progettato per valutare la soddisfazione degli studenti riguardo agli argomenti del corso. Sono state eseguite sia analisi descrittive che inferenziali sui risultati. Inoltre, è stato calcolato il Vaccine Confidence Index per valutare la propensione degli studenti nei onti delle vaccinazioni.

Risultati. Un totale di 423 studenti ha partecipato all'Attività Didattica Elettiva nei mesi inziali del 2022. Complessivamente, gli studenti hanno mostrato maggiore fiducia nei vaccini in generale rispetto ai vaccini COVID-19, soprattutto per quanto riguarda il profilo di sicurezza. Il Vaccine Confidence Index degli studenti si è avvicinato molto al valore di 0,25, che indica una propensione a favore delle vaccinazioni. Tuttavia, nel questionario di soddisfazione compilato alla fine del corso, la percentuale di studenti favorevoli alla vaccinazione contro il COVID-19 è aumentata sia per gli studenti di medicina (dal 94% al 99%) che per gli studenti di area farmaceutica (dall'81% al 97%).

Conclusioni. Il nostro studio suggerisce che attività educative come questa Attività Didattica Elettiva potrebbero essere considerate una strategia didattica efficace per migliorare i tassi di accettazione dei vaccini tra gli studenti di area sanitaria.

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Supplementary Materials 1. Structure of attitude questionnaire

In general, are you in favor of vaccinations?
Yes
No
I don't know
Express your degree of agreement with the following statements (Likert scale: options from completely agree to completely disagree)
A1 Vaccines are important for human health
A2 Vaccines are effective
A3 Vaccines are safe
A4 Vaccines are in line with my beliefs
B1 Vaccines are dangerous for human health
B2 Vaccines are not adequately studied in clinical trials
B3 Vaccines are not adequately controlled during production
B4 Vaccines are produced and recommended only for the economic interest of companies
Are you in favor of the COVID-19 vaccination?
Yes
No
I don't know
It depends on the type of vaccine offered to me
Do you think COVID-19 vaccine vials may contain microorganisms that have not been adequately treated to make them harmless and incapable of causing disease?
Yes
No
I don't know
Do you think COVID-19 vaccine vials may contain harmful components?
Yes
No
I don't know
Do you think mRNA vaccines for the prevention of disease caused by SARS-CoV-2 are safe as they are made?
Yes
No
I don't know
Do you think viral vector vaccines for the prevention of disease caused by SARS-CoV-2 are safe as they are made?
Yes
No
I don't know
Do you think subunit vaccines for the prevention of disease caused by SARS-CoV-2 are safe as they are made?
Yes
No
I don't know
Do you think the clinical development of vaccines against SARS-CoV-2 already on the market has been too fast at the expense of their safety and/or efficacy?
Yes
No
I don't know
Do you think COVID-19 vaccines are adequately monitored by pharmacovigilance?
Yes
No
I don't know

Do you think pharmacovigilance of COVID-19 vaccines guarantees their safety?
Yes
No
I don't know
Do you agree with the decision to introduce the mandatory COVID-19 vaccination for people over 50 years old?
Yes
No
I don't know
Would you recommend COVID-19 vaccination to a pregnant woman?
Yes
No
I don't know
How relevant do you think COVID-19 vaccination is in the fight against the SARS-CoV-2 pandemic?
Very relevant
quite relevant
not very relevant
not relevant at all
Do you have any concerns about COVID-19 vaccines?
Yes
No
How do you rate your current level of knowledge about COVID-19 vaccines?
Poor
Insufficient
Sufficient
Good
Excellent
To date, where/from whom have you obtained information about COVID-19 vaccination? (Multiple answers possible)
Word of mouth (family, friends)
Books, scientific journals
Institutional websites
Blogs/forums/non-institutional websites
Traditional mass media (TV, radio, newspapers)
Vaccination service doctor
Family doctor
Pediatrics
Private trusted doctor
Gynecologist, midwife, family planning clinic
School
University
Other

Supplementary Materials 2. Structure of satisfaction questionnaire

Express your judgment on the ETA as a whole:
very negative
negative
positive
very positive
Express if the ETA was useful to you:
useless
slightly useful
useful
very useful
To what extent were your expectations at the beginning of the course satisfied?
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
The content covered during the ETA:
was already known to you.
was not known to you.
was partially known to you, but you wanted to deepen your understanding.
The topics addressed:
were adequately covered.
were not adequately covered.
Why do you think the topics addressed were not adequately covered?
The course was too short to delve deeper into the topics.
Other topics were preferred without delving too deeply into the themes.
Express your judgment on the individual topics covered (Likert scale options from very useful to very unuseful):
The different types of COVID-19 vaccines
Mass COVID-19 vaccination
Process for releasing a vaccine and the role of the Qualified Person
Vaccine vigilance of COVID-19 vaccines
The role of the pharmacist in COVID-19 vaccination
Product Technical Complaint and management of recalls
Are there any other topics that were not covered that you would have liked to address?
Yes
No
Do you have any suggestions, criticisms, or proposals to make?
Yes (specify)
No
Would you recommend this type of training to a colleague next year?
Yes
No

Do you believe that this type of training is necessary for your profession?
Yes
No
After participating in the ETA, how do you rate your current knowledge level about COVID-19 vaccines?
Insufficient
Sufficient
Good
Excellent
After participating in the ETA, are you in favor of COVID-19 vaccination?
Yes
No
I don't know.
Did the ETA change your judgment on vaccines in general?
Yes, now I am more in favor of vaccines.
No, I remained in favor of vaccines as before.
No, I remained not in favor of vaccines as before.
I don't know.