

Nursing students and COVID-19 vaccination. ESitA Study An Observational Study

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Abstract. *Background and aim of the work:* Vaccine hesitancy is an important problem in terms of health policy. This historical moment leads us to wonder if vaccine hesitancy is also present among nursing students who should be particularly sensitive to the subject *Research design and methods:* Between 10 and 17 February 2021, 1080 students enrolled in the Bachelor of Science in Nursing course of the Department of Medicine of the University of Perugia were invited to answer an online questionnaire sent to their university mailboxes for an observational study. The questionnaire initially asked the students' personal data; then, among others, it asked whether they had fallen ill, whether they considered government interventions effective, whether the vaccine was safe, whether there was a real health emergency. Finally, whether they had undergone the vaccine *Results:* A certain amount of vaccination hesitancy was detected among the students in our study. It can be assumed that the issues surrounding the AstraZeneca vaccine, which occurred at the start of the vaccination campaign, may have led to an increase in people's hesitancy. Boosting vaccination campaigns, including appropriate use of social media, may lead to greater acceptance. *Conclusions:* At would be useful to assess the cultural basis of the recent anti-Vax controversy, particularly for students of nursing or other health professions, who should be able to evaluate, source and recognize the most validated data. (www.actabiomedica.it)

Key words: COVID-19, nurse, vaccine hesitancy, SARS COV 2, student

Background

The term “vaccine hesitancy”, according to the standards the SAGE Working Group on Vaccine Hesitancy, means “to refer to the delay in the acceptance or the refusal of vaccination despite the availability of vaccination services”. The same sources denote how this phenomenon is extremely complex and is based in the specific context of reference. In fact, it is specific to the place, it varies over time and the type of vaccine. Other influencing factors are complacency, convenience and trust (1).

After the onset of the Covid 19 pandemic clinical research has proven, once again, to be a fundamental

resource. In an extremely short time, various pharmaceutical companies have developed several vaccines that have shown excellent effectiveness. In Italy, the vaccine produced by the pharmaceutical company Pfizer (Comirnaty), has been administered since December 27, 2021, while other products are pending approval (2). COVID-19 vaccine studies began in spring of 2020. Studies lasted only a couple of months compared to the standard timeline. However, there was a tremendous number of participants, about ten times more compared to similar studies of other vaccine developments. Therefore, numbers were sufficient to demonstrate effectiveness and safety (3). None of

the regular steps to verify the effectiveness and safety of the vaccine were skipped. The short time that led to a rapid development of the vaccine was made possible thanks to several factors. First, the many years of research already conducted on RNA vaccines. Second, the great human and economic resources readily made available and third, the evaluation of the results by regulatory agencies was not conducted at the end of the studies but as they were produced. The safety and efficacy profile of this vaccine has been evaluated in research conducted in several countries. (3) Efficacy was demonstrated one week after the second dose.

The extremely urgent nature of the situation, added to the known anti-Vax controversy (4) that already exists for other types of vaccines, made it extremely difficult to obtain the coverage necessary to reach herd immunity (5,6,7). As a matter of fact, vaccination is still perceived as unsafe by an important part of the population, including healthcare providers (8).

In Italy, vaccination coverage for both flu syndromes and highly infectious diseases such as measles is extremely difficult (9). This hesitancy reshapes the vaccination policies and the tools through which they are implemented (10, 6, 11). The issues call for a profound reflection on the matter (12, 7). In this context, future healthcare providers should be trained with knowledge based on the extensive evidence of efficacy and safety of vaccines. The new generations of practitioners represent a fundamental tool to convey this message especially among parents of young children (13). Nursing students were chosen as the population for our study because we believe students represent a meeting point between citizens and healthcare workers; in fact, not yet being part of the healthcare force, students are able to define the needs and concerns of the population (14, 4, 8). The primary objective of the study is to try to understand if there is vaccination hesitancy among nursing students, and possibly understand from where they stem.

Methods

Study Design

The hypothesis that was investigated concerned the possible presence of vaccination hesitancy for

COVID 19 in a population group representing part of the future generation of health workers

The chosen study design is observational and an ad hoc questionnaire was prepared and submitted to a group of experts working in several Italian hospitals. The questionnaire was completed with 23 closed questions. The study was conducted by administering the questionnaire to a sample of 10 nursing students to check the comprehensibility and consistency of the different items. In particular, we asked for comments on the degree of clarity of the questionnaire's cover letter; the degree of overall clarity of the questionnaire; and the degree of overall neutrality of the questionnaire.

Study population

The ESit.A Study - *ESitazione vaccinale durante una pandemia* was conducted on a sample population of 1080 students of the Bachelor Degree in Nursing of the University of Perugia. To send the questionnaire, university email addresses were used and also included a cover letter explaining the project and its purpose. At the beginning of the questionnaire, confidentiality guarantees were described and students were asked to accept or refuse to fill in the questionnaire. Those who refused, were asked to specify the reason.

Measurements and data collection

The online survey was conducted with Google Forms™ from the 10th to the 17th February 2021. The homepage presented the online consent form with specific information on the purpose of the study and the general description of the questionnaire. In addition, the time needed to complete the survey (less than 10 minutes) and privacy information were reported. In particular, to ensure anonymity, the IP address was not registered and no sensitive data was requested. Investigators and the research team have not employed any active publicity to increase recruitment rates, nor have they played any active role in selecting and/or targeting specific subsets of respondents.

The questionnaire was anonymous and consisted of 23 close-ended questions. The items were articulated starting from demographic sections to get to sections

where students expressed the reasons for their various choices, the perception of the pandemic in progress, and if they had been infected by the virus or they knew someone who had been infected. Also investigated was their attitude towards previous vaccination campaigns, especially those not mandatory. Participants were asked if they had knowledge of Covid 19, fears towards the COVID 19 vaccine (on safety, speed of development, contraindications, news received about), their level of confidence in government interventions, economic interests towards the vaccine, and the need to make the COVID19 vaccine mandatory.

Statistical analysis

The data was organized on an Excel 2019® spread-sheet (Microsoft Corporation, WA, USA) then elaborated according to the statistical program Stata 14.1 (Copyright 1996–2015 StataCorp LP, 4905 Lakeway Drive, College Station, TX 77845 USA). Descriptive statistics was performed using frequencies, percentages, frequency tables for categorical variables and mean \pm standard deviation (SD) for quantitative variables. Non-parametric Mann-Whitney test

was performed to compare continuous variables with no normal distribution. Categorical variables were evaluated by X^2 analysis or Fisher's exact test were appropriate. The Hosmer and Lemeshow test were performed for the *goodness of fit* for the logistic regression model. All the variables included in the final model had a P-value < 0.25 .

Results

The questionnaire was sent to 1080 students, yielding 804 responses, with a response rate of 74.4%. The test sample showed that 737 (91.67%) students would get vaccinated, while 67 remaining (8.33%) would not. As described in Table 1, 92.33% of female students (n.590) and 89.09% of male students (n.147) intended to get vaccinated. On the other hand, 7.67% of female (n.49) and 10.91% of male (n.18) students expressed hesitation about vaccination. However, the gender-related percentage difference was not statistically significant ($p=0.179$) as described in Table 2.

Distinguishing by year of course, a gradual trend in the propensity to get vaccinated can be seen

Table 1. Descriptive statistics

Item	Category	yes vax		no vax		tot	p-value
		n	Row %	n	Row %		
1	Female	590	92,33	49	7,67	639	0,179
	Male	147	89,09	18	10,91		
2	Fist	253	89,72	29	10,28	282	0,492
	Second	183	91,96	16	8,04		
	Third	233	93,20	17	6,80		
	Out of course	68	93,15	5	6,85		
3	18–25	618	91,42	58	8,58	676	0,560
	> 25	119	92,97	9	7,03		
4	Classis/scientific high school	307	93,31	22	6,69	329	0,160
	Other	430	90,53	45	9,47		
5	< 5000 pop	140	91,50	13	8,50	153	0,670
	between 5.000 and 10.000 pop	281	92,74	22	7,26		
	> 10.000 pop	316	90,80	32	9,20		
6	Many frustrations	72	84,71	13	15,29	85	0,014

(Continued)

Item	Category	yes vax		no vax		tot	p-value
	<i>Many rewards</i>	665	92,49	54	7,51	719	
7	Yes	696	94,44	41	5,56	737	0,003
	No	57	85,07	10	14,93	67	
8	<i>Insufficient</i>	326	89,56	38	10,44	364	0,049
	<i>Optimal</i>	411	93,41	29	6,59	440	
9	<i>Ineffectual</i>	39	60,00	26	40,00	65	<0,001
	<i>Useful</i>	698	94,45	41	5,55	739	
10	<i>I don't think there is</i>	36	65,45	19	34,55	55	<0,001
	<i>I'm very worried</i>	701	93,59	48	6,41	749	
11	<i>Favorable</i>	736	92,70	58	7,30	794	<0,001
	<i>Adverse</i>	1	10,00	9	90,00	10	
12	<i>Inadequate</i>	260	84,14	49	15,86	309	<0,001
	<i>Adequate</i>	477	96,36	18	3,64	495	
13	Yes	163	72,44	62	27,56	225	<0,001
	No	574	99,14	5	0,86	579	
14	Yes	230	97,87	5	2,13	235	<0,001
	No	507	89,10	62	10,90	569	
15	Yes	605	98,53	9	1,47	614	<0,001
	No	132	69,47	58	30,53	190	
16	Yes	123	78,85	33	21,15	156	<0,001
	No	614	94,75	34	5,25	648	
17	Yes	41	66,13	21	33,87	62	<0,001
	No	696	93,80	46	6,20	742	
18	Yes	96	80,00	24	20,00	120	<0,001
	No	641	93,71	43	6,29	684	
19	Yes	126	80,25	31	19,75	157	<0,001
	No	611	94,44	36	5,56	647	
20	Yes	46	77,97	13	22,03	59	<0,001
	No	691	92,75	54	7,25	745	
21	Yes	676	96,43	25	3,57	701	<0,001
	No	61	59,22	42	40,78	103	
22	Yes	698	97,35	19	2,65	717	<0,001
	No	39	44,83	48	55,17	87	
23		737	91,67	67	8,33	804	

Legenda: 1: Sex; 2: Year of course; 3: Age group; 4: You training; 5: The population where you live; 6: Do you think working as a nurse I can give you; 7: Do you know anyone who has been infected with Sars Cov 2?; 8: Your knowledge about Sars Covid 2 are; 9: The vaccine campaigns are; 10: How do you feel about the current health emergency?; 11: With respect to optional vaccinations your opinion is; 12: The informations received about the Sars Cov 2 vaccine is; 13: Are you afraid of Covid 19 vaccine?; 14: Do you have confidence in government interventions?; 15: Covid 19 vaccine is safe; 16: Covid 19 vaccine was made too quickly; 17: Covid 19 vaccine has too many contraindications; 18: Covid 19 vaccine doesn't develop the necessary immunity; 19 : Economic interests overestimate the effectiveness/safety of Covid 19 vaccine; 20: More vaccine are administered than are useful; 21: Covid 19 vaccine should be compulsory for health professionals; 22: Would you recommend the Covid 19 vaccination?; 23: Will you getting the Covid 19 vaccination?

Table 2: Univariable and multivariable analysis

Item	Category	Uni variate	P	Multi variate	P
1	Male	1.47 (0.42)	0.18	-	-
	Female (ref)	-	-	-	-
2	First	1.31 (0.43)	0.40	-	-
	Third	0.83 (0.30)	0.61	-	-
	Out of course	0.84 (0.45)	0.75	-	-
	Second (ref)	-	-	-	-
3	18-25	1.24 (0.46)	0.56	-	-
	> 25 (ref)	-	-	-	-
4	Classic/scientific high school	1.46 (0.34)	0.16	-	-
	Other	-	-	-	-
5	between 5.000 and 10.000 pop	0.84 (0.31)	0.64	-	-
	> 10000 pop	1.09 (0.8)	0.40	-	-
	< 5000 pop (ref)	-	-	-	-
6	Many frustrations	2.22 (0.74)	0.002	2.94 (1.53)	0.042
	Many rewards (ref)	-	-	-	-
7	Yes	2.98 (1.13)	0.004	-	-
	No (ref)	-	-	-	-
8	Optimal	1.65 (0.42)	0.05	-	-
	Insufficient (ref)	-	-	-	-
9	Useful	11.55 (3.40)	<0.001	2.75 (1.41)	0.049
	Ineffectual (ref)	-	-	-	-
10	I don't think there is a health emergency	7.71 (2.47)	<0.001	-	-
	I am very worried (ref)	-	-	-	-
11	Favorable	114.20 (121.38)	<0.001	15.7 (23.71)	0.068
	Adverse (ref)	-	-	-	-
12	Inadequate	4.99 (1.43)	<0.001	-	-
	Adequate (ref)	-	-	-	-
13	Yes	43.67 (20.60)	<0.001	11.11 (6.30)	<0.001
	No (ref)	-	-	-	-
14	No	5.63 (2.65)	<0.001	-	-
	Yes (ref)	-	-	-	-
15	Yes	29.53 (10.95)	<0.001	2.96 (1.41)	0.022
	No (ref)	-	-	-	-
16	Yes	1.48 (0.10)	<0.001	1.20 (0.12)	0.069
	No (ref)	-	-	-	-
17	Yes	7.75 (2.39)	<0.001	-	-
	No (ref)	-	-	-	-

(Continued)

Item	Category	Uni variate	P	Multi variate	P
18	Yes	3.73 (1.03)	<0.001	2.97 (1.30)	0.013
	No (ref)	-	-	-	-
19	Yes	4.17 (1.10)	<0.001	-	-
	No (ref)	-	-	-	-
20	Yes	3.62 (1.25)	<0.001	-	-
	No (ref)	-	-	-	-
21	Yes	18.60 (5.32)	<0.001	3.34 (1.37)	0.003
	No (ref)	-	-	-	-
22	Yes	45.21 (14.33)	<0.001	11.47 (5.17)	<0.001
	No (ref)	-	-	-	-

Legenda: 1: Sex; 2: Year of course; 3: Age group; 4: You training; 5: The population where you live; 6: Do you think working as a nurse I can give you; 7: Do you know anyone who has been infected with Sars Cov 2?; 8: Your knowledge about Sars Covid 2 are; 9: The vaccine campaigns are; 10: How do you feel about the current health emergency?; 11: With respect to optional vaccinations your opinion is; 12: The informations received about the Sars Cov 2 vaccine is; 13: Are you afraid of Covid 19 vaccine?; 14: Do you have confidence in government interventions?; 15: Covid 19 vaccine is safe; 16: Covid 19 vaccine was made too quickly; 17: Covid 19 vaccine has too many contraindications; 18: Covid 19 vaccine doesn't develop the necessary immunity; 19 : Economic interests overestimate the effectiveness/safety of Covid 19 vaccine; 20: More vaccine are administered than are useful; 21: Covid 19 vaccine should be compulsory for health professionals; 22: Would you recommend the Covid 19 vaccination?.

although it is not statistically significant ($p=0.492$). In fact, 89.72% of first year nursing students would get vaccinated, increasing to 91.96% for the second year nursing students (253 out of 282 students) and to 93.20% in the third year (253 out of 282 students). Also, 93.15% of off-course students (68 out of 73) would take the vaccine. Even between the two age groups into which the population examined was divided, the difference is very small. In fact, age does not seem to be correlated with the choice to opt for vaccination ($p=0.56$). Aggregation according to different previous schooling also showed no significant differences in the subclasses. ($p=0.160$).

In the sample of our students, those living in centers with a population of less than 5,000 rather than in centers with a population between 5,000 and 10,000 or with a population greater than 10,000, did not significantly influence the decision to get vaccinated ($p=0.670$). The first factor that seems to influence the propensity to vaccinate or not is the prospective that the student has on the future profession that they will pursue ($p=0.014$). In fact, 15.29% of the participants who declared that working as a nurse could be frustrating and unfulfilling in some ways would not get vaccinated (of the hesitant students) compared to 7.51% of the hesitant students who instead considered it rewarding and potentially full of satisfaction.

Another element suggested as favorable to vaccination is the one explored by item n.7 "Do you know anyone who has been infected with Sars Cov 2?". In this case, having personally experienced the disease or having had family members or acquaintances who had fallen ill was found to be a strong predisposing factor to vaccination ($p=0.003$). Among the hesitant students, 10.44% of them claimed they had an insufficient level of knowledge about SARS-Cov-2, significantly higher than the 6.59% of those who said they had an adequate level of knowledge. Believing that vaccination campaigns are ineffective is a clear disincentive. This factor affects 40% of the hesitant students in the study sample. On the other hand, only 5.55% of the students who have confidence in the effectiveness of vaccination campaigns expressed concern about future vaccination against Covid 19. The underestimation of the emergency condition of the Covid 19 pandemic, also seems to lead a significant percentage of students towards non-vaccination (see Table n.1, item 10: "How do you feel about the current health emergency?").

Those favorable towards non-compulsory vaccinations, seem to be inclined to get vaccinated against Covid 19 ($p=0.001$). Information on the Covid-19 vaccine plays an important role in the choice of vaccination; 73.13% of the students who would not get vaccinated (49 of 67 students) expressed that the

information they received was inadequate. If we look at table 1, we see that there is a lack of confidence in government intervention as well as the perception that the vaccine is not safe, leading to 10.90% and 30.53% of the respondents to respectively choose to not be vaccinated (for both $p=0.001$).

Subsequent items regarding the perception that the vaccine was developed too quickly (item 16: “*Covid 19 vaccine was made too quickly*”), that it has too many contraindications (item 17 “*Covid 19 vaccine has too many contraindications*”) and that it does not develop the necessary immunity (item 18: “*Covid 19 vaccine doesn't develop the necessary immunity*”), also significantly influenced whether or not participants would get vaccinated. 31 out of 67 students who had not been vaccinated ($p=0.001$) believe that the efficacy and safety of the vaccine against COVID-19 are overestimated due to economic interests. This hypothesis also seems to be confirmed by the answers to item 20 (“*More vaccine are administered than are useful*”). 22.03% of those who would not get vaccinated (13 out of 59 interviewees) replied in an affirmative way, compared to 7.25% (54 out of 745) who had a negative reply.

Analyzing item 21 (“*Covid 19 vaccine should be compulsory for health professionals*”) there is a very large consensus on mandating COVID 19 vaccinations for healthcare workers among students in favor of the vaccine. On the contrary, hesitant students are unfavorable to mandatory vaccination (59,22% vs 40,78%). A very similar trend is also found in the sample examined regarding attitudes towards the recommendation to vaccinate against Covid 19. In fact, 698 out of 373 students in favor of vaccination would recommend it to friends, family members or acquaintances (94.71%). A suggestion that would instead come from only 19 of 67 hesitant students (28.36%).

Conclusion

The data of our study has led us to reflect on some relevant points. The first is the hesitation rate of 8.33% in our sample which consists of all nursing students of the University of Perugia in three different Umbrian sites. Results are in line with recent studies which show hesitation rates of 7.30% (15) and 13.90% (9) among the Israeli and Italian populations respectively. These

results are lower by about one third when compared with other international data. In fact, Mustafa et al. (16), who evaluated 19 studies in 39 countries, showed a hesitation rate of 18.9% among healthcare students (95% Ci=14.5-24.2).

The reasons behind vaccine hesitancy can be analyzed using the epidemiological triad. Firstly, environmental factors, which include public health policies, social factors and media messages. Secondly, agent factors (vaccine and disease) which involve perceptions of vaccine safety and efficacy as well as perceived susceptibility to disease. Lastly, host factors which depend on knowledge, prior experience, education and income levels.

Analysis of the gender distinction reveals that men in our study seem to be more hesitant than women, contrary to what other studies show (17, 16, 8). However, the majority of students enrolled in nursing and health related degrees are female which leads to a potential bias that needs further assessment. In addition, there were no significant differences in participants' level of education, year of study and qualification possessed before enrolment. Tavalacci et al. (18) found that age, sex and being enrolled in the first years of study were associated with a significantly higher risk of vaccine hesitancy. In our study the indirect correlation between year of study and vaccine hesitancy was confirmed despite not being statistically significant. In addition, in line with what is suggested by the literature, the difference between living in a big city compared to a small town has no statistical significance (18).

A first, and in some ways original finding, which we have not found in other published studies, is a positive correlation between vaccination and the belief that the profession is fulfilling. It would be useful to engage in further research to try and understand the motivations that drive people to enroll in a nursing degree program. Perhaps, hypothesizing a relationship between choosing a nursing career out of economic necessity, which may lead to being unsatisfied, compared to a choice dictated by passion. To interpret these results, the Italian version of the Jefferson Scale of Empathy-Health Professional Student's version could be utilized (19).

Having direct or indirect experience of Sars Cov 2 disease seems to favor the choice of vaccination, a finding that is also confirmed in the international literature

(15, 20). Our results highlight the need to develop special educational campaigns aimed at limiting the phenomenon of vaccination resistance and hesitation, therefore improving knowledge that seems insufficient to motivate students to vaccinate (19). Often social media and the web present inaccurate information that fuel disinformation. However, the same media tools can be an important weapon that government agencies could use to fight the described phenomenon and reach a wider and heterogeneous audience (21).

As already represented by Malik Sallam mass production of vaccines and their equitable distribution, together with collaborations among all stakeholders, can lead to *“build confidence in COVID-19 vaccination among the general public by disseminating timely and clear messages through reliable channels that support the safety and effectiveness of currently available COVID-19 vaccines.”* (22, p.10). As already suggested by Al-Mulla and colleagues (23), it is also important to highlight how research has more and more appropriate tools to allow policy makers to take evidence based measures in almost real time. As highlighted in other studies the information available is continuously updated and it is likely that people’s attitudes will change as more data and information on the COVID-19 vaccine becomes available (22). In fact, those who are more aware of the risks appear to be more willing to accept vaccination (8), as highlight by a recent study which uses the adherence rate of health professionals to the flu vaccine as a predictive factor for adherence to the Covid 19 vaccine (23). The results show that it would be difficult to achieve herd immunity. *“Our study has several important public health implications. First, identification of determinants associated with COVID-19 vaccination intention and influenza vaccination helps inform future vaccination campaigns”* (7, p.7)

The hesitation of vaccination seems to have social media as a vehicle, which in fact have greater penetration (24). As stated in a recent study (25), also our data in items 13, *(Are you afraid of Covid 19 vaccine?)* 15, *(Covid 19 vaccine is safe)* 16, *(Covid 19 vaccine was made too quickly)* 17 *(Covid 19 vaccine has too many contraindications)* 18 *(Covid 19 vaccine doesn’t develop the necessary immunity)* suggests the subjects’ concerns about the vaccine. It highlights how students are against vaccines in general; they think that the vaccine

was produced in a hurry; that it has too many contraindications and that it does not develop the necessary immunity, leading them to refusing vaccination. It should be noted that a considerable percentage of our sample believes that the current health emergency does not exist, even though our country has been one of the most affected.

Concerns regarding safety and vaccine side effects were the predominant reasons for students to avoid vaccination. This is also reflected in the literature analyzed. Our study was conducted before the well-known restrictions that have been mandated for the Astrazeneca vaccine, which led several states to suspend the administration or limit it to only certain age groups. Therefore, possibly the number of vaccine hesitant nursing students could have been higher, as already assumed by other studies (26).

Our data seem to confirm that clear and targeted interventions may limit the concerns of the population and the belief that recommendations are the result of political interests (19). Kanyike and colleagues already noted that the side effects of the vaccine prompted students to develop a certain opposition, which was strongly influenced by social media, this therefore suggests that students should rely more on different information sources and not on social media (17). Creating awareness-raising policies associated with communication strategies based on psychosocial research remains an extremely valid avenue and *“is an important step towards adequately sensitizing individuals and communities to the value of preventive behavior as their right and responsibility”* (9, p.782-3).

At present, it is not the intention of the Italian government to make vaccination mandatory for the population. On the other hand, the Italian Chamber of Deputies has approved the conversion into law of Decree no. 44 of 1 April 2021 which mandates compulsory vaccination for health workers. Italy also mandated the “green certificate”, already approved by the European Parliament, which came into force on August 6 and starting October 15 2021, and was also made mandatory for workplaces. Hence the need to understand whether or not compulsory vaccination is a useful tool, allowing higher vaccination rates to be achieved or, on the contrary, maybe one more reason to increase refusal (27, 28). Based on research data it

appears that “*Efforts to increase vaccination rates, including education, persuasion, incentivization, and coercion have been only partially effective and may be contributing to a backlash against the vaccines. Further exploration of the risks and benefits of the vaccines are needed along with increased transparency about these risks and benefits. Additionally, research examining options for the prevention and treatment of COVID-19 must also be supported to help manage breakthrough cases and treatments for individuals who refuse vaccination or cannot mount an adequate immune response.*” (29, p.18)

Some limitations to this study were noted:

- There is a self-selection bias, while ensuring anonymity.
- Students who are not interested in vaccination may not complete the questionnaire.
- We tried to eliminate this problem by inviting people to provide reasons for refusal, but we received only one feedback, so we cannot comment on it.
- The sample is limited to the students of the Bachelor Degree in Nursing at the University of Perugia.

There was some hesitancy among the students in our study; it can be rationally assumed that the problems with Astra-Zeneca, which occurred at the beginning of the vaccination campaign, may in some cases lead to an increase in this hesitancy, although it does not seem to lead to substantial changes substantial the use of other types of vaccines (30, 26). Information campaigns to try to clarify doubts among practitioners, including vaccine safety, could be a useful tool to try and limit such concerns (25, 22). A recent Polish study found that clear and centralized organization is one of the reasons why people are positively influenced towards vaccination (31). We should also consider how we can convey the message that the vaccine is safe and can create the necessary immunity, thus leading to a potentially greater acceptance. The recent bitter anti-vax controversy should make us reflect on the most appropriate means to reduce controversy, and take into account the possible cultural basis of this rejection. Understanding and trying to change certain beliefs seems, now more than ever, to be a way forward.

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