

Navigating vaccine confidence: A mixed methods study investigating healthcare providers' perspectives across four non-EU European regions

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ABSTRACT

Background: Vaccine confidence remains a global public health challenge, especially highlighted during the COVID-19 pandemic. Public trust in vaccines is crucial, with healthcare providers (HCPs) playing a pivotal role in navigating this sensitive topic. This requires an understanding of HCPs' perceptions of vaccines. Most European studies focus solely on the 27 EU countries, with sparse evidence available among other European countries. This study aims to expand the scope of HCPs' vaccine confidence oversight into European regions where limited research has been conducted thus far.

Methods: The study employed a mixed-methods approach to examine vaccine confidence among HCPs (general practitioners and nurses) in six European countries outside of the EU: North Macedonia, Bosnia & Herzegovina (Balkans), Belarus (Eastern Europe), Armenia, Georgia (Caucasus), and Kazakhstan (Central Asia). Quantitative surveys ($N = 600$) assessed vaccine confidence levels and recommendation practices, which were analyzed using SPSS. Qualitative interviews ($N = 30$) provided deeper insights into HCPs' perceptions of vaccination, role, and training needs, and were processed using NVivo.

Results: Findings revealed varying levels of vaccine confidence among HCPs across the six countries. The quantitative survey indicated disparities in confidence levels, with Belarus and Kazakhstan exhibiting notably lower confidence in vaccines. North Macedonia stands out as the country where HCPs are most confident about their role in encouraging vaccination, while the remaining five countries share similar lower levels. Qualitative interviews provided deeper insights into HCP perspectives, highlighting the complexities of tailoring recommendations and the collaborative decision-making process. HCPs expressed a clear need for training on vaccination, particularly in understanding effective doctor-patient communication.

Conclusions: These findings underscore the value of implementing targeted interventions to support HCPs, for example by providing training in vaccination knowledge and communication to improve their confidence in addressing patient concerns about vaccination. Ultimately, responding to skills and knowledge needs, this can contribute to improved vaccine acceptance.

1. Introduction

Globally, vaccination programs are one of the most effective means to prevent the impact and spread of infectious diseases. The COVID-19 pandemic brought renewed global attention to the critical importance of vaccination programs, but also highlighted the challenges they face in

relation to public confidence in vaccines. In 2019, a year before the COVID-19 pandemic, the WHO listed vaccine hesitancy as one of the ten biggest threats to global health [1]. While public questioning of vaccination is not a new phenomenon, the need for a global mass vaccination campaign against COVID-19 has exposed important differences in vaccine acceptance across the world. This issue is particularly pressing as

Abbreviations: HCPs, healthcare providers; MMR, measles-mumps-rubella; Flu, seasonal influenza; HPV, Human Papillomavirus; VCP, Vaccine Confidence Project; VCI, Vaccine Confidence Index; EU, European Union; GP, general practitioner..

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low public confidence in vaccination can threaten vaccine uptake and jeopardize herd immunity, thereby allowing diseases to reappear and to circulate in unprotected populations [2,3].

Confidence in vaccination is multifaceted and influenced by a diverseness of individual, social, political, religious, and structural factors as well as varying across different vaccines and the diseases they prevent. Additionally, confidence in vaccination is highly unstable, pointing to a need for continuous monitoring of confidence levels to detect possible changes and, when needed, prepare rapid and targeted responses to restore or maintain trust in vaccination.

In 2016, Europe was identified as the region in the world with the lowest level of public confidence in vaccination [4], which has since been confirmed in various follow-up studies [5–7] and more recently in studies exploring public willingness to accept COVID-19 vaccination [8,9]. Common concerns circulating across the European Union (EU) include fears of vaccine side effects, the belief that vaccines do not work, or that vaccine preventable diseases are not severe or prevalent [10]. Most follow-up and monitoring studies have focused on countries from the EU [6,7], with less evidence available in relation to vaccine confidence in the wider WHO European region, in particular countries from Eastern Europe, the Balkans, Caucasus, and Central Asia. Yet, evidence suggests confidence in vaccination is low in some of these countries [5].

1.1. The role of the healthcare provider

Addressing the challenges posed by vaccine confidence is complex and requires multi-disciplinary responses. Healthcare providers (HCPs) often have a central role in these responses as they are widely considered to be the most trusted source of information on vaccine-related topics [11–13]. Yet, recent evidence has shown that some HCPs also express hesitancy towards vaccination, influencing their intentions to vaccinate themselves or their children, as well as their recommendations to the public [14–18]. HCPs' vaccine hesitancy often mirrors similar concerns found among the general population, including questioning of the safety or effectiveness of vaccination, creating doubt and mistrust among GPs, nurses, paediatricians, pharmacists, and other types of HCPs [10]. Blake [19] found that inadequate medical training in both vaccination and communication science may contribute to HCPs' hesitancy, underscoring the need for targeted interventions aimed at bolstering their confidence and equipping them with the skills to effectively address vaccine-related concerns.

While studies have examined HCPs vaccine hesitancy in a local, national context, very few studies exist that aim to compare confidence levels across countries [10]. Vaccine confidence levels have been monitored in the EU through the State of Vaccine Confidence reports [4,5,7], but evidence in the rest of the region remains sparse, despite possible important challenges. The aim of this mixed method study is to examine HCPs' confidence in vaccination in a selection of six WHO European countries: North Macedonia, Bosnia & Herzegovina (Balkans), Belarus (Eastern Europe), Armenia, Georgia (Caucasus), and Kazakhstan (Central Asia). This paper presents findings pertaining to HCPs, the quantitative data is part of a broader survey that also assessed vaccination confidence across the general population in these countries. These findings will be available in a separate paper.

2. Methods

2.1. Explanatory sequential design

Mixed methods move beyond qualitative and quantitative research towards a “third research paradigm”. In the field of vaccine confidence, an increasing number of studies are now combining various methods to produce more robust, rich, and comprehensive analyses [20–22]. By eliciting evidence from an explanatory sequential research approach including 1) a quantitative survey on HCPs (GPs and nurses) confidence in vaccination and 2) qualitative interviews with HCPs, the study will

generate knowledge on HCPs vaccine confidence and effectively uncover the drivers of and barriers to HCPs vaccine uptake and recommendations. Sequentially integrating quantitative and qualitative components, this design allows for a comprehensive exploration of vaccine confidence among HCPs.

2.2. Quantitative surveys with HCPs

HCPs across six countries, namely North Macedonia, Bosnia & Herzegovina, Belarus, Armenia, Georgia, and Kazakhstan, were surveyed. This phase employed robust sampling procedures (facilitated by ORB International) in collaboration with local partners to identify and recruit 100 HCPs (GPs and nurses) involved in vaccination practices (recommending, prescribing, or administering vaccines) in each country (total N = 600). HCPs were identified using existing nationwide panels of participants that have consented to take part in research, maintained by ORB International's local partners. The HCPs were required to be actively working in their respective countries at the time of the study, between October and December 2023, and have a demonstrable role in vaccination. Participants who agreed to take part in the study were asked to fill in an online survey.

We aimed to provide a comprehensive overview of vaccine confidence dynamics across the six countries by assessing vaccine confidence levels, recommendation practices and attitudes towards vaccination. The questionnaire was developed based on existing research with HCPs, including the Vaccine Confidence Project's (VCP) Vaccine Confidence Index (VCI) [5], previous VCP studies on HCPs' attitudes towards vaccination in the EU, and the Vaccine Training Barometer developed by the University of Antwerp [23].

The questionnaire was composed of five parts (see Appendix A), including socio-economic demographic variables, confidence in and recommendations of vaccines in general and specific vaccines (measles-mumps-rubella vaccines (MMR), Human Papillomavirus vaccines (HPV), seasonal influenza vaccines (Flu), and COVID-19 vaccines), attitudes and views towards vaccination, confidence in answering questions about vaccines or addressing public vaccine hesitancy, and needs for training on vaccination. Vaccine confidence is measured using the VCI, developed by the VCP to measure confidence in vaccines in general as well as confidence towards specific vaccines. The VCI has been used to map and monitor vaccine confidence around the globe since 2015. Four dimensions of vaccine confidence are measured: confidence in the importance of vaccines, confidence in their safety, confidence in the effectiveness of vaccines, and compatibility of vaccines with religious or personal beliefs.

For the analysis, responses to all survey items are grouped from their original four Likert scale categories into two. “Strongly agree” and “tend to agree” responses are recoded to “agree” and all remaining choices, including the “do not know” response or no response, are recoded to “disagree.” This method of recoding prevents the loss of missing data and helps facilitate comparisons in vaccine confidence over time.

2.3. Qualitative in-depth interviews with HCPs

Complementing the quantitative surveys, the qualitative phase of this research involved in-depth interviews with HCPs conducted by phone. Participants were recruited through the ORB International network (same as for the quantitative surveys), which utilizes a database of individuals who have previously expressed interest in participating in research studies. Participants were further selected using a snowball sampling technique that specifically targeted healthcare providers with the necessary specializations for this study. ORB collaborated with local research agencies in the respective regions, selecting interviewers with appropriate language skills and cultural familiarity to ensure accurate and context-sensitive data collection. ORB provided an online briefing to the local interviewers, going over the interview guide and objectives in detail.

Thirty HCPs were selected for 30-minute in-depth qualitative interviews across three countries, with each country contributing a sample size of ten participants. The selection of countries for qualitative interviews was informed by the results of the quantitative survey. HCPs from Belarus and Kazakhstan exhibited the lowest levels of vaccine confidence, both countries were therefore selected for follow-on qualitative research. Bosnia & Herzegovina was selected as the third country, as HCPs participating in the survey demonstrated the lowest likelihood to recommend Flu and COVID-19 vaccines to pregnant women. Incentives were provided to participants for their involvement in the study. Each participant received a monetary incentive in their local currency, equivalent to approximately 50–55 USD, to fairly compensate for their time and effort.

The topic guide for these interviews (see Appendix B) was developed based on a preliminary analysis of the survey data collected. This allowed us to cover predefined topics and provide the necessary flexibility for the interview to be shaped by participant's awareness, experiences, and interests. The qualitative interviews allowed us to gain more in-depth knowledge on some of the issues and challenges being faced by HCPs, including their specific concerns about vaccination as well as their possible challenges in communicating about vaccines and training needs. Questions were therefore developed to cover some of the key issues identified through the surveys in more detail.

Transcripts from the interviews were translated into English and anonymised. The analysis of interviews was conducted using NVivo, to systematically organize codes and themes. We started with a coding framework based on the interview guide, collaboratively developed by two researchers to ensure consistency and relevance to the study objectives. During analysis, we adopted an iterative approach: as new themes or sub-themes emerged, they were added to the coding framework to capture the evolving insights from the data. This iterative process allowed us to refine our understanding of the issues discussed. A list of quotes was generated for each code, enabling the identification of key issues and comparative analysis. Comparative analysis considered participant terminology, conversational challenges, and the recurrence of issues.

3. Results

3.1. Socio-economic demographics

The final quantitative sample comprised 600 participants, divided in 100 HCPs per country. The number of nurses and general practitioners (GPs) participating in the survey was equally divided within and

between countries. There was a substantial overrepresentation of female participants in our survey (between 75 % and 99 % of respondents). HCPs working in an urban setting were more prevalent among all six countries (between 87 % and 96 % of respondents). This also goes for HCPs working in public practices (between 68 % and 91 % of respondents), except in Georgia where there were less HCPs working in public services (35 %) compared to private services (65 %). [Table 1](#) shows a summary of the socio-economic demographics of HCPs participating in this study.

3.2. Vaccine confidence

HCPs from Belarus and Kazakhstan had the lowest levels of vaccine confidence among the six countries in the study; in both countries 77 % of HCPs agreed that vaccines in general are important, safe, effective, and compatible with their beliefs (see [Fig. 1](#)). Georgia and Armenia followed with, respectively, 83 % and 84 % of respondents agreeing with vaccine confidence statements. Vaccine confidence among HCPs was higher in Bosnia & Herzegovina (89 %) and North Macedonia (96 %).

When delving into the data broken down by specific vaccines, we found that in all six countries HCPs expressed lower levels of confidence in COVID-19 vaccines (ranging from 59 % to 71 %) than in MMR, Flu and HPV vaccines (ranging from 70 % to 96 %). This disparity is clearly illustrated in [Fig. 2](#), which shows the comparative levels of confidence for each type of vaccine across the surveyed countries. [Fig. 3](#), in its turn, shows that low confidence levels also translated into low recommendation practices for all vaccines. Confidence levels were lowest for COVID-19 vaccines, and this trend reappears when looking at recommendation practices. Kazakhstan is the only country where recommendation practices for COVID-19 vaccines (77 %) exceeded recommendation practices for another vaccine, namely HPV vaccination (70 %). Recommendation levels for Flu and COVID-19 vaccination in pregnant women were particularly low in all countries, especially when compared to recommendation levels for the same vaccines in the general population. For Flu vaccination in pregnant women, a significant difference between countries was noted, with HCP recommendations ranging between 36 % in Bosnia & Herzegovina and 81 % in Georgia. Also, for COVID-19 vaccination varying responses regarding recommendations for pregnant women surfaced, with HCPs from Bosnia & Herzegovina ranking lowest with 33 % and Georgia ranking highest with 71 %. For some countries the recommendation level dropped to almost half of that for the general population, for example, recommendation of Flu vaccination in North Macedonia was 94 % for the general population compared to 52 % for pregnant women and recommendation of COVID-

Table 1
Summary socio-economic demographics HCPs.

	Armenia (n = 100)	Belarus (n = 100)	Kazakhstan (n = 100)	North Macedonia (n = 100)	Bosnia & Herzegovina (n = 100)	Georgia (n = 100)
<i>Profession</i>						
Nurse	50.0	60.0	50.0	50.0	60.0	50.0
GP	50.0	40.0	50.0	50.0	40.0	50.0
<i>Sex</i>						
Men	3.0	24.0	15.0	8.0	13.0	1.0
Women	97.0	75.0	85.0	92.0	87.0	99.0
Other	0.0	1.0	0.0	0.0	0.0	0.0
<i>Age group</i>						
18–24	1.0	12.0	13.0	2.0	14.0	1.0
25–34	12.0	36.0	37.0	11.0	46.0	7.0
35–44	20.0	25.0	20.0	22.0	23.0	25.0
45–54	31.0	22.0	19.0	32.0	10.0	26.0
55–64	24.0	5.0	10.0	33.0	7.0	29.0
65+	12.0	0	1.0	0.0	0.0	12.0
<i>Urban vs. Rural</i>						
Urban Practice	87.0	89.0	88.0	96.0	92.0	94.0
Rural Practice	13.0	11.0	12.0	3.0	8.0	5.0
<i>Private vs. Public</i>						
Private Practice	16.0	9.0	30.0	13.0	13.0	65.0
Public Practice	83.0	91.0	68.0	87.0	85.0	35.0

Percent of HCPs agreeing vaccines in general are important, safe, effective, and compatible with their beliefs

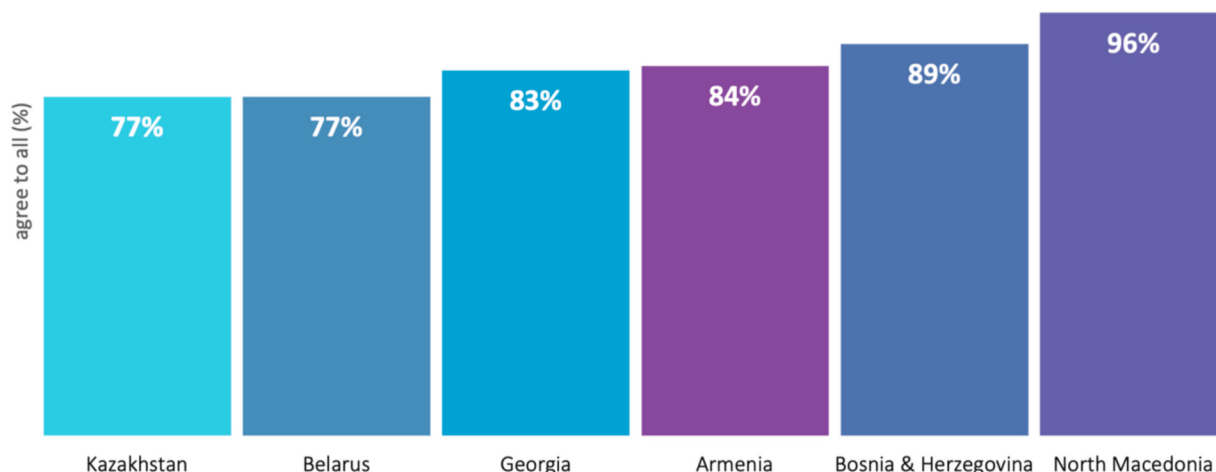


Fig. 1. Percent of HCPs agreeing vaccines in general are important, safe, effective, and compatible with their beliefs.

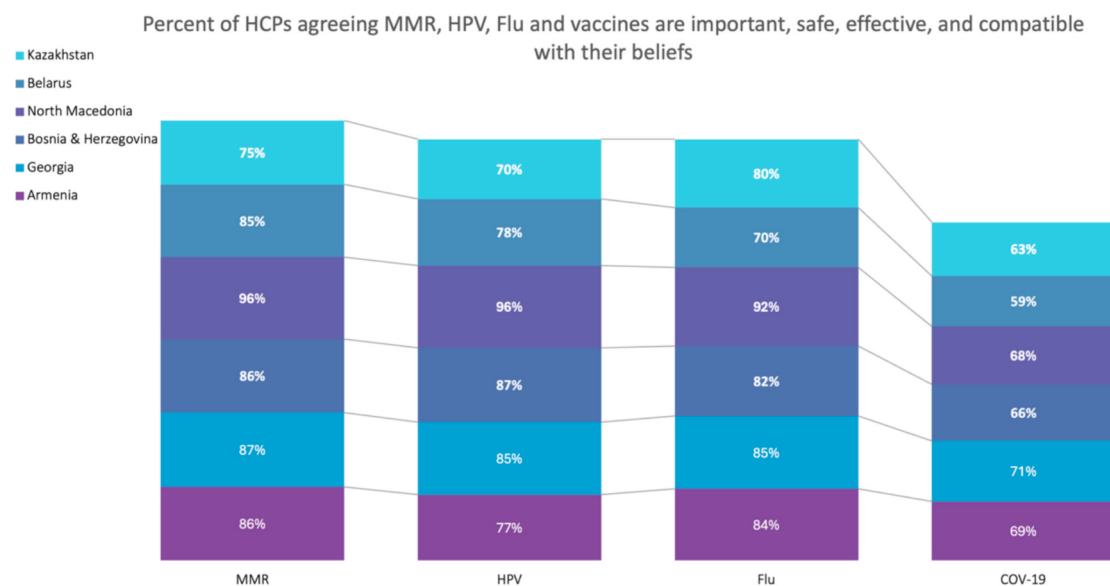


Fig. 2. Percent of HCPs agreeing MMR, HPV, Flu and COVID-19 vaccines are important, safe, effective, and compatible with their beliefs.

19 vaccination in Armenia was 81 % for the general population compared to 54 % for pregnant women.

We explored this further in the qualitative interviews (which involved three countries, Belarus, Kazakhstan, and Bosnia & Herzegovina, compared to six for the quantitative analysis) and found that there were significant concerns among some HCPs regarding the potential risks associated with vaccinating pregnant women, particularly due to uncertainty about the safety of vaccines during pregnancy. The perceived combined risks of vaccination for the mother and the fetus, was often referred to as the main reason of hesitancy. HCPs that are hesitant towards vaccinating pregnant women pointed out that, to their knowledge, limited research has been conducted in this area, particularly with regards to the possible long-term effects of vaccines on the development of fetuses. It is important to reiterate that these concerns

are not based on scientific evidence. Contrary to these concerns, a recent study evaluating antenatal mRNA COVID-19 vaccination found no increased risk of adverse pregnancy outcomes such as pre-term birth, small for gestational age, gestational diabetes, or hypertensive disorders of pregnancy [24]. Despite this evidence, vaccinating pregnant women feels like a great responsibility for HCPs, especially as pregnant women often require more communication. As one HCP explained: “*They are unpredictable. Vaccinating pregnant women is like vaccinating children, they can have unpredictable side effects, they are more vulnerable, their immunity is reduced. And that’s why vaccines should be recommended to pregnant women with caution.*” (KZ_GP).

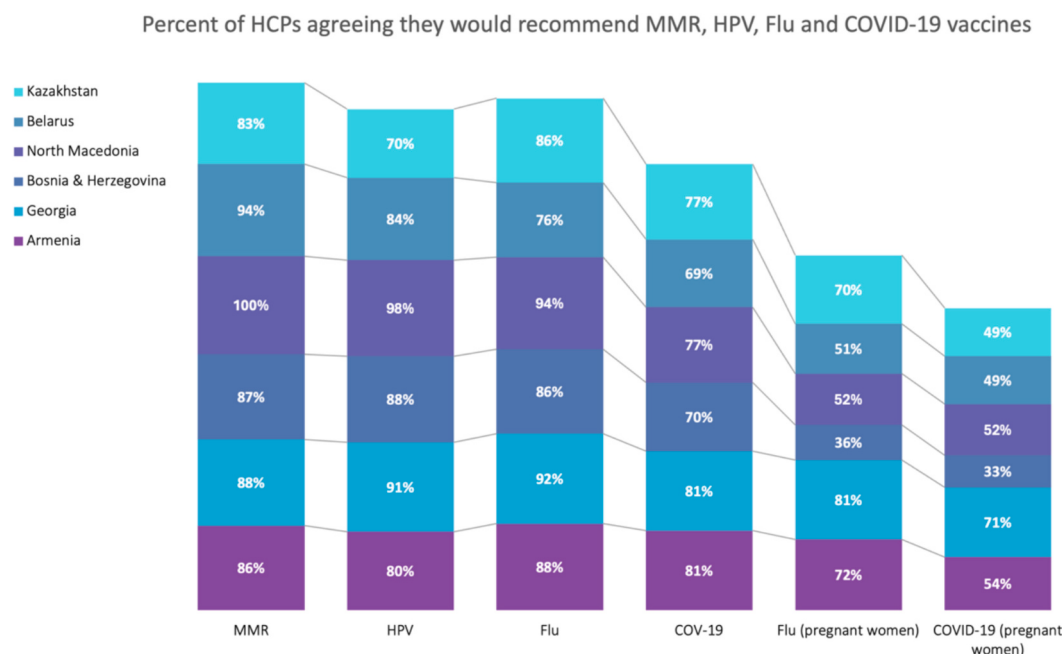


Fig. 3. Percent of HCPs agreeing they would recommend MMR, HPV, Flu and COVID-19 vaccines.

3.3. The role of HCPs in vaccination

Across all six countries, the majority of HCPs perceived it to be their role to promote vaccines. However, varying degrees of perceived responsibility in advocating for vaccination were identified, as can be seen in Fig. 4. In North Macedonia, 91 % of HCPs affirmed that they consistently believed to play a role and encourage vaccination among hesitant patients. In contrast, in the remaining five countries, the proportion of respondents who indicated advocating ‘all the time’ ranged between 28 % and 52 %, for ‘most of the time’ this percentage ranged from 25 % to 42 %. Hence, it is notable that even in these countries, there remains a considerable perception among HCPs that encouraging vaccination is part of their professional duty, albeit to a lesser extent.

Various themes emerged regarding HCPs’ perceived role in advising

and recommending vaccines from the qualitative interviews. While HCPs generally adopted a passive approach, waiting for patients to initiate conversations about vaccines, they expressed a willingness to engage and provide information when prompted. According to one HCP “There should be no conviction. We, as medical professionals, should give maximum information to the person about the pros and cons of vaccination. And already a person must decide for himself. Need, no need. (...)” (BY_GP). Despite strongly recommending vaccination, they respected patients’ autonomy in decision-making, providing information about potential side effects and allowing patients to make informed choices.

HCPs expressed trying to tailor their recommendations based on patients’ specific circumstances, such as their health status, medical history, and concerns, providing personalized advice to address individual needs. HCPs emphasized the importance of collaborative

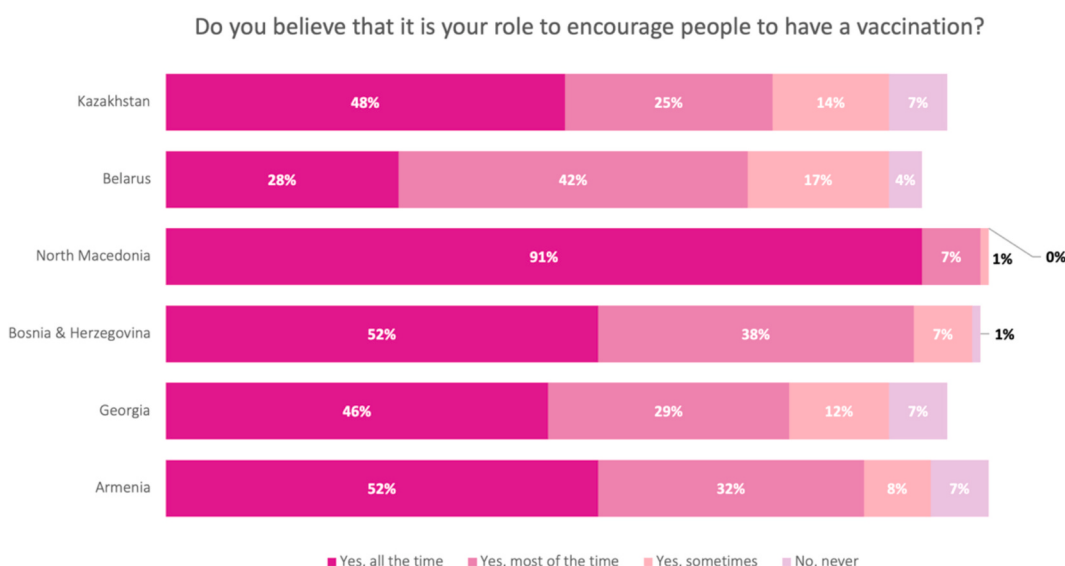


Fig. 4. Do you believe that it is your role to encourage people to have a vaccination even if they are hesitant? ***

*The questionnaire included a ‘do not know/refused’ response option, so not all categories sum to 100 %.

** The colors in Figs. 4–6 highlight patterns in responses across agreement levels (e.g., “yes, all the time”), ensuring clear visual differentiation of response categories. Country names are labeled next to each bar for reference.

decision-making, involving patients in discussions about vaccines and respecting their choices. They offered guidance and support while allowing patients to ultimately decide whether to vaccinate. However, some HCPs faced challenges in communicating with vaccine-hesitant individuals, including reluctance to engage in dialogue, “If they are adamant that they don’t want it, then we have no available method to change their minds. We can’t force anyone into something they don’t want.” (BA_GP).

3.4. Confidence in vaccination communication

The quantitative survey revealed variations in HCPs confidence levels across different countries when replying to questions about vaccines (see Fig. 5). In North Macedonia, 85 % of HCPs reported feeling confident enough to reply ‘yes, all the time’ to such questions. Similarly, HCPs in Armenia and Georgia reported consistently either ‘all the time’ or ‘most of the time’, highlighting strong confidence in addressing vaccine-related inquiries. Conversely, HCPs from Belarus, Kazakhstan, and Bosnia & Herzegovina exhibited lower confidence to reply to questions about vaccines, as evidenced by higher proportions of HCPs answering ‘yes, sometimes’ (between 11 % and 18 %) or ‘no, never’ (between 1 % and 3 %) to this question compared to other countries. Notably, this lower confidence in communicating about vaccines in Bosnia & Herzegovina stands in contrast to their generally higher overall confidence levels, which were among the highest of the six countries surveyed.

The qualitative interviews found that HCPs felt a responsibility to provide accurate and comprehensive information about vaccines to patients, recognizing the significance of educating them about vaccination benefits and safety profile. However, they encountered challenges when discussing vaccines with hesitant individuals, particularly in the face of misinformation and misconceptions about vaccines. Some HCPs felt that a certain level of courage is needed to address these

sensitive topics during patient discussions, emphasizing the importance of being fully informed and confident in their own understanding before advocating their viewpoints. One respondent said “I think that, in general, more time should be devoted to vaccines and prevention from the beginning of medical education. I believe it is being neglected from the very beginning. And when you don’t know something, it becomes a stigma and unknown, and you don’t have the ability to recommend it when you don’t know what you’re dealing with.” (BA_NU).

3.5. Need for training

Fig. 6 below illustrates the need for training among HCPs based on three criteria: already sufficiently informed, attended a training, and willingness to attend additional courses on vaccination. These measures aim to gauge the current level of training on this specific topic and the perceived need for further education among the HCPs surveyed. With all countries scoring 80 % or more, HCPs felt sufficiently informed on vaccination practices. However, training levels were lower for Belarus (67 %) and Bosnia & Herzegovina (64 %) than for HCPs in the remaining countries (88 % and higher). HCPs’ interest in attending an extra course on vaccination was reported in all six countries.

In contrast to the findings from the surveys, HCPs in qualitative interviews did not give the impression that they felt sufficiently informed and expressed a perceived lack of information on a wide range of vaccination topics. Overall, they expressed a need for access to trustworthy and up-to-date information on vaccines, “First, the whole truth about side effects, and statistics. When, for example, it can accumulate over the years, all information about vaccinated patients, of course, would be very interesting. (...) And how justified are the risks of vaccination, side effects, the risk of not being vaccinated, and then getting an infectious disease?” (BY_GP). The importance of concrete reports from epidemiological services to understand vaccine availability, types, and supply, was emphasized. Some HCPs suggested more active promotion of vaccines

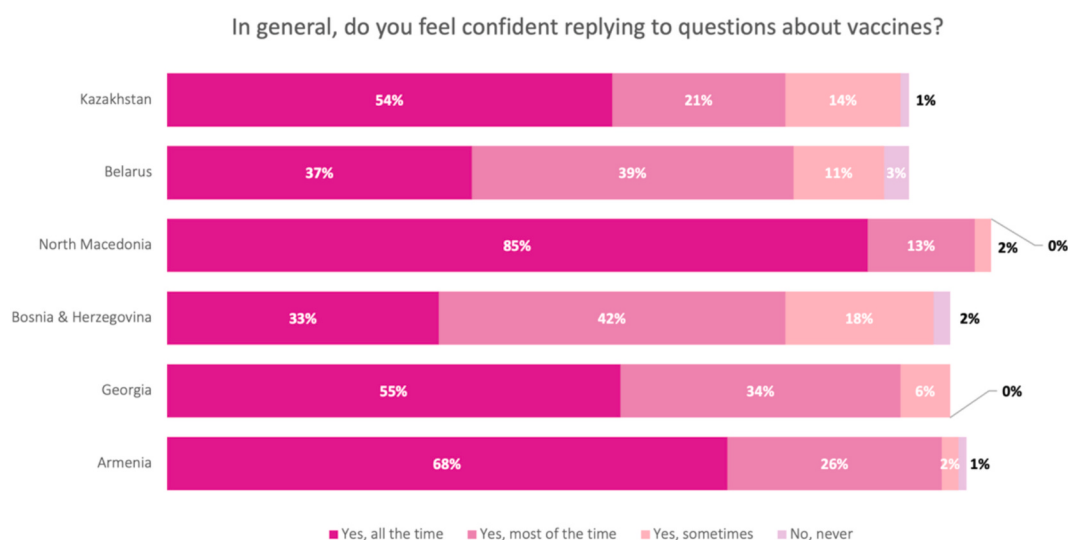


Fig. 5. In general, do you feel confident replying to questions about vaccines?*

*The questionnaire included a ‘do not know/refused’ response option, so not all categories sum to 100 %.

Training history and information needs

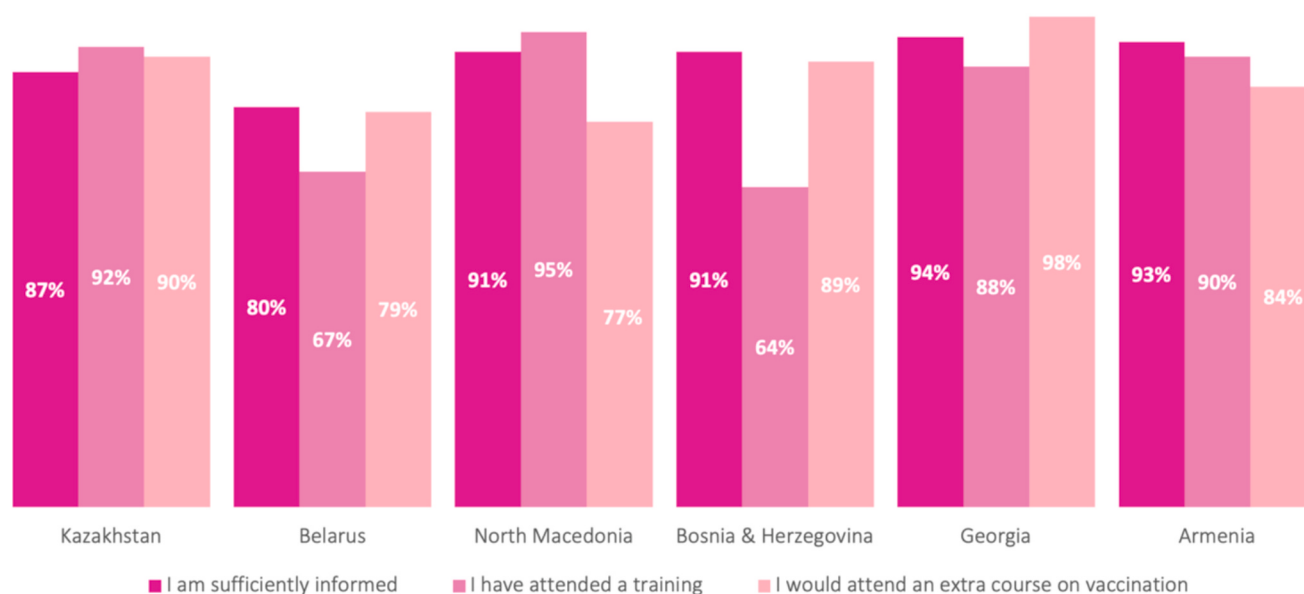


Fig. 6. Questions on training history and information needs.

through media channels, for example similar to campaigns seen during the COVID-19 pandemic.

The interviews with HCPs also revealed a lack of specific and formal training opportunities dedicated to vaccination. HCPs reported limited or no participation in vaccination training sessions, with their training experiences primarily revolving around general medical seminars, congresses, or healthcare training that did not specifically focus on vaccination. As mentioned by one HCP “Well, the word *training* probably doesn’t quite fit. These are some kind of general meetings, even for which some information was presented, reported and that’s all. (...)” (BY_GP). Moreover, some HCPs indicated that their knowledge about vaccination was acquired through informal means such as self-study, on-the-job learning, or discussions with colleagues, rather than through formal training sessions. This is in contrast with the quantitative findings and could be explained by HCPs not interpreting the question ‘I have attended a training’ as specifically about vaccines. The lack of dedicated training in vaccination underscores a potential gap in professional development efforts, emphasizing the importance of implementing targeted educational initiatives to address the evolving needs of HCPs.

3.6. Training topics of interest

Diving into the topics of interest when attending a training, in all six countries, the quantitative data showed information regarding vaccine safety (between 71 % and 84 % in all countries) and vaccine

effectiveness (between 60 % and 79 % in all countries) stood out as the most crucial factors aiding healthcare providers in feeling more confident when recommending vaccines. When examining skills that could possibly bolster confidence in vaccine recommendation, in the quantitative survey HCPs were presented with three skills: communication techniques for vaccination, responding to vaccine hesitant patients, and addressing misconceptions. Responding to vaccine-hesitant patients ranked highest in four countries (Belarus 62 %, Bosnia & Herzegovina 58 %, Armenia 60 %, and Georgia 66 %), while communication techniques for vaccination ranked highest in the remaining two (North Macedonia 67 % and Kazakhstan 73 %).

Throughout the qualitative interviews, HCPs expressed a need for education and guidance on various aspects of vaccination. The importance of having detailed knowledge and continuous updates on available vaccines, new vaccines, vaccination schedules, and guidelines was stressed by HCPs. Understanding the mechanism of different types of vaccines was highlighted as another crucial topic, reflecting a desire to refresh knowledge and enhance understanding. Equally important was the need for information and data on vaccine side effects to facilitate informed decision-making. HCPs also expressed a strong interest in training on effective communication strategies to engage with patients, address their concerns, and build trust in vaccination. “How to work with the patient, how to convince them, how to explain that this vaccine does not have anything negative for the child, risks, complications. They think it’s a complication of the vaccination.” (KZ_GP). We detected a need for

Table 2
Overview themes qualitative interviews HCPs.

Themes	Sub-themes	Quotes as an example
Vaccine confidence	- General vaccine confidence - Confidence in specific vaccines (<i>MMR, HPV, Flu, COVID-19</i>) - Recommendation practices for different vaccines - Confidence in vaccinating pregnant women - Willingness to provide vaccination information - Passive vs. active recommendation approach - Tailoring recommendations (<i>health status, medical history.</i>)	<i>For COVID, I categorically don't support it. Children up to 15 years old shouldn't receive that vaccine because they're still developing, and their bodies are completely different from adults. But it's mainly due to misinformation because we don't know how these vaccines behave in that population.</i> (BA_NU) //sub-theme: recommendation practices for different vaccines
Role of HCPs in vaccination recommendation	- Collaborative decision-making - Respect for patient autonomy - Communication challenges with vaccine-hesitant individuals - Patient reluctance to engage in dialogue - Responsibility to provide accurate information	<i>"Generally, we cannot force anyone to get vaccinated. We must present our stance, facts, if they are smart, they will trust the clinician, someone who deals with it every day. We can never tell parents 100 % that they must vaccinate their child. We must explain the potential side effects, what might happen, but we must handle the facts related to the vaccine, and patients will ultimately make the decision and be responsible for their lives."</i> (BA_GP) //sub-theme: respect for patient autonomy
Confidence in vaccination communication	- Challenges of misinformation/misconceptions - Courage needed to address sensitive topics - Need for HCPs to be fully informed and confident - Perceived lack of vaccine information - Need for up-to-date vaccine information	<i>"It's not comfortable to recommend vaccines in general. I try to recommend it, although some mothers explicitly write that they don't want their child to receive vaccines when they come to the maternity ward. This would be the discomfort, but we continue to be persistent."</i> (BY_GP) //sub-theme: courage needed to address sensitive topics
Need for training	- Current knowledge mainly from self-study/on-the-job learning - Limited formal training opportunities specifically dedicated to vaccination - Need for ongoing refreshers during career - In-depth knowledge and updates on available and new vaccines - Practical management (<i>vaccine availability, types, supply.</i>)	<i>"In our country, it is expected that we ourselves should understand the importance of vaccines. At my workplace, no training was carried out, our management does not actively involve us. This is a going-without-saying situation for them."</i> (BY_GP) //sub-theme: limited formal training opportunities specifically dedicated to vaccination
Training topics of interest	- Training on communication strategies to engage patients - Training to address patient concerns and build vaccine trust	<i>"I would like to hear about communicating with patients, and how to behave to persuade them to get vaccinated. As for how to communicate with people who are aggressive or negative, what arguments and how should be given, I would like to attend such a training."</i> (BY_GP) //sub-theme: training on communication strategies to engage patients

continuous education to stay informed about advancements in vaccination and address the diverse needs and concerns of patients. To provide a concise overview of all key themes identified in the qualitative responses, we summarised these findings in [Table 2](#)

4. Discussion

This mixed-method study summarises the levels of vaccine confidence among HCPs in six countries from Eastern Europe, the Balkans, Caucasus, and Central Asia, regions that have been relatively overlooked in prior vaccine confidence research.

This study found that HCPs from Belarus and Kazakhstan had lower levels of vaccine confidence than North Macedonia, Bosnia & Herzegovina, Georgia, and Armenia. Notably, HCPs in Bosnia & Herzegovina, despite having higher general vaccine confidence, exhibited lower confidence in communicating about vaccines compared to their peers in other countries. When delving into the data broken down by specific vaccines, in all six countries, confidence in COVID-19 vaccines was lower compared to other vaccines, which contributed to the reduced likelihood of recommending COVID-19 vaccines. It is critical to contextualize these findings within the HCP population. Given their medical expertise and substantial influence on public vaccination attitudes, one could expect near-universal agreement in this group. When viewed through this lens, the findings suggest considerable room for improvement, especially as similar results in the general population would already warrant attention.

Simultaneously, recommendation levels of Flu and COVID-19 for pregnant women were almost halved compared to those for the general

population, due to concerns about the risks to both the woman and the fetus. While HCPs did not outright oppose vaccinating pregnant women, they emphasized the limited research in this area, expressing doubts about the long-term effects of vaccines on fetal development. This aligns with findings across the 27 EU member states, where HCPs likelihood to recommend Flu and COVID-19 vaccines to pregnant women was generally lower than their likelihood to recommend these vaccines to other patients [25]. These doubts observed may relate to the exclusion of pregnant women in early clinical trials. For instance, initially, COVID-19 vaccines were not recommended for pregnant women, potentially impacting confidence among HCPs in recommending this vaccine. To address this, improved representation in clinical trial design, specifically targeting sub-populations such as pregnant women, is necessary [26,27].

An interesting observation from the socio-demographic data of our sample was the difference in age groups among HCPs in the studied countries. Armenia, North Macedonia, and Georgia had a majority of HCPs in the 44–64 age group, while Belarus, Kazakhstan, and Bosnia & Herzegovina predominantly had HCPs in the 25–44 age group. Notably, the countries with a younger cohort of HCPs were also the ones exhibiting lower levels of confidence in vaccines. This is consistent with findings from the Vaccine Confidence Project's latest survey for the 27 EU countries [25], which reported similar age-related differences in vaccine confidence among the general population. This age disparity thus warrants further investigation, as it might be a significant factor affecting vaccine confidence. Younger HCPs may have different concerns or less experience, and are more exposed to social media, which could influence their confidence levels and their likelihood to

recommend vaccines.

HCPs in all countries expressed a willingness to engage with patients about vaccination and provide information when prompted, while respecting patients' autonomy in decision-making. They emphasized collaborative decision-making and the importance of addressing individual patient concerns. However, challenges in discussing vaccines with hesitant individuals were reported. HCPs from Belarus, Kazakhstan, and Bosnia & Herzegovina appear to not always feel confident to hold this conversation with their patients. Prior research indicates as well that HCPs often lack knowledge and confidence to communicate about vaccination with patients, especially when confronted with vaccine hesitant patients [28–30]. These combined findings highlight the importance of developing strategies to support HCPs to effectively engage with patients about vaccination. At the same time promoting a supportive and collaborative healthcare environment where HCPs feel empowered to address patient concerns while respecting their autonomy, can also be beneficial.

The study also highlighted a need for more training opportunities dedicated specifically to vaccination, including communication approaches to manage difficult conversations, suggesting a gap in professional development efforts that should be addressed through targeted educational initiatives. As several studies have shown, a lack of training or inadequate training on vaccination, can have detrimental effects not only on HCPs' knowledge about vaccines but also on how HCPs convey information to their patients. HCPs do not feel confident to discuss specific issues concerning vaccination and are less likely to recommend vaccination when they perceive gaps in their own knowledge [18,31,32]. Our study aligns with these findings, emphasizing the importance of enhancing vaccination knowledge among both current and future HCPs [23].

Some limitations are important to mention. While this study intended to compare data between countries, the sample size of 100 was too small for strong comparisons. Nurses and GPs participating in our survey were largely female, which may reflect a gender imbalance (a higher number of female) in vaccination services. We also recognize that our recruitment approach may introduce a degree of selection bias, as participants in the ORB network are likely to have a pre-existing interest in research. This potentially means they are more engaged and/or more likely to have strong opinions and a willingness to express them compared to the general healthcare provider population in each country.

The data collected relies on self-reporting by HCPs. This introduces the possibility of bias, as participants may provide responses they perceive as socially desirable or withhold information that could be perceived negatively. It is interesting to consider further research examining the correlation between self-reported confidence levels and actual behaviors in practise, as these two may not always align. The findings of this study are present in a specific timeframe in which data was collected. Vaccine confidence among HCPs can evolve over time due to a wide range of factors, emphasizing the importance of continuous monitoring.

We conducted a pre-determined number of interviews across the three countries, due to time and budget constraints. However, during the analysis process, thematic saturation was reached, meaning no new themes emerged from the data towards the end of the coding process.

5. Conclusion and recommendations to the field

HCPs play a pivotal role in navigating the sensitive topic of vaccines, highlighting the importance of having a strong understanding of the drivers and barriers of vaccine confidence among HCPs to improve and maintain high vaccine coverage in countries. By exploring both quantitative and qualitative insights, this research provides a comprehensive overview of HCPs' attitudes towards vaccination in four non-EU European regions. While different levels of confidence in vaccination among HCPs were measured, similar challenges were identified such as doubts

to recommend Flu and COVID-19 vaccines to pregnant women and a need for training on vaccination and communication. Our findings underscore the value of implementing targeted interventions to support HCPs and bolster vaccine confidence. By equipping HCPs with the necessary skills and knowledge, we can enhance vaccine communication and effectively address patient concerns. Ultimately, alongside other interventions responding to skills and knowledge needs, this can contribute to the success of vaccination programs and improved vaccine acceptance.

Ethics approval and consent to participate

Data was collected by ORB International following strict industry standards laid down by the professional bodies they subscribe to, such as the World Association for Public Opinion Research (WAPOR). Ethical approval was received for this study from the University of Antwerp on 20/03/2023 (Project ID: 5265). Participants were informed that their participation was voluntary, and that they could refuse to answer questions during data collection. Verbal or written informed consent was required to take part in the study.

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CRediT authorship contribution statement

Toni Claessens: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation. **Rachel L. Eagan:** Visualization, Formal analysis, Data curation. **Greet Hendrickx:** Writing – review & editing, Supervision, Project administration. **Pierre Van Damme:** Writing – review & editing, Supervision. **Heidi J. Larson:** Writing – review & editing. **Emilie Karafillakis:** Writing – review & editing, Supervision, Project administration, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT to enhance the accuracy of the writing. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The Vaccine Confidence Project (RLE, HJL, and EK) has received research funding from GSK, Merck and J&J.

Data availability

Data will be made available on request.

Appendices

Appendix A. Quantitative questionnaire HCPs

Part 0: screening

In your role as a HCP, are you ever involved in prescribing, recommending, or administering vaccines?

- Yes
- No (SCREEN OUT)

Part 1: Socio-economic Demographic variables

1.1 The following socio-economic demographic variables will be collected:

- Sex: Male or female
- Age: 18–24, 25–34, 35–44, 45–55, 56–64, or 65+
- Years in profession
- Place of work: urban or rural; private or public
- Role in relation to vaccination: recommending, administering or prescribing paediatric/adolescent/adult vaccines
- Self-reported vaccination status: influenza, DTP, Hepatitis B, COVID-19

Part 2: Vaccine confidence

2.1 How strongly do you agree or disagree with each of the following statements about vaccines? (Response scale: Strongly agree, tend to agree, tend to disagree, strongly disagree, do not know/no response)

- Vaccines are important for children to have
- Vaccines are important for people of all ages to have
- Overall I think vaccines are safe
- Overall I think vaccines are effective
- Overall vaccines are compatible with my religious, personal, or philosophical beliefs

2.2 How strongly do you agree or disagree with each of the following statements about the XX vaccines? (Response scale: Strongly agree, tend to agree, tend to disagree, strongly disagree, do not know/no response)

(NOTE: XX = MMR – Seasonal Influenza – HPV; * only for paediatric vaccines)

- Overall I think the XX vaccine is important (for children to have*)
- Overall I think the XX vaccine is safe
- Overall I think the XX vaccine is effective
- Overall I think the XX vaccine is compatible with my religious, personal, or philosophical beliefs

2.3 How strongly do you agree or disagree with each of the following statements about the COVID-19 vaccines? (Response scale: Strongly agree, tend to agree, tend to disagree, strongly disagree, do not know/no response)

- Overall I think the COVID-19 vaccine are safe
- Overall I think the COVID-19 vaccines are important
- Overall I think the COVID-19 vaccines are effective at preventing me from getting infected with coronavirus/SARS-CoV-2/COVID-19
- Overall I think the COVID-19 vaccines are effective at preventing me from developing severe disease caused by COVID-19
- Overall I think the COVID-19 vaccines are effective at preventing me from transmitting coronavirus/SARS-CoV-2/COVID-19 to others

2.4 How likely are you to recommend ... (Response scale: highly likely, somewhat likely, somewhat not likely, highly unlikely, do not know/no response, not relevant to my job)

- ...the MMR vaccination to patients?
- ...the seasonal influenza vaccination to patients?
- ...the seasonal influenza vaccination to a pregnant woman?
- ...the HPV vaccination to patients?
- ...the COVID-19 vaccination to patients?
- ...the COVID-19 vaccination to a pregnant woman?

Part 3: Views and attitudes towards vaccination

3.1 To what extent do you agree or disagree with the following

statements? (Response scale: strongly agree, tend to agree, tend to disagree, strongly disagree, do not know)

- Today, certain vaccines recommended by the authorities are pointless
- The media publish too many negative messages about vaccination
- Children are vaccinated against too many diseases
- The health authorities are influenced by the pharmaceutical industry
- You trust your own judgment more than the official recommendations
- I sometimes come across misinformation about vaccines
- Some vaccines are not effective in preventing diseases
- Vaccines could have serious side effects
- The risks of vaccines outweigh their benefits
- Some vaccine-preventable diseases are not dangerous
- Adjuvants in vaccines could be unsafe
- Vaccines can give you the disease they are designed to protect you against
- Vaccines should be mandatory for the general population
- Vaccines should be mandatory for healthcare professionals
- Approval/development for vaccines may be rushed and they may not be thoroughly tested

3.2 Please rank the following sources of information on vaccination from the most trusted to the least trusted:

- Health ministry
- Government
- Pharmaceutical industry
- Scientists and experts
- International organizations (e.g. WHO)
- Colleagues
- Friends and family
- Healthcare professionals

3.3 Please rank the following channels of information on vaccination from the most trusted to the least trusted:

- Online (websites)
- Online (social media)
- Face-to-face interactions
- News media (TV, press, radio)
- Printed materials or videos
- Scientific

3.4 Have you ever seen information on social media about vaccines?

- Yes
- No

3.5 Where have you seen information about vaccines? (Check all that apply)

- Facebook
- Twitter
- Instagram
- Reddit
- YouTube
- Other social media

3.6 What kind of information have you seen on social media about vaccines? (Check all that apply)

- Diseases prevented by vaccines
- National recommendations for vaccines

- Mandates/legal requirements for vaccines
- Safety or side effects of vaccines
- Personal opinions about vaccines
- Stories about celebrities
- Advertisements from drug companies
- Stories from local or national news
- Scientific information
- Other

3.7 How much information did you see supporting vaccines on social media?

- None
- A little
- Some
- A lot

3.8 How much information did you see questioning vaccines on social media?

- None
- A little
- Some
- A lot

3.9 Did the information questioning vaccines on social media make you feel (check all that apply):

- Worried
- Unsure
- Annoyed
- Uncomfortable
- At least
- Confident
- Relieved
- Optimistic
- None of the above

Part 4: Confidence in answering questions about vaccines

4.1 How frequently do you receive question(s) about vaccines from the general population?

- Every day
- Every week
- Every month
- Never or sporadic
- Do not know/no response

4.2 In general, do you feel confident replying to questions about vaccines?

- Yes, all the time
- Yes, most of the time
- Yes, sometimes
- No, never

4.3 Do you believe that it is your role to encourage people to have a vaccination even if they are hesitant?

- Strongly agree
- Tend to agree
- Tend to disagree
- Strongly disagree
- Do not know/No response

4.4 In general, do you feel comfortable giving explanations to

your patients about (Response scale: not at all comfortable, somewhat uncomfortable, somewhat comfortable, very comfortable, do not know):

- The value of vaccines
- The safety of vaccines
- The role of adjuvants

Part 5: Need for training

5.1 To what extent do you agree or disagree with the following statements? (Response scale: Strongly agree, tend to agree, tend to disagree, strongly disagree, do not know/no response)

- In the last months, I received questions on vaccines I could not answer
- I am sufficiently informed through my standard (para)medical education to answer questions about vaccination
- I have attended training on vaccination
- Health authorities provide reliable information on vaccination for healthcare professionals (HCPs)
- Governments provide reliable information on vaccination for HCPs
- Pharmaceutical companies provide reliable information on vaccination for HCPs

5.2 Which information would help you feel more confident when recommending vaccines? Information to help communicate about... (select all that apply)

- vaccine safety
- vaccine effectiveness
- how the quality of vaccines is guaranteed
- the diseases targeted by vaccines
- the benefits of vaccines on a personal health level
- the benefits of vaccination on a public health level
- Other
- None of the above

5.3 Which skills would help you feel more confident when recommending vaccines? (select all that apply)

- Responding to vaccine hesitant people
- Communication techniques for vaccination
- Replying to misconceptions
- Other
- None of the above

5.4 Would you be willing to follow an extra course on vaccination if it was provided to you?

- Yes
 - o Face-to-face Lecture (1 h)
 - o Face-to-face Course (3 h)
 - o Face-to-face Course (1 day)
 - o Face-to-face Course (5 days)
 - o Online course
- No

5.5 What type of extra support would be useful for you to feel more confident when answering questions about vaccination from the general population? (select all that apply)

- Leaflet
- Website
- FAQ system (e-system to find the answers to frequently asked questions)
- Training course / Education

- App with information on disease, vaccines, recommendations & vaccination schemes.
- Government recommendations / support
- 24/7 helpline (via telephone or email)
- Other: ...
- None of the above

5.6 Where do you look for information about vaccines to stay informed? (select all that apply)

- Online (e.g. Google search)
- Online medical library or standard medical platform
- Online other: ...
- Text books or other reference works
- Scientific articles
- I send an email to experts
- National health institute
- International health organizations
- Conferences
- Colleagues
- Other: ...
- I do not look for information about vaccines

Appendix B. Topic guide qualitative interviews HCPs

Admin

Aim – Introduce yourself. Outline the purpose of the discussion, which is to discuss their decision-making process around vaccination.

Explain the presence and purpose of recording equipment – I will be using an audio recorder tonight to help with note taking.

Confidentiality – Everything that you say will be confidential, and anything you say today will remain anonymous. There are no right or wrong answers, I just want to hear about your personal experiences.

Introduction and background information

To start with I would like you to tell me a bit about yourself...

- Tell me about yourself (probe: age, family situation, children, etc.)
- Tell me a little bit about your work and your responsibilities with vaccinations (probe: administration of vaccines, recommendations or advice, etc.)

Health and vaccination information

OK. I would now like to move the conversation on to talk about general health and vaccination information.

- Could you tell me about the last time you received information about vaccination (for example about a new vaccine being introduced, information about side effects of vaccines, or a change in vaccine schedule)?
 - o How satisfied are you with the quality of information you receive about vaccination?
 - o What about the quantity of information you receive about vaccination?
 - o What type of information would you need to feel more confident in recommending a vaccine?
 - o If you need more information about vaccination, where do you look for information or who do you ask? (Probe: internet, colleagues, health websites, scientific conferences, etc.)
- What sorts of sources/who would you say you trust to give you credible and honest information about vaccination? Why is that?
 - o Probes: what about the government or health authorities; international organizations such as the World Health Organization; pharmaceutical companies?
- What sort, if any, of sources of information about vaccination would you trust less? Why is that?

- o Probes: what about the government or health authorities; international organizations such as the World Health Organization; pharmaceutical companies?

Vaccination attitudes

I would now like to talk about your attitudes towards vaccinations.

- Were you offered last season's influenza vaccine? If so, did you take it?
 - o Can you describe to me how you came to your decision?
 - What were your specific reasons for accepting/refusing? (First wait for spontaneous responses, then possible probes: ease of access/convenience, vaccine safety, prevention of infectious diseases, vaccine effectiveness, high risk group, mandatory)
- Have you personally been vaccinated against COVID-19? If so, how many doses have you received?
 - o Can you describe to me how you came to your decision?
 - What were your specific reasons for accepting/refusing? (First wait for spontaneous responses, then possible probes: ease of access/convenience, vaccine safety, prevention of infectious diseases, vaccine effectiveness, high risk group, mandatory)
 - Is there anything that could make you less or more likely to accept the vaccine?
- [ASK ONLY IF PARTICIPANT HAS CHILDREN] Are your children/is your child vaccinated according to the national immunization schedule?
 - o Is he/she missing any vaccines and why? (Probe: HPV)
 - o Can you describe to me how you came to your decision to vaccinate/not vaccinate your child(ren)?
 - What were your specific reasons for accepting/refusing? (First wait for spontaneous responses, then possible probes: ease of access/convenience, vaccine safety, prevention of infectious diseases, vaccine effectiveness, high risk group)
 - o Do you feel differently about vaccinating patients and vaccinating your own children? If so, in what way?
- How do you feel about vaccination in general? (Probe: are you in favour/against vaccines, do you have doubts, are you confident in vaccines)
 - o To what extent do you consider vaccines to be safe?
 - [IF PARTICIPANT MENTIONS CONCERNS RE. SAFETY OF VACCINES] Can you tell me more about that? What specific concerns do you have?
 - o To what extent do you consider vaccines to be effective? (probes: are there some vaccines that are more effective than others, do you feel this way for all vaccines)
 - o To what extent do you consider vaccines to be important? (probes: are vaccine preventable diseases dangerous, are they prevalent in your country, do you feel this way for all vaccines)
 - o To what extent do you consider vaccines to be compatible with your religious, philosophical, or personal beliefs?

Relationship with patients

OK. In the next section I want to explore the relationships you may have with patients.

- To what extent do you personally give advice to patients on vaccination (probe: do you strongly recommend, advise or propose vaccines)?
 - o Does it differ by the type of patient (e.g. pregnant women, older adults, children) or vaccine (e.g. influenza, HPV, measles)?
 - o To what extent do you provide recommendations or advice for HPV vaccination among children in your role?
 - How do you feel about vaccinating children against HPV?

- What would you say are the risks and benefits of the vaccine?
- Some countries are starting to offer the vaccine to boys as well as girls, what are your thoughts on this?
- What sort of role, if any, should healthcare professionals have in encouraging patients to vaccinate (probe: only recommend, try convince, give information, only offer when patients ask)?
 - o What sort of impact do you feel health care professionals' own vaccination status has on patients? (probe: can they change patients' mind)
 - o Are there any vaccines you feel less comfortable recommending? Why is that? What would help to make you feel more comfortable?
- What do you think are the main barriers to vaccination in your country? (Probe: access, vaccine hesitancy, healthcare professionals recommendations, misinformation)
- In your role, are there any vaccines you recommend, administer or prescribe to pregnant women and if so what are they?
 - o How do you feel about vaccinating pregnant women?
 - o What are the risks and benefits of vaccinating pregnant women?
- *Some parents might hesitate to vaccinate their children or have concerns about vaccination.* Why do you think this is the case? (probe: safety, misinformation, internet, rumours)
 - o Has there been any changes in vaccine hesitancy you have seen in the past year? (Probe: are people becoming more or less hesitant)
 - o How would you respond to parents that are hesitant to vaccinate themselves or their children? How comfortable would you feel responding to their concerns?
 - o What resources or information would help you to address their concerns?
 - o What do you think can be done about those challenges?

Need for training.

In this last section, I would like to talk specifically about training on vaccination for healthcare professionals.

- Could you describe the last training you attended on vaccination? (Probe: *when was it, who provided it*)
 - o How satisfied were you with the information provided during the training?
- If you were to take part in a training on vaccination, what topics would you like the training to cover?
- What would constitute barriers for you to attend a training on vaccination? (probe: timing during week/day; frequency/length, online vs face to-face, content covered, time available)
- In your opinion, what would be the best format for a training on vaccination to attract more healthcare professionals? (Probe: *online, face-to-face, during the week or in the weekends, certificate of completion, etc.*)?

Wrap Up

Thank you for your time, we have now come to the end of our discussion. Before you go, I have a couple more questions:

- If you had one message to healthcare professionals/ bodies about vaccinations, what would it be?
- Is there anything we haven't discussed so far today that you would like to talk about?

Thank the participant, ask if they have any questions, and provide contact details for the research team if requested.

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