

BMJ Open Exploring HPV vaccine knowledge, attitudes, barriers and information sources among parents, health professionals and teachers in Kazakhstan: a mixed-methods study protocol

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ABSTRACT

Introduction Human papillomavirus (HPV) is a prevalent sexually transmitted infection linked to certain types of malignant neoplasms, notably cervical cancer (CC). In Kazakhstan, a high prevalence of high oncogenic HPV types (HR-HPV) has been observed, and CC ranks as the second most common malignancy among women with a crude incidence rate of 18.3 cases per 100 000 women. The HPV vaccine, developed as the primary prevention measure against HPV infection, including the most prevalent HR-HPV, received approval from the WHO in 2009. In 2014, Kazakhstan initiated HPV vaccination as a pilot project in four sub-national regions; however, it was later in 2017 discontinued due to widespread parental refusal influenced by negative media reports. This study aims to examine knowledge, attitudes, information sources, barriers to HPV vaccination and factors associated with HPV vaccination hesitancy among different target groups in Kazakhstan prior to the HPV vaccine re-launch announced by the Ministry of Health.

Methods and analysis This mixed-method-designed research comprises quantitative and qualitative components. Data on HPV awareness, attitudes towards HPV vaccination and sources of information will be collected through an online survey administered by parents and legal guardians, health professionals, and schoolteachers in the Republic of Kazakhstan between January 2023 and January 2024. Additionally, qualitative data on Kazakhstani parental beliefs and attitudes toward HPV vaccination will be collected through online focus group discussions.

Ethics and dissemination of results The study has been approved by the local ethics committee at the Kazakhstan Medical University “Higher School of Public Health” (KMU “KSPH”) (No. 138 of 31.05.2021). The results will be reported in publications, at conferences among researchers and healthcare and school education professionals in Kazakhstan, and internationally.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study is the first of its kind to examine human papillomavirus vaccination related knowledge, attitudes, barriers and information sources in Kazakhstan.
- ⇒ The study covers rural and urban areas and addresses multiple target groups.
- ⇒ By using a mixed-method design, the study allows for a more extensive evaluation.
- ⇒ Non-probabilistic sampling in online surveys may lead to a biased study sample.

INTRODUCTION

Human papillomavirus (HPV) is one of the most common sexually transmitted infections. The persistence of high-risk HPV types (HR-HPV) increases the risk of developing cervical, oropharyngeal, oral, laryngeal, anal, penile, vaginal and vulvar cancers.¹ Studies show that 5.2% of all cancers and 16% of gynecological cancers worldwide are linked to HPV, with an average incidence of 8.0 per 100 000 person-years. Moreover, HPV causes benign diseases such as genital and oropharyngeal warts in adults and children, significantly affecting quality of life and increasing costs for patients and the healthcare system. Up to 80% of all HPV-associated cancers are cervical cancers (CC).^{2 3} CC is the fourth most common cancer in women worldwide, causing more than 300 000 deaths per year. New cases of CC are more common in low-income and middle-income countries, where early diagnosis and prevention programmes are limited. In the Republic of Kazakhstan the prevalence HR-HPV infection is substantial and ranges from 43.8% to 55.8%.⁴ Among

women attending outpatient clinics with normal and abnormal cytological results, the prevalence of HR-HPV reaches 39%, with the most common types being HPV 16 (54%), followed by HPV 51, 68 and 18.⁵ In addition to HPV 16 and 18 types, the prevalence of other HR-HPV types among women is also high, reaching up to 22%.⁶ Since 2008, Kazakhstan has implemented a national population-based CC screening programme, targeting specific age groups and intervals adjusted over time. The programme currently targets women aged 30–70 years and screens once every 4 years. This screening protocol involves the collection of either liquid-based or conventional cytological samples using the Papanicolaou method for examination. The interpretation of results follows the Bethesda Terminology System (2001), and if necessary, colposcopy and/or cervical biopsy are conducted for further evaluation and treatment.^{7,8} Despite the continuous efforts, CC remains a significant public health concern and the second most prevalent malignancy among Kazakhstani women, accounting for approximately 1800 incident cases and 600 deaths annually.^{9,10} In 2021 in Kazakhstan, CC exhibited a crude incidence rate of 18.3 cases per 100 000 women and a crude mortality rate of 9.1 per 100 000 women.¹¹ Over the period from 2009 to 2018, there was a trend of increase in the overall incidence of CC in the Republic of Kazakhstan, as well as in all its regions.¹²

In 2006, with the introduction of the first HPV vaccine, primary prevention of HR-HPV-associated diseases became available.¹³ Even though by 2021, 120 (61%) of the 194 WHO member states had introduced HPV vaccination, about 70% of the world's female population is not covered.¹⁴ The safety and efficacy of the HPV vaccine have been repeatedly proven in numerous studies. The effectiveness of the vaccine against HPV infection reaches 93%–97%, and in the prevention of both intraepithelial neoplasia and CC its effectiveness is up to 98.7% and 86%, respectively.^{15–18}

HPV vaccination coverage varies globally but is considered suboptimal.¹⁹ There are many types of vaccine uptake barriers, which can be divided into infrastructural, socio-economic and communication-related factors. Barriers can exist on the part of the state, medical professionals and organisations, schools and parents, legal guardians and adolescents themselves, while the significance of certain barriers may vary from country to country.

Patients' main barriers to vaccination include low awareness, misconceptions and lack of information.²⁰ The vaccine is surrounded by myths due to its novelty and reproductive system link.^{21,22} To address these myths, educational training of healthcare professionals and stakeholders is essential.²³ Meanwhile, knowledge gaps about HPV vaccination among healthcare professionals in various countries have a significant impact on vaccine uptake, leading to challenges during counselling, including those related to sexual issues.^{24,25} Additional medical specialists' barriers, such as children's age, time constraints, cost and insurance coverage hinder HPV

vaccination.^{26,27} Strong advice from healthcare professionals plays a significant role for parents in the decision to vaccinate, which can increase vaccination rates by three to nine times.²⁴

Most countries (61.3%) choose schools as the primary vaccination site in order to achieve greater coverage that require an active role of schoolteachers in the vaccination process.²⁸ Teachers' better knowledge leads to stronger recommendations to parents and students.²⁹ The source of information related to HPV vaccination and its credibility play an important role in the degree of HPV vaccine awareness. People get their information from medical resources, friends and family members, the media, social networks, radio, etc, while the prevalence, reliability and credibility of different sources may differ from country to country and within societies.³⁰ In terms of reliability, the media and medical doctors are considered the most dependable sources, whereas information obtained from friends is associated with lower levels.³¹ In Kazakhstan, HPV vaccination was initiated as a pilot project in four sub-national regions in 2014 but was discontinued in 2017 due to widespread media reports about potential/perceived side effects of the vaccination followed by mass parental refusal.³² However, the Ministry of Health of Kazakhstan has announced plans to re-introduce HPV vaccination in the coming years.³³ Previous studies among women in Kazakhstan have indicated a low level of awareness about HPV and HPV vaccination, with only slightly over half of them displaying a positive attitude towards the vaccine.³⁴ There is a research gap regarding the knowledge of attitudes towards HPV vaccination among parents and caregivers, barriers to recommending HPV vaccination by physicians and teachers, and the specifics of communication in Kazakhstan. This study aims to explore the level of preparedness for HPV vaccination in Kazakhstan by examining knowledge, attitudes, information sources, barriers to HPV vaccination, and factors influencing HPV vaccination hesitancy and recommendation among different stakeholders involved in vaccination, including parents, schoolteachers and health professionals. The results will be useful for creating a communication plan for the initiation and continuation of the HPV vaccination programme in Kazakhstan.

RESEARCH OBJECTIVES AND HYPOTHESES

The main objectives of this study are:

1. To explore the level of awareness and knowledge about HPV and the HPV vaccine among parents and legal guardians, healthcare professionals and school professionals in the Republic of Kazakhstan.
2. To assess the prevalence of parental hesitancy towards HPV vaccination and to assess its correlation with knowledge, awareness about HPV and HPV vaccination, sources of information and sociodemographic factors. As a hypothesis, we assume that higher levels of knowledge and more reliable sources of informa-

tion are associated with a higher intention to vaccinate children.

3. To identify parental existing and preferred sources, channels and methods of communication for obtaining information about HPV and HPV vaccination.
4. To examine barriers by healthcare professionals and schoolteachers to HPV vaccination and their willingness to recommend it.
5. To understand attitudes toward the introduction of the new HPV vaccine among parents and legal guardians by assessing barriers and motivating factors in group discussions.

Given the past negative experience of HPV vaccination in Kazakhstan, we assume low levels of awareness and high prevalence of myths and misconceptions about the HPV vaccine in the different target groups of this study. Confirmation of this fact will provide a clear understanding of the necessary content of educational interventions and information campaigns for all stakeholder groups, including parents, schoolteachers, healthcare professionals and others. Therefore, this research will be relevant in identifying potential challenges decision-makers may encounter and will help to prepare for tailored communication strategies.

METHODS AND ANALYSIS

Study design

A mixed-method research design will be used, combining sequentially quantitative and qualitative research methods.

Survey methodology

The quantitative part of this study comprises three types of cross-sectional surveys among parents and legal guardians of boys and girls under 18 years old, teachers and health professionals (figure 1).

Interviews will be conducted through electronic self-administered, anonymous basic questionnaires dedicated to all three groups, with specialised questions for health professional and schoolteachers. Convenience sampling with snowballing will be done by disseminating invitation links to an online questionnaire created in Google Forms. This link will be sent out two or three times each to parent communities, school chats, professional communities in messengers and social networks. Health professionals and teachers will also be recruited by mailing to schools and medical clinics through local state government offices. In addition, QR codes to the survey will be posted in medical clinics and schools across the country to better reflect the heterogeneity of the country and cover different regions with different social structures (32 medical organisations and 17 schools in Almaty, Astana, Shymkent, Aktau, Kokshetau, Kyzylorda, and villages of Almaty, North Kazakhstan, East Kazakhstan, and Kyzylorda regions). Organisations could take part in the study through consent of their head. Data collection will occur during 2023–2024 (January 2023 to January 2024) (figure 2).

Qualitative part of the research

The second stage of studying parental barriers, beliefs and attitudes toward HPV vaccination is conceived as 1-hour online focus group discussions with recording. The quantitative questionnaire for parents will include a question about the willingness to participate in a focus group discussion, with an option to indicate contact details. Subsequent selection for focus groups will be random among those who wish to participate. During group discussion, reflection and expression of new ideas are formed, while leading the line of discussion within the topic. In the beginning, the group has no structure in terms of certain roles of the participants; however, we assume that while the opinions of all participants are expressed, leaders are formed around whom the micro-group gathers. Researchers observe which issues resonate the most and how group and public opinion is formed. A moderator (principal investigator) and an assistant will guide the focus group discussions.

Objects of research and sample size calculation

The study design targeting three population sub-groups in quantitative part and parents and legal guardians of girls and boys under 18 years of age in focus groups. The selected study participants were determined considering the WHO recommendations on HPV vaccination age (girls 9–14 years old and catch-up vaccination up to 18 years old). As children and adolescents at this age cannot receive any healthcare without parental or legal guardian consent, this category is included in the study.³⁵

Inclusion and exclusion criteria

Inclusion criteria for the three surveys were (1) a citizen of the Republic of Kazakhstan who is (2) a parent or legal guardian of children of both genders under 18 years old or (3) an employed health professional nurse or doctor of any specialisation or (4) an employed schoolteacher and (5) willing to participate (table 1). In Kazakhstan, elementary schools teach children from ages 6–7 to 9–10; therefore, it was decided to include all schoolteachers in the study without dividing them into primary and secondary schools. The inclusion criteria for focus groups were Kazakhstani parents or legal guardians of girls and boys under 18 years old gave their consent to participate in the course of the quantitative parental survey.

Sample size

Sample size calculations for surveys

The sample size for the parent survey was determined by the formula recommended for multivariate regression: $n=100+50i$, where i refers to the number of independent variables in the final model (the number of independent variables in the model is 15, and the sample size according to this formula is 850 participants).³⁶ According to the same formula, the total sample of medical professionals will be at least 270 participants and for teachers 225 participants.

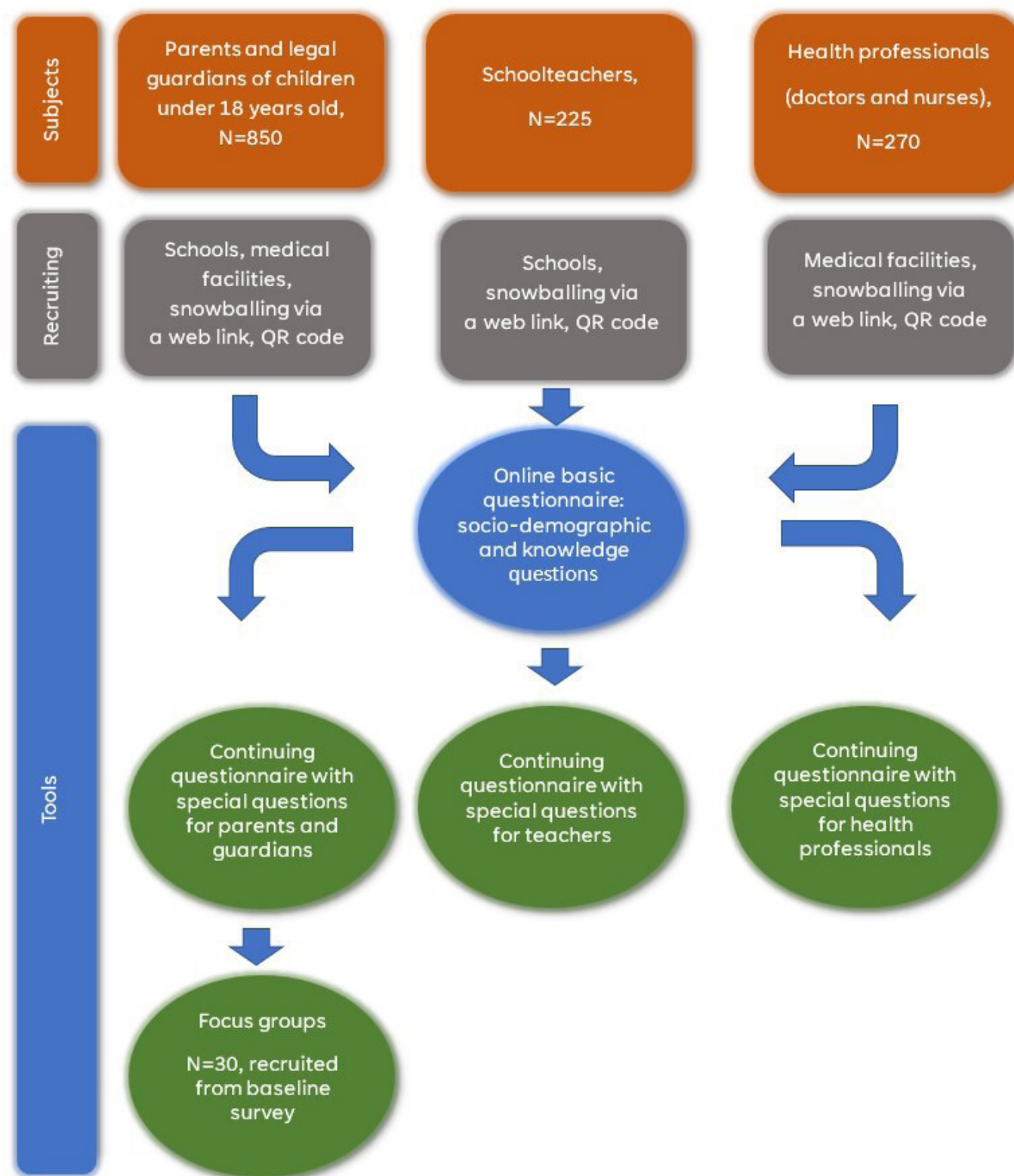


Figure 1 Research overview.

Determining the focus group sample size

In order to form four or five groups, a random sample of 30–40 parents or guardians of children under 18 years old will be drawn from those participants of the parental surveys who agreed to participate in the focus group discussions.

Data analysis

Quantitative study

Statistical analysis of primary data will be carried out using the IBM SPSS Statistics software (SPSS). Standard central tendencies of descriptive statistics (arithmetic



Figure 2 Settlements planned for the study on the map of Kazakhstan.

mean and CI, median, mode, SD) will be considered when analysing quantitative data on sociodemographic variables, knowledge, attitudes, intentions and barriers to HPV vaccination as well as data related to HPV vaccination communication. Answers to questions related to knowledge will be evaluated as follows: for correct answers or existing knowledge, one point is assigned; for incorrect answers or the answer 'I do not know', '0' is assigned. To check statistically significant differences in proportions depending on a number of comparison groups, we will use the Student's t-test criterion and the Mann-Whitney U

test criterion to compare the averages in several groups, or a one-factor dispersion analysis of analysis of variance and Kruskal-Wallis will be used. Binary logistic regression will be used to assess the probability of using the vaccine based on the correlates of interest, including sociodemographic data, awareness, knowledge, sources of information and other variables. The OR with a 95% CI will be calculated. The next step is to perform a multivariate logistic regression analysis with the simultaneous input of all correlates from the previous analysis to calculate the adjusted OR. The principal component analysis will aid

Table 1 Inclusion and exclusion criteria of the study

	Inclusion criteria	Exclusion criteria
Parental survey	Parent or legal guardian of children of both genders under 18 years of age	Parents or legal guardians of children 18 years or older
Survey for healthcare professionals	Employed health professionals (nurse or doctor) of any specialisation	Retired or unemployed healthcare professionals
Survey for schoolteachers	Employed schoolteacher, either primary or secondary	<ul style="list-style-type: none"> Retired or unemployed school professionals Educational professionals of other than primary or secondary schools
All online surveys	<ul style="list-style-type: none"> Access to the internet Willingness to participate 	<ul style="list-style-type: none"> Internet access limitation Unwillingness to continue the study
Focus group discussions	<ul style="list-style-type: none"> Parents or legal guardians of children under 18 years of age living in the Republic of Kazakhstan Availability of informed consent Internet access for online meetings 	<ul style="list-style-type: none"> Internet access limitation Parents or legal guardians of children 18 years or olderLack of informed consent

Table 2 The main expected outcomes and methods of analysis of the study

Main outcomes and determinants	Method of analysis
Outcomes	Descriptive statistics
► HPV vaccination hesitancy prevalence	
► Level of knowledge about HPV, HPV-associated diseases, HPV vaccine	
► Parental barriers to HPV vaccine acceptance	
► Barriers to HPV vaccination recommendation among healthcare professionals and schoolteachers	
HPV, HPV-associated diseases, HPV vaccine knowledge determinants	T criterion and the Mann-Whitney U criterion, one-factor dispersion analysis of ANOVA, Kruskal-Wallis tests
► Sociodemographic determinants	
► Information sources	
HPV vaccination hesitancy determinants	Principal component analysis binary, multivariate logistic regression
► Sociodemographic determinants	
► Knowledge and awareness of HPV, HPV-associated diseases, HPV vaccine	
► Information sources	
► Children's vaccination history, cervical screening history among women	
ANOVA, analysis of variance; HPV, human papillomavirus.	

in identifying the determinants of HPV vaccination hesitancy. The value of $p < 0.05$ in bilateral tests will be considered statistically significant (table 2).

Qualitative study

The data from the focus group discussions will be digitally recorded, and content will be analysed using the software MAXQDA. The content will be analysed by a method of identifying, analysing and describing patterns (themes) in the data.³⁷ In the first step, the data will be transcribed and coded by two researchers who identify and group the contents by themes. Subsequently, the two versions of the coding will be compared and partially corrected. The second step will be a discussion with coauthors to reach a consensus and complete the analysis. The results of the analysis will be presented in the form of descriptions of individual participants' answers according to a question guide, as well as separate descriptions of trends in the development of discussions.

Research tools

Questionnaires

Data collection will be carried out using questionnaires developed for all three target groups based on similar studies and adapted for data collection according to the purpose and objectives of the study (figure 1).

Questionnaire development and validation

The development and validation of the questionnaires were conducted in a few stages. During the initial phase, the research group developed three types of questionnaires tailored for parents and legal guardians, teachers, and healthcare professionals, based on previous valid questionnaires.^{29 38–40} Recognising the potential association between vaccine hesitancy and religious beliefs, three additional questions pertaining to religious beliefs and practices were included in the surveys.^{41 42} In Kazakhstan, the re-launch of HPV vaccination is planned post-COVID-19 pandemic period, and attitudes towards COVID-19 vaccination can reflect the overall compliance with vaccinations, including HPV vaccination. In previous studies conducted in Kazakhstan, a high level of vaccine hesitancy towards the COVID-19 vaccine was identified.⁴³ To explore the possible relationship between attitudes towards COVID-19 vaccination and HPV, a question on attitudes towards COVID-19 vaccination was included in the basic questionnaire for all target groups. Building on previous findings that demonstrated the association between the source of information and awareness levels, this study aims to evaluate the impact of information sources as a factor influencing HPV vaccine hesitancy and to identify effective channels for public awareness during the introduction of the HPV vaccine.³¹ To achieve this, additional questions were included in the survey concerning the sources of information about the HPV vaccine, the frequency of internet and social media usage, and preferred information sources. While acknowledging the sensitivity and societal taboo surrounding the LGQIA+ issue in Kazakhstan, and also considering the adherence to international research standards, it is important to clarify that questions related to gender identity diversity were intentionally excluded from the questionnaires. This decision was taken to mitigate any potential undesirable side effects that could compromise the research objectives.

After developing the questionnaires, a two-step translation process was performed to ensure linguistic equivalence and accuracy. First, the questionnaire was translated into Russian and then further translated into Kazakh by a certified translator (direct translation). Subsequently, the translated version was back-translated into Russian (reverse translation). This meticulous approach aimed to maintain consistency and validity between the two language versions of the questionnaire.

Following the language validation, a panel of five specialists in the fields of education, public health and clinical medicine, in addition to a focus group of parents, participated in the expert content validation process. The

experts meticulously evaluated the adequacy and validity of the questions, ensuring that they effectively addressed the research objectives and accurately measured the targeted constructs. After consulting with experts, the total number of questions for the three target groups was reduced from 112 to 81.

On successful completion of the expert validation stage, a pilot study was conducted involving 12 participants of each target group to examine the external validity of the questionnaire for acceptability and feasibility. The questions with initially unclear wording were updated. The average time spent answering the final questionnaires was 13.67 min for parents and guardians, 10.08 min for teachers and 12.83 min for healthcare professionals.

Questionnaire's structure

The proposed survey consists of a basic questionnaire for all participants and three special types of questionnaires for each target group (parents and legal guardians, healthcare professionals and schoolteachers). The basic questionnaire includes questions on sociodemographic characteristics, the history of vaccination and screening for CC in women, and knowledge about HPV and HPV-associated cancers. The questionnaire for parents and guardians comprises questions about attitudes toward HPV vaccination, hesitancy or intentions to vaccinate their children and barriers to HPV vaccination, available and preferred sources of information about HPV with characteristics of behaviour in the media space, and preferred communication modes for the invitation of adolescents to vaccination. In total, there are 54 questions in the parental questionnaire. The specific questions number 23 for health workers and 7 for schoolteachers.

The survey implies complete anonymity for respondents and can be administered in Kazakh and Russian. Prior to the survey, respondents will be acquainted with voluntary informed consent to the study in both languages (online supplemental appendix 1), including information about the researchers, the essence of the research, its main objectives, the guarantee of confidentiality and anonymity, security in participation, data protection and the expected duration of the survey. The administration of the survey will only be possible after informed consent has been obtained.

The questionnaire is compiled in simple language for easy comprehension, and the link is sent through available channels of communication. For convenience, respondents can stop and resume completing the questionnaire later if necessary. Respondents can only submit their response when they have answered all the questions on the questionnaire.

The basic questionnaire consists of two parts collecting data on sociodemographic characteristics and basic knowledge of HPV and HPV vaccination (figure 1). The first part of the basic questionnaire includes questions defining the sociodemographic characteristics of the respondents (online supplemental tables 1 and 2). For

female participants, three additional questions about the history of CC prevention are offered.

The second part of the common questionnaire assesses knowledge of HPV and vaccination against HPV. Responses to the 11 knowledge questions (online supplemental table 3) are assessed as follows: correct answers or existing knowledge are given a score of 1, while wrong answers or 'I don't know' are given a score of '0'. Question 10 offers 11 answer options, and there is an opportunity to choose several answer options, of which only five are correct (when shaking hands, through kisses, during sexual contact, during childbirth from mother to fetus, with bodily contact), five incorrect (through blood, through air, during pregnancy from mother to fetus, through water in the pool, through insect bites) and one option was 'difficult to answer'. Thus, the maximum score for all knowledge questions is 15, equivalent to 100%. Further, for parents and legal guardians, the questionnaire will continue with questions regarding attitudes toward vaccinations, barriers to vaccinations and communication. The first section includes questions on attitudes towards vaccination in general and childhood vaccination in particular (online supplemental table 3). The answers will help assess the level of confidence in vaccination in the Republic of Kazakhstan among different strata of citizens. The second section of the questionnaire includes questions examining barriers to HPV vaccination (online supplemental table 4). Because the HPV vaccine is targeted at adolescents of both sexes, differences in barriers for parents of boys and girls are assumed. To assess these, we included separate questions for parents of boys and girls. Examination of barriers will enable the design of key messages and responses to the most pressing issues in communicating with parents and legal guards during the HPV vaccination campaign, adapted for the Republic of Kazakhstan.

The final section concerns sources of information on HPV and HPV vaccination (online supplemental table 5). Responses to the questions of this block will give an understanding of the most demanded channels and ways of communication during the HPV vaccination campaign. In addition to communication channels, this block includes questions about the vaccination invitation process.

Specific questions have been developed for medical doctors and nurses to explore knowledge about vaccine administration, the vaccine recommendation process and counselling, and barriers to vaccine recommendation (online supplemental table 6). A special questionnaire for teachers includes seven questions about occupational characteristics and work experience, as well as questions about knowledge and practices about HPV and the HPV vaccine, and the willingness to recommend the vaccine to their students (online supplemental table 7). This study will reveal the intention to recommend HPV vaccination among healthcare professionals and teachers along with a variety of factors related to this intention. We assume that their knowledge and attitudes towards HPV vaccination

may be key predictors of their intention to recommend HPV vaccination.

Focus group discussion

We developed a topic guide to collect data in focus groups (online supplemental appendix 2). Since this vaccine is perceived as new for Kazakhstan, before the panel discussion, participants are given brief information in a few sentences about WHO recommendations regarding HPV-associated cancers and HPV vaccination. To answer the research questions, we included questions about parents' attitudes toward the introduction of the vaccine in Kazakhstan, the issues they are concerned about when deciding to vaccinate their children, what barriers they experience, and opposite facilitators to vaccinate against HPV. The discussion will also include questions about informing children about HPV and the vaccine and what modes of communication they feel are appropriate for their children. To gauge the development of the discussion, it will begin and end with the same question about willingness to vaccinate their children. Throughout the discussion, the moderator and the assistant encourage all parents to participate and ask for extended feedback. The focus group scenario can change slightly when particularly important topics are touched on, but the main points of the guide must be covered. Focus group discussions will be conducted in Kazakh or Russian.

Patient and public involvement

Acknowledging the significance and adhering to the principles of involving patients and the public in research, we incorporated public members into the study's design phase. We engaged a group of parents in a focus group to validate the content of the questionnaire, with their primary objective being the evaluation of the questions' relevance and clarity, the appropriateness of the questions, along with providing feedback encompassing both the questionnaire content and the study's overall framework. Following the conclusion of the study, our intention is to disseminate the findings to the participants.

ETHICS AND DISSEMINATION

Ethics of research

The study was approved by the Ethical Committee of the Kazakhstan Medical University 'KSPH' No. 138 of 31 May 2021.

Plan for the dissemination of the results of the study

The results of the study will be published in peer-reviewed scientific journals and will also be reported at national and international scientific conferences. Given that findings based on this study may be of interest to public education and influence public health policy, we will furthermore aim for the dissemination of the findings to national stakeholders, such as public health organisations.

DISCUSSION

Significance of the study

To ensure the successful introduction and acceptance of the HPV vaccine in Kazakhstan, especially after previous challenges, it is crucial to develop a comprehensive communication plan tailored to the society's specific needs. The findings from this study, conducted by interviewing a countrywide population sample of parents, health professionals and teachers, will enable an assessment of the necessity and extent of educational interventions and will help to design key messages for different communities in specific regions of the country. Understanding the preferred information sources and communication behaviour will guide the identifying effective communication channels during an information campaign among parents and legal guardians. The results on knowledge levels, barriers to recommending HPV vaccination, and factors influencing negative attitudes among healthcare professionals and schoolteachers will assist in the development of an educational strategy, equipping key sources to effectively disseminate accurate information about HPV, HPV-associated cancer and HPV vaccination to parents and adolescents. Equipped with these insights, health policy makers will have the necessary input to design an information campaign incorporating Kazakhstan-specific communication components, meeting the unique information needs of key stakeholders involved in the vaccination process. Therefore, equipping health policy makers with essential insights on the main components of communication will enable them to design a Kazakhstan-specific information campaign, tailored to the unique information needs of key stakeholders involved in the vaccination process. This, in turn, will ensure the success of the HPV vaccination programme and contribute to reducing the burden of cancer.

Strengths of the methodology

The involvement of different target groups in the survey that are assumed to be important stakeholders in the vaccination process is a strength of this study. Assessing the knowledge, attitudes towards the HPV vaccine, and barriers of each group in one period of time will give the most complete picture of these aspects in society. Using the online survey methodology improves the quality, speed and accuracy of the data collected, which is not inferior to a traditional paper survey.⁴⁴ Respondents' answers are recorded simultaneously in an Excel database, which eliminates errors on the part of researchers in the formation of the database. At the same time, not considering incomplete questionnaires excludes unmotivated participants and improves the quality of the study.

Due to the simplicity of the wording in the questionnaire, participants do not need to spend a lot of time on the answers, which contributes to a higher probability of completing the survey. Since this survey is conducted anonymously online and can be independently filled out at any convenient time, respondents have the opportunity

to answer honestly without fear of condemnation. This online survey can reach a large number of people and is performed without any time and financial cost for additional printed materials or people to conduct it. Among other things, participation in this kind of questionnaire in itself expands awareness of HPV and HPV vaccination.

A study in the form of focus group discussions can provide a broader understanding of barriers to vaccination, as parents will interact with each other during these discussions and provide more detailed explanations. In our opinion, a focus group is more appropriate for this purpose, as HPV vaccination is a completely new topic to parents, and the results can frame the discussion with the communities when vaccination programmes are introduced.

Possible limitations

To our knowledge, this is the first study in Kazakhstan that addresses several target groups in order to reveal inhibiting and supporting factors of HPV vaccination at an individual level. However, a few limitations of this study can be identified. One limitation may be the simultaneity of the study at that moment when a vaccine is not yet available and introduced in the country. It is expected that knowledge and opinion may change with increasing vaccination experience. Another limitation is the snowball sampling method in the online survey, which may affect the representativeness of the sample under study. The incorporation of medical and school organisations to disseminate questionnaires, along with an adequate sample size, can serve to counteract this limitation. Monitoring the diversity of respondents by place of residence, gender, occupation and other sociodemographic indicators will help to distribute of questionnaires also among underrepresented respondents. In our opinion, the benefits of reaching a broader spectrum of population groups may outweigh these limitations. The limitation of online surveys is primarily the availability of internet access, which can potentially influence sampling. Although internet access is widespread in Kazakhstan, there are still places where it is not available or is a financial burden for potential participants. The absence of interviewers in self-administered questionnaires may be a limiting factor, as interviewers help respondents to understand the structure of the questionnaire and the questions more easily. Another limitation of a survey using Google Forms can be attributed to the inability to calculate response rates, since the number of persons who receive the link is unknown.⁴⁵

In our study, which primarily involves a survey, we acknowledge the possibility of certain risks occurring. Given that the study lacks the possibility of attracting additional recruiters, there might be challenges in recruiting respondents within the designated timeframe. To address this risk, the number of survey responses will be continuously monitored, and in case of lower-than-expected completed survey rates, an extension of up to 3 months may be considered for conducting the survey. To mitigate response bias, the questionnaire will include

several validation questions and incorrect or inconsistent responses will be monitored and excluded from the analysis. For instance, in the parent's questionnaire, there will be specific questions to verify the presence of children, and if inconsistent responses are received, these questionnaires will be removed from the analysis. During focus group sessions, the interviewer effect may influence the type and quality of information obtained. To mitigate this risk, focus groups will be facilitated by research team members with training in qualitative research. Furthermore, to enhance data validity, audio recordings of the sessions will be made, allowing for discussions among study participants during the qualitative data analysis.

SUMMARY

Based on the published literature, there are limited studies examining barriers to the HPV vaccination programme in Kazakhstan. This study will identify social factors and knowledge gaps that limit vaccine acceptance among those involved, such as parents and caregivers, medical professionals, and school education professionals. Given past negative experiences with HPV vaccination in Kazakhstan, our proposed research will be important in forming a plan to introduce HPV vaccination in Kazakhstan, particularly the communication strategy and the need for training interventions for health professionals and teachers. It can also be used to assess which channels and methods of communication should be used in the HPV vaccination campaign. In addition, this study will shed light on the decision-making process of parents to vaccinate their children, which may provide insight into communication strategies when introducing the vaccine.

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