

Original article

Cervical cancer and Human Papillomavirus: Factors impacting knowledge, attitude, and practices among physicians in Kazakhstan

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Abstract

Introduction. This study aimed to assess the level of knowledge, the attitude, and practices of physicians from Kazakhstan on topics related to cervical cancer and Human Papillomavirus (HPV), and to find their associations with socio-demographic variables.

Methods. A 41-item questionnaire was distributed online through the snowballing method, which was completed by 389 participants. Any physician who practiced or is practicing in Kazakhstan was eligible for participation. The Poisson test with robust error variances was used for statistical model building.

Results. Approximately half of the physicians had appropriate knowledge (score > 70%) on topics of cervical cancer and HPV. Seventy-one percent of physicians expressed intention to vaccinate their own children against HPV. Less than half (44.41%) have recommended the HPV vaccine to their patients previously. Younger physicians, pediatricians, and general practitioners had a lower prevalence of appropriate knowledge, a supportive attitude towards the HPV vaccine, and actively recommended the HPV vaccine.

Conclusion. Knowledge of physicians regarding cervical cancer and HPV could be improved. Improvement in the attitudes and practices of physicians could positively influence the uptake of cervical cancer screening and HPV vaccine in Kazakhstan.

Key words: human papillomavirus, vaccination, cervical cancer, knowledge, physician, Kazakhstan.

1. Introduction

Human Papillomavirus (HPV) is a virus with over 120 different strains, but only about a dozen of which are associated with cervical cancer [1]. HPV is the most common viral infection of the female reproductive system, and cervical cancer is the third most common female cancer [2]. Cervical cancer is the second most common type of cancer among women in Kazakhstan. As was estimated for 2018, each year around 1729 women are being diagnosed, and 838 women die from cervical cancer in Kazakhstan. In the Central Asian region, Kazakhstan has the third-highest mortality rate due to cervical cancer, after Kyrgyzstan and Turkmenistan [3].

Kazakhstan implemented a free cervical cancer screening program for women aged 35 to 60 years old, with a 5-year interval in 2008. In 2017, the program was expanded to include women 30 to 70 years old, and the interval was shortened to 4 years [4].

The uptake of the screening, according to the report by Kaidarova (2018) was 45.9% in 2016. However, the results obtained in the study conducted in Western Kazakhstan [5] showed lower (35%) uptake, which could be region-specific. HPV type 16, which is a highly oncogenic type, was found to be the most common HPV type among women in Kazakhstan [6-8]. Currently, there are two HPV vaccines registered and authorized for sale in Kazakhstan, which are Cervarix (HPV 16 and 18) and Gardasil (HPV 6, 11, 16, and 18).

In 2013, a pilot National immunization program was launched in several regions of Kazakhstan. It was stopped shortly after the media reports of side effects and backlash from the public [9]. A study conducted in the regions where the pilot immunization program took

place showed that 54% of parents of teenage girls do not consider the vaccine to be safe. Among medical workers, the number was 27% [10]. According to Kaidarova (2018), there were plans for free HPV vaccination for teenage girls in 2019 – 2020. However, the renewed mandatory vaccination was restarted only in 2024, and it includes vaccination of 11-year-old girls against HPV [11,12].

For the success of both cervical cancer screening and HPV vaccination, support from medical workers is necessary. The majority of the general population obtains their information about HPV from the Internet and medical workers [13]. A study conducted in Georgia also showed that women prefer to get their information on the topics of cervical cancer and HPV from medical workers [14]. It has been established that physicians' recommendations play a major role in patients' willingness to undergo screening [15,16]. Knowledge of physicians on cervical cancer and HPV directly influences physicians' attitudes and practices in recommending vaccine uptake [17,18].

To date, no study has been conducted in Kazakhstan to understand where physicians stand with regard to cervical cancer screening programs and HPV vaccination uptake. Therefore, the objectives of this study are (1) to assess Kazakhstani physicians' knowledge about cervical cancer and Human Papillomavirus, (2) to evaluate Kazakhstani physicians' attitude and practices towards cervical cancer and Human Papillomavirus, and (3) to identify if attitudes and practices of physicians are affected by socio-demographic factors and/or physicians' knowledge about cervical cancer and Human Papillomavirus.

2. Materials and Methods

Study design

A cross-sectional survey study was conducted in 2020 and - continued in 2025 among Kazakhstani physicians to assess their knowledge, attitudes, and practices towards cervical cancer, HPV, and HPV vaccination. This was a quantitative study that used an online questionnaire to collect primary data.

Eligible population

The target population of the study was physicians. Physicians of any ethnicity, age, or sex were eligible if they practiced or had practiced in Kazakhstan. The participants were required to be able to read and write in Kazakh or Russian and be over 18 years of age.

Online snowball sampling was used for this study in order to reach an appropriate number of physicians across Kazakhstan. The virtual snowball sampling method was proven to be efficient in studying "hard-to-reach" populations, despite geographical or time constraints [19]. The questionnaire contained parts about demographics, knowledge, attitude, and practice of physicians on topics regarding cervical cancer, HPV, and HPV vaccination. It was developed through the survey host medical doctors were told that participation was voluntary, anonymous, and confidential. Those who were willing to fill out the questionnaire were also asked

to send the message with the link to other physicians they know.

The total number of people who accessed the link to the survey was 514, and out of those people, 45 did not give their consent to participate in the study. A total of 469 (91.25%) agreed to participate, out of which 125 people did not meet the inclusion criteria (for example, nurses, medical students etc.) or left the survey incomplete and thus were eliminated. Overall, 389 (75.6%) participants were included in the study.

The study instrument

The questionnaire used in the study was adapted and translated from [20] and [21]. Some of the questions were removed, added, or modified and adjusted to accommodate the various topics of cervical cancer, HPV, and HPV vaccination in the context of Kazakhstan. The questionnaire consisted of 41-items and was divided into three main parts: demographics, knowledge, and attitude/practice (please see the Appendix). The questionnaire was translated and then back-translated from English into Kazakh and Russian languages to ensure correct understanding of the questions. Kazakh and Russian languages were chosen because these are the two official languages of the country, and the majority knows at least one of the two languages. Participants were given the choice to fill out the questionnaire in Kazakh or Russian.

Data collection

After obtaining ethical approval of the study from the Institutional Research Ethics Committee, emails and messages with links to the study were sent to prospective participants.

Study variables

The knowledge of the physicians on topics of cervical cancer, HPV, and HPV vaccination was assessed through true/false statements. Each correct answer was given a point; incorrect or "don't know" were given a zero. A total of 14 knowledge questions resulted in 2 binary outcomes that assessed participants' knowledge: cervical cancer knowledge (maximum of 7 points) and HPV knowledge (maximum of 7 points). Fifty and seventy percent were considered for the knowledge cutoff point, but 70% was eventually chosen following (Ndizeye et al.), aiming for a stricter assessment of the physician's knowledge levels. A physician had to score at

least 5 points (score > 70%) to be considered to have appropriate knowledge. Attitude towards HPV vaccination was measured by the desire of the physicians to vaccinate their children, where a will to vaccinate was considered a positive attitude, and reluctance was considered negative. The practice of physicians was measured by the experience of recommending the HPV vaccine to their patients. Independent variables were participants' gender, language in which the questionnaire was filled out, age, nationality, clinical specialty, place of practice, city of work, university, additional training in their specialization, and number of patients attended to in a week.

Data analysis

To understand the data collected, all the variables were first analyzed in descriptive statistics. Frequencies and distributions of the answers were recorded. To establish associations between binary outcome variables and independent variables, the Chi-squared test or Fisher's exact test was performed where applicable. Variables with p-value <0.05 were considered significant. However, variables with p-values <0.25 were also considered for use in the final model, as they could become significant when adjusted for other variables. To evaluate the prevalence risk ratio of the dependent variables, Poisson with robust error variance was used as it was found to provide more accurate estimates in cross-sectional studies with binary outcomes [22]. Data was analyzed in STATA 12.0 (StataCorp, 2011).

Ethical Approval

The study was approved by Nazarbayev University School of Medicine – Institutional Research Ethics Committee (NUSOM-IREC) on January 28th, 2019, and University Medical Center Institutional Research Board approval (Minutes No. 2024/02-013 of 10.05.2024). The informed consent included the details and purposes of the study, as well as the confidentiality, anonymity, and voluntary nature of participation in the study. Participants were informed that they could stop and withdraw from the study at any moment. The survey had minimal risks for the participants and did not collect any identifiers. There were no incentives for participation in the study.

3. Results

As summarized in Table 1, the mean age of the participants was 39.56 years (SD±10.61). Most of the physicians were female (89.83%) and Kazakh (82.5%) in nationality. Distribution of the specialties was as follows:

35.47% general practitioners, 29.56% obstetrics and gynecology (OB/GYN), 3.85% pediatricians, 3.85% oncologists, and 27.24% of other specialties. Participants practiced in more than 33 different cities and towns in

Kazakhstan. The majority practiced in Astana (44.7%). Physicians mainly have graduated from the 5 major Kazakhstani Medical Universities with a minority who have obtained their medical degree from abroad (8.43%).

More than half of the physicians (64.83%) practiced in governmental clinics. The majority (76.45%) of the doctors have received additional training in their specializations.

Table 1 - Characteristics of participants

Variable	N (%)
Number of participants	389 (100)
Gender	
Male	35 (9.0)
Female	354 (91.0)
Age	
25 - 30	83 (21.33)
31 - 37	123 (31.6)
38 - 46	96 (24.67)
47 - 66	87 (22.36)
Nationality	
Kazakh	321 (82.50)
Russian	49 (12.5)
Other	19 (4.88)
Clinical specialty	
General practitioner	138 (35.47)
OB/GYN	115 (29.56)
Pediatrician	15 (3.85)
Oncology	15 (3.85)
Other	106 (27.24)
City of work	
Astana	174 (44.7)
Almaty	45 (11.56)
Oblast capital	124 (31.87)
Other cities	46 (11.8)
Medical University	
Astana Medical University (AMU)	120 (30.80)
Asfendiyarov Kazakh National Medical University (KazNMU)	70 (17.99)
Karaganda Medical University (KGMU)	34 (8.74)
Semey Medical University (SMU)	49 (12.59)
West Kazakhstan Marat Ospanov State Medical University (ZKGMU)	87 (22.33)
Russian Universities	13 (3.34)
Other	16 (4.11)

Twenty-two (6.4%) of the participants had not heard about the HPV vaccine before the survey. Approximately 60% of the physicians either thought that the HPV vaccine could only be given to females or did not know whether it could be administered to males as well. Twenty-six percent of participants thought that HPV vaccination is included in the national immunization program of the Republic of Kazakhstan. Regarding vaccines in general, 4.94% of the physicians surveyed stated that they have a negative attitude. Detailed responses to knowledge statements can be seen in Table 1. The mean score for cervical cancer knowledge

was 4.47 (SD±1.49). Out of all participants, 178 (51.74%) have obtained at least 5 points (>70%) and were considered to have appropriate knowledge about cervical cancer. The mean score for HPV knowledge was 3.94 (SD±1.97). There were 151 (43.90%) physicians who scored 5 or higher and were considered to have appropriate knowledge about HPV.

Bivariate test showed that language, age, and clinical specialty had statistically significant associations (p -value<0.25) with knowledge about cervical cancer and thus were considered as variables for the full model. The majority of participants who answered in Russian had

appropriate knowledge (score > 70%) about cervical cancer (53.25% vs. 28.57% in Kazakh). Age group 47 to 66 had the highest proportion (63.22%) of physicians who scored high on the cervical cancer knowledge test. Oncologists (66.67%) and OB/GYN (65.71%) had the

highest number of knowledgeable physicians on the topic, while general practitioners (46.38%) and pediatricians (46.67%) had the lowest. Information about frequencies, percentages, and p-values of other variables is summarized in Table 2.

Table 2 - Participants' knowledge on the topic of Cervical Cancer and Human Papillomavirus stratified by independent variables

Variables		Score < 70% N=166 (48.26%)	Score > 70% N=178 (51.74%)	p-value	Score < 70% N=193 (56.10%)	Score > 70% N=151 (43.90%)	p-value
Gender	Male	18 (51.34)	17 (48.57)	0.692	24 (68.57)	11 (31.43)	0.117*
	Female	148 (47.9)	161 (52.1)		169 (54.69)	140 (45.31)	
Language	Kazakh	15 (71.43)	6 (28.57)	0.028**	16 (76.19)	5 (23.81)	0.056*
	Russian	151 (46.75)	172 (53.25)		177 (54.8)	146 (45.2)	
Age	25 - 30	44 (53.01)	39 (46.99)	0.082*	40 (48.19)	43 (51.81)	0.27
	31 - 37	38 (48.72)	40 (51.28)		47 (60.26)	31 (39.74)	
	38 - 46	52 (54.17)	44 (45.83)		59 (61.46)	37 (38.54)	
	47 - 66	32 (36.78)	55 (63.22)		47 (54.02)	40 (45.98)	
Nationality	Kazakh	135 (48.91)	141 (51.09)	0.682	163 (59.06)	113 (40.94)	0.083*
	Russian	21 (42.86)	28 (57.14)		22 (44.90)	27 (55.10)	
	Other	10 (52.63)	9 (47.37)		8 (42.11)	11 (57.89)	
Clinical specialty	General practitioner	74 (53.62)	64 (46.38)	0.058*	83 (60.14)	55 (39.86)	<0.001**
	OB/GYN	24 (34.29)	46 (65.71)		23 (32.86)	47 (67.14)	
	Pediatrician	8 (53.33)	7 (46.67)		12 (80.00)	3 (20.00)	
	Oncology	5 (33.33)	10 (66.67)		3 (20.00)	12 (80.00)	
	Other	55 (51.89)	51 (48.11)		72 (67.92)	34 (32.08)	
Place of practice	Governmental clinic	109 (48.88)	114 (51.12)	0.329	124 (55.61)	99 (44.39)	0.047**
	Private clinic	23 (38.98)	36 (61.02)		33 (55.93)	26 (44.07)	
	Both	26 (53.06)	23 (46.94)		24 (48.98)	25 (51.02)	
	Other	8 (61.54)	5 (38.46)		12 (92.31)	1 (7.96)	
City of work	Astana	62 (408.06)	67 (51.94)	0.908	73 (56.59)	56 (43.41)	0.326
	Almaty	20 (44.44)	25 (55.56)		20 (44.44)	25 (55.56)	
	Oblast capital	60 (48.39)	64 (51.61)		71 (57.26)	53 (42.74)	
	Other cities	24 (52.17)	22 (47.83)		29 (63.04)	17 (36.96)	
Medical University	Astana Medical University (AMU)	42 (56.00)	33 (44.00)	0.27	41 (54.67)	34 (45.33)	0.530
	Asfendiyarov Kazakh National Medical University (KazNMU)	29 (41.43)	41 (58.57)		39 (55.71)	31 (44.29)	
	Karaganda Medical University (KGMU)	18 (52.94)	16 (47.06)		16 (47.06)	18 (52.94)	
	Semey Medical University (SMU)	19 (38.78)	30 (61.22)		25 (51.02)	24 (48.98)	
	West Kazakhstan Marat Ospanov State Medical University (ZKGMU)	45 (51.72)	42 (48.28)		57 (65.52)	30 (34.48)	
	Russian Universities	4 (30.77)	9 (69.23)		7 (53.85)	6 (46.15)	
	Other	9 (56.25)	7 (43.75)		8 (50.00)	8 (50.00)	
Additional training in your specialization	Yes	123 (46.77)	140 (53.23)	0.32	142 (53.99)	121 (46.01)	0.155*
	No	43 (53.09)	38 (46.91)		51 (62.96)	30 (37.04)	
	0	17 (47.22)	19 (52.78)	0.592	23 (63.89)	13 (36.11)	0.279

Number of patients typically attended to in a week	1 - 24	73 (52.14)	67 (47.86)		78 (55.71)	62 (44.29)	
	25 - 49	22 (41.51)	31 (58.49)		24 (45.28)	29 (54.72)	
	above 50	54 (46.96)	61 (53.04)		68 (59.13)	47 (40.87)	

* - *p*-value < 0.25, included for final model consideration

** - *p*-value < 0.05, statistically significant

Table 3 - adjusted prevalence rate ratio on cervical cancer knowledge, Human Papillomavirus knowledge, participants' attitude and participants' practice, Kazakhstan, 2019

Variable	Cervical Cancer Knowledge		HPV Knowledge		Attitude		Practice	
	aPR (95% CI)	P-value	aPR (95% CI)	P-value	aPR (95% CI)	P-value	aPR (95% CI)	P-value
Age								
25 - 30	ref.	0.047	-	-	ref.	0.006	ref.	0.003
31 - 37	1.08 (0.79 - 1.48)		-		0.71 (0.56 - 0.90)		1.00 (0.66 - 1.50)	
38 - 46	0.97 (0.71 - 1.33)		-		0.89 (0.74 - 1.08)		1.33 (0.93 - 1.90)	
47 - 66	1.34 (1.02 - 1.77)		-		1.05 (0.90 - 1.24)		1.74 (1.23 - 2.47)	
Nationality								
Kazakh	-	0.025	ref.	-	-	-	-	-
Russian	-		1.48 (1.09 - 1.99)		-		-	
Other	-		1.30 (0.88 - 1.91)		-		-	
Clinical specialty								
General practitioner	ref.	0.025	ref.	<0.001	ref.	<0.001	ref.	<0.001
OB/GYN	1.41 (1.10 - 1.80)		1.73 (1.33 - 2.25)		1.21 (1.03 - 1.42)		1.75 (1.36 - 2.24)	
Pediatrician	0.95 (0.55 - 1.63)		0.52 (0.19 - 1.42)		0.91 (0.60 - 1.36)		0.65 (0.27 - 1.53)	
Oncology	1.49 (0.99 - 2.23)		2.08 (1.46 - 2.99)		1.53 (1.22 - 1.92)		2.14 (1.37 - 3.34)	
Other	1.05 (0.81 - 1.37)		0.80 (0.57 - 1.13)		0.96 (0.80 - 1.16)		0.70 (0.48 - 1.03)	

aPR – adjusted Prevalence rate ratio

CI – confidence interval

Poisson regression model with robust error variances showed that physicians in the age group 47 to 66 had 34% higher prevalence of having appropriate knowledge (score>70%) on cervical cancer, compared to those in the age group from 25 to 30, adjusting for clinical specialty. Compared to general practitioners, the prevalence of appropriate knowledge on cervical cancer was 41% higher among OB/GYNs and 49% higher among oncologists, while pediatricians had 5% lower prevalence

of having good knowledge, adjusting for other variables (Table 3).

Bivariate analysis showed a statistically significant association between knowledge on the topic of HPV and physicians' gender, language, nationality, clinical specialty, place of practice, and additional training in specialization (Table 2). Thus, these variables were considered for the full model. The highest proportion of physicians with appropriate knowledge (score>70%) was among those who answered in the

Russian language (45.20% vs. 23.81% in Kazakh language) and among physicians of nationalities other than Kazakh or Russian (57.89% vs. 40.94% Kazakh). The number of physicians with good knowledge about HPV was highest among those who worked in both private and governmental clinics (51.02%). Eighty percent of oncologists were classified as having appropriate knowledge.

The final model for HPV knowledge includes nationality and clinical specialty as descriptive variables. Russians have 48% and other nationalities have 30% higher prevalence of appropriate knowledge (score>70%) about HPV compared to physicians of Kazakh nationality, adjusting for other variables. Compared to general practitioners, oncologists have 108% higher prevalence of appropriate knowledge, while OB/GYNs have 73% higher prevalence, adjusting for other variables. Pediatricians have 48% less prevalence of being

knowledgeable on the subject, with adjustments to other variables (Table 3).

Attitude towards HPV vaccination was measured by the question “Would you like your children to be vaccinated against HPV?”. Out of 322 physicians who were aware of the HPV vaccine, 70.81% said yes and 29.19% said no. Ninety-four physicians have provided a reason for their reluctance to vaccinate. Bivariate analysis showed a statistically significant association between attitude towards HPV vaccine and physicians’ age, nationality, and clinical specialty (Table 4). Age group 47-66 had the highest proportion of physicians who wanted to vaccinate (80% vs. 55.71% age group 31-37). Doctors of Russian nationality had the least (59.57%) people wanting to vaccinate their children. Almost all oncologists (93.33%) wanted to vaccinate their kids from HPV; meanwhile, only 64.29% of pediatricians and 63.92% of physicians of other specialties expressed such a desire.

Table 4 - Participants' attitude and practice towards the Human Papillomavirus vaccine stratified by independent variables

Variables		Attitude			Practice		p-value
		Negative N=94 (29.19%)	Positive N=228 (70.81%)	p-value	Did not recommend HPV vaccine N=179 (55.59%)	Recommended HPV vaccine N=143 (44.41%)	
Gender	Male	9 (29.03)	22 (70.97)	0.984	15 (48.39)	16 (51.61)	0.396
	Female	85 (29.21)	206 (70.79)		164 (56.36)	127 (43.64)	
Language	Kazakh	4 (20.00)	16 (80.00)	0.350	12 (60.00)	8 (40.00)	0.682
	Russian	90 (29.80)	212 (70.20)		167 (55.30)	135 (44.70)	
Age	25 - 30	18 (23.08)	60 (76.92)	0.005**	51 (65.38)	27 (34.62)	0.006**
	31 - 37	31 (44.29)	39 (55.71)		45 (64.29)	25 (35.71)	
	38 - 46	28 (31.46)	61 (68.54)		48 (53.93)	41 (46.07)	
	47 - 66	17 (20.00)	68 (80.00)		35 (41.18)	50 (58.82)	
Nationality	Kazakh	71 (27.63)	186 (72.37)	0.166*	137 (53.31)	120 (46.69)	0.034**
	Russian	19 (40.43)	28 (59.57)		34 (72.34)	13 (27.66)	
	Other	4 (22.22)	14 (77.78)		8 (44.44)	10 (55.56)	
Clinical specialty	General practitioner	41 (32.28)	86 (67.72)	0.022**	76 (59.84)	51 (40.16)	<0.001**
	OB/GYN	12 (17.39)	57 (82.61)		19 (27.54)	50 (72.46)	
	Pediatrician	5 (35.71)	9 (64.29)		10 (71.43)	4 (28.57)	
	Oncology	1 (6.67)	14 (93.33)		4 (26.67)	11 (73.33)	
	Other	35 (36.08)	62 (63.92)		70 (72.16)	27 (27.84)	
Place of practice	Governmental clinic	57 (27.40)	151 (72.60)	0.320	119 (57.21)	89 (42.79)	0.117*
	Private clinic	19 (33.33)	38 (66.67)		27 (47.37)	30 (52.63)	
	Both	12 (26.67)	33 (73.33)		23 (51.11)	22 (48.89)	
	Other	6 (50.00)	6 (50.00)		10 (83.33)	2 (16.67)	
City of work	Astana	39 (32.23)	82 (67.77)	0.451	72 (59.50)	49 (40.50)	0.024**
	Almaty	9 (20.93)	34 (79.07)		16 (37.21)	27 (62.79)	
	Oblast capital	32 (27.35)	85 (72.65)		63 (53.85)	54 (46.15)	
	Other cities	14 (34.15)	27 (65.85)		28 (68.29)	13 (31.71)	
Medical University	Astana Medical University (AMU)	27 (38.57)	43 (61.43)	0.288	47 (67.14)	23 (32.86)	0.312
	Asfendiyarov Kazakh National	13 (19.40)	54 (80.60)		32 (47.76)	35 (52.24)	

	Medical University (KazNMU)						
	Karaganda Medical University (KGMU)	8 (26.67)	22 (73.33)		19 (63.33)	11 (36.67)	
	Semey Medical University (SMU)	14 (30.43)	32 (69.57)		24 (52.17)	22 (47.83)	
	West Kazakhstan Marat Ospanov State Medical University (ZKGMU)	24 (29.63)	57 (70.37)		43 (53.09)	38 (46.91)	
	Russian Universities	5 (38.46)	8 (61.54)		7 (53.85)	6 (46.15)	
	Other	3 (20.00)	12 (80.00)		7 (46.67)	8 (53.33)	
Additional training in your specialization	Yes	71 (28.98)	174 (71.02)	0.881	131 (53.47)	114 (46.53)	0.172*
	No	23 (29.87)	54 (70.13)		48 (62.34)	29 (37.66)	
Number of patients typically attended to in a week	0	10 (30.30)	23 (69.70)	0.740	23 (69.70)	10 (30.30)	0.258
	1 - 24	37 (29.37)	89 (70.63)		66 (52.38)		
	25 - 49	12 (23.08)	40 (76.92)		26 (50.00)	26 (50.00)	
	above 50	35 (31.53)	76 (68.47)		64 (57.66)	47 (42.34)	
* - p-value < 0.25, included for final model consideration							
** - p-value < 0.05, statistically significant							

The most popular answers were the lack of evidence for the vaccine's necessity or its effectiveness,

side effects of the vaccine and lack of information regarding the vaccine (Table 5).

Table 5 - Participants' reasons for not wanting to vaccinate their children from Human Papillomavirus

Physicians who don't want to vaccinate their children against HPV		
N = 94 (29.19%)		
<i>Provided their reason</i>	<i>N = 53</i>	<i>56.38 %</i>
lack of evidence for vaccine necessity or effectiveness	20	37.74%
side effects	8	15.09%
don't have enough information	6	11.32%
no daughters	4	7.55%
against vaccination in general	3	5.66%
low quality of vaccines	2	3.77%
created for commercial reasons	1	1.89%
unnecessary for cervical cancer prevention	1	1.89%
price	1	1.89%
psychologically not ready	1	1.89%
cervical cancer is not a big problem	1	1.89%
advocate for abstinence before marriage	1	1.89%
other	4	7.55%

Prevalence of positive attitude towards vaccinating their children was 29% lower in physicians within the age group 31–37, when compared to physicians of the 25–30 age group, after adjusting for clinical specialty. OB/GYN and oncologists have 21% and 53% higher prevalence of wanting to vaccinate their kids when compared to general practitioners, and adjusting for age (Table 3).

The practice of physicians was measured by the question "Have you ever recommended HPV vaccination to your patients?" Of those who knew about the HPV vaccine, 44.41% answered yes and 55.59% answered no. Significant association was demonstrated through bivariate analysis between the practice of vaccine recommendation and age, nationality, clinical specialty, additional training, and city of work (Table 4). Once again, the older age group of 47–66 (58.82%) had more

physicians who had recommended the vaccine. Physicians of nationalities other than Kazakh and Russian had the highest percentage (55.56%) of those who had recommended the HPV vaccine before. Understandably, oncologists (73.33%) and OB/GYN (72.46%) had higher frequencies of recommendation. Physicians who worked in private clinics (52.63%) had the highest number of people recommending the HPV vaccine.

The prevalence of physicians who recommended the HPV vaccine in the age group 47 to 66 is 74% higher than that of physicians in the age group 25 to 30, adjusting for clinical specialty and nationality. The prevalence of doctors who recommended the vaccine is

65% and 114% higher among OB/GYN and oncologists, respectively, when compared to general practitioners and adjusted for other variables (Table 3).

Approximately 80% of physicians were interested in receiving further training and education on topics of HPV, cervical cancer, and the pap smear test. Physicians' attitude and practice, but not knowledge, had statistically significant associations in bivariate analysis with the desire to learn more about the topics. A higher proportion of physicians with a positive attitude towards the vaccine wanted to learn more about all three topics. A higher proportion of physicians who have not recommended the vaccine to their patients declined the opportunity to learn more about the topics (Table 6).

Table 6 - Bivariate analysis between physicians' desire to learn more and their knowledge, attitude, and practices towards cervical cancer and Human Papillomavirus

Variables		Want to know more about					
		Cervical cancer		HPV		Pap Test	
		No	Yes	No	Yes	No	Yes
Cervical cancer knowledge	Score < 70%	34 (56.67)	132 (46.48)	31 (50.00)	135 (47.87)	32 (53.33)	134 (47.18)
	Score > 70%	26 (43.33)	152 (53.52)	31 (50.00)	147 (52.13)	28 (46.67)	150 (52.82)
<i>p-value</i>		0.151		0.761		0.386	
HPV knowledge	Score < 70%	34 (56.67)	159 (55.99)	34 (54.84)	159 (56.38)	33 (55.00)	160 (56.34)
	Score > 70%	26 (43.33)	125 (44.01)	28 (45.16)	123 (43.62)	27 (45.00)	124 (43.66)
<i>p-value</i>		0.923		0.824		0.849	
Overall knowledge	Insufficient	34 (56.67)	164 (57.75)	31 (50.00)	167 (59.22)	32 (53.33)	166 (58.45)
	Sufficient	26 (43.33)	120 (42.25)	31 (50.00)	115 (40.78)	28 (46.67)	118 (41.55)
<i>p-value</i>		0.878		0.184		0.466	
Attitude	Negative	22 (40.74)	72 (26.87)	24 (42.86)	70 (26.32)	24 (44.44)	70 (26.12)
	Positive	32 (59.26)	196 (73.13)	32 (57.14)	196 (73.68)	30 (55.56)	198 (73.88)
<i>p-value</i>		0.041*		0.013*		0.007*	
Practice	Passive	39 (72.22)	140 (52.24)	41 (73.21)	138 (51.88)	41 (75.93)	138 (51.49)
	Active	15 (27.78)	128 (47.76)	15 (26.79)	128 (48.12)	13 (24.07)	130 (48.51)
<i>p-value</i>		0.007*		0.003*		0.001*	

*- *p-value* < 0.05, statistically significant

4. Discussion

This is the first study to evaluate the knowledge, attitude, and practices of Kazakhstani physicians regarding cervical cancer and HPV. As physicians are on the frontline of communicating proper prevention and treatment of any disease, it is important for them to have high levels of knowledge, which in turn influences their attitude and practices towards any illness, including cervical cancer. As cervical cancer is the second leading female cancer in the country, the importance of

physicians in the propagation of preventative methods cannot be underestimated. A study in Western Kazakhstan had shown that only 34.7% of the women interviewed had regularly participated in the nationwide cervical cancer screening program, and only 22.9% had a positive outlook on the HPV vaccine. Meanwhile, 38.8% of women have never heard about the vaccine at all [5].

This study revealed that approximately half of the participating physicians had appropriate knowledge

(score>70%) on the topic of cervical cancer, and approximately 44% had appropriate knowledge (score>70%) regarding HPV. Interestingly, 6.4% of doctors had not heard about the HPV vaccine before the survey, which is similar to the results from the study in a culturally similar country, Turkiye [23], where 90% of physicians were aware of the HPV vaccine. Around 40% of physicians correctly identified that the HPV vaccine can be administered to both males and females, resonating the results found in a study in India [24], where 40% of physicians said that the vaccine can be administered to both males and females. This could be due to the false perception that HPV is strictly a female issue, which is further corroborated by only 46.8% of this survey's respondents identifying that HPV can cause more than one type of cancer.

Our statistical models show that clinical specialty is significantly associated with knowledge, attitude, and practices on topics of cervical cancer and HPV. OB/GYN and oncologists had a higher prevalence of appropriate knowledge, positive attitude (expressed desire to vaccinate their children), and practice of recommending the vaccine in both models, when compared to general practitioners. Despite having higher scores comparatively, not all oncologists and OB/GYNs scored enough to be categorized as having appropriate knowledge. Pediatricians had the lowest prevalence of appropriate knowledge (score>70%) in both knowledge models, the lowest prevalence of wanting to vaccinate their children, and of recommending the vaccine to their patients, when compared to general physicians and adjusted for other variables. This could be because pediatricians do not consider the prevention of cervical cancer as part of their expertise.

In all statistical models, except for HPV knowledge, age was found to be a significant variable. In all three models, the oldest age group (47–66) had a higher prevalence of appropriate knowledge, positive attitude, and practice of recommending the vaccine compared to the youngest group (25–30), after adjusting for other variables. This could reflect the differences in the education received by different generations or the amount of experience with the topic among older physicians. Support of vaccine among older physicians could also be explained by the obligatory vaccination practice in the ex-USSR, where vaccination was mandatory and nonnegotiable. Meanwhile, the younger generation in Kazakhstan is refusing vaccination more often. The current measles outbreak, and Kazakhstan was ranked high in the world with the fastest spread of measles cases [26]. People in Kazakhstan are more distrustful of vaccines, and it could be reflected in the younger physicians' answers to our survey.

Approximately two-thirds (70.81%) of Kazakhstani physicians would want to vaccinate their children. Results were consistent with a previous study, where 73% of physicians expressed their confidence in HPV vaccine safety [10]. The results were also similar to the findings obtained in 2013 in a Turkish study among pediatricians [27], where 75% stated that they would recommend the vaccine to their daughters. A bit more than half of physicians (56.38%) have provided a reason why they would not want to vaccinate their children (Table 5). Most popular answers were “lack of evidence for vaccine necessity and effectiveness”, “side effects”, and “lack of information about the vaccine”. Similar results were found in a 2015 study conducted in Japan among OB/GYN [28], where only 65.2% of those interviewed indicated that they would recommend the HPV vaccine to teens, and the majority stated that their reluctance stems from media reports of side effects and the consequent suspension of vaccine recommendation by the Japanese government. The situation resembles Kazakhstan's attempt to launch the HPV immunization program in 2013 in a few regions. The program was closed shortly after the media reported about the fainting of two girls due to vaccination, resulting in a backlash from the parents [9]. This once again demonstrates the importance of the propagation of accurate information on such topics as HPV and vaccination.

For the HPV knowledge model analysis, nationality has been found to be of significance. Russians had 46% higher prevalence of appropriate knowledge when compared to Kazakhs, and adjusted for clinical specialty. Interestingly, only 28.57% of those who answered the survey in Kazakh had scored enough on the topic of cervical cancer to be considered to have appropriate knowledge. As Kazakhstan has spent more than 70 years under the direct influence of Russia, during which education was mainly provided in the Russian language, there still might be gaps in education provided in the Kazakh language today. Such differences could be reflected in the results of our study.

The limitation of the study is that it is cross-sectional, and the findings show associations, but cannot signify causality. The data was collected via an online snowballing method, which is a convenience sampling that can create bias; however, this method allowed us to access many physicians during the month of data collection from different regions of the country. Online survey collection was non-random, which could have created bias in favor of favoring younger physicians, who are more comfortable with filling out online questionnaires. Therefore, not represent the true population of physicians in Kazakhstan. Almost 27% of those who received the link to the survey either did not

meet the inclusion criteria, did not consent to the survey, or did not complete the survey to the end. There could be a significant difference between those doctors who participated and those who did not, creating nonresponse bias.

This study revealed that only half of the surveyed physicians had appropriate knowledge on the topics of cervical cancer and HPV. Support for the HPV vaccine and practice of HPV vaccine recommendations were found to be low in this study. Younger physicians should

be educated more on the topics of cervical cancer and HPV. The same applies to pediatricians and general practitioners. The role of these two specialties is especially important, as they are the first doctors who could recommend the vaccine or send a patient to OB/GYN or oncology specialists. A study on a national scale among physicians should be done to provide a more accurate estimation of the knowledge, attitude, and practices among doctors in Kazakhstan.

5. Conclusion

This study shows that while physicians in Kazakhstan have a general positive attitude towards HPV vaccination, there is a significant gap in their knowledge and practice about cervical cancer and HPV prevention. Only half of the physicians had adequate knowledge, while fewer than half of them recommended the HPV vaccine to patients, indicating a missed opportunity to prevent cervical cancer. Differences between physicians of various specialties and age groups indicate that educating them, especially general practitioners and pediatricians, could greatly enhance their advocacy of HPV vaccination and cervical cancer screening. Enhancing physicians' knowledge and their confidence in communicating information about HPV and cervical cancer is critical to building trust among patients, thus helping to reduce cervical cancer morbidity in Kazakhstan.

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Жатыр мойны обыры және адам папиллома вирусы: Қазақстандағы дәрігерлердің біліміне, көзқарасына және тәжірибесіне әсер ететін факторлар

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Түйіндемe

Кіріспе. Бұл зерттеудің мақсаты - жатыр мойны обыры мен адам папилломавирусына (АПВ) қатысты тақырыптар бойынша Қазақстан дәрігерлерінің білім деңгейін, көзқарасын және тәжірибесін бағалау және олардың әлеуметтік-демографиялық айнымалылармен байланысын табу.

Әдістер. 41 сұрақтан тұратын сауалнама онлайн режимінде қар бүрку әдісі арқылы таратылды, оны 389 қатысушы толтырды. Қазақстанда тәжірибеден өткен немесе тәжірибеден өтіп жатқан кез келген дәрігер қатысуға құқылы болды. Статистикалық модель құру үшін сенімді қателіктері бар Пуассон сынағы пайдаланылды.

Нәтижелер. Дәрігерлердің шамамен жартысы жатыр мойны обыры мен АПВ тақырыптары бойынша тиісті білімге ие болды (балл>70%). Дәрігерлердің жетпіс бір пайызы өз балаларын АПВ-ға қарсы вакцинациялау ниетін білдірді. Жартысынан азы (44,41%) бұрын пациенттеріне АПВ вакцинасын ұсынған. Жас дәрігерлердің, педиатрлардың және жалпы тәжірибе дәрігерлерінің тиісті білімінің таралуы төмен, АПВ вакцинасына қолдау көрсететін көзқарасы болды және АПВ вакцинасын белсенді түрде ұсынды.

Қорытынды. Дәрігерлердің жатыр мойны обыры мен АПВ туралы білімін жақсартуға болады. Дәрігерлердің көзқарасы мен тәжірибесін жақсарту Қазақстанда жатыр мойны обырын скринингтеу және HPV вакцинасын енгізуге оң әсер етуі мүмкін.

Түйін сөздер: адам папилломавирусы, вакцинация, жатыр мойны обыры, білім, дәрігер, Қазақстан.

Рак шейки матки и вирус папилломы человека: Факторы, влияющие на знания, отношение и практику врачей в Казахстане

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Резюме

Введение. Целью данного исследования было оценить уровень знаний, отношения и практики врачей из Казахстана по вопросам, связанным с раком шейки матки и вирусом папилломы человека (ВПЧ), а также выявить их связь с социально-демографическими переменными.

Методы. Онлайн-опросник из 41 вопроса был распространен методом «снежного кома», его заполнили 389 участников. К участию допускались все врачи, практикующие или практикующие в Казахстане. Для построения статистической модели использовался критерий Пуассона с робастными дисперсиями ошибок.

Результаты. Примерно половина врачей обладала достаточными знаниями (балл > 70%) по вопросам рака шейки матки и ВПЧ. Семьдесят один процент врачей выразили намерение вакцинировать своих детей против ВПЧ. Менее половины (44,41%) ранее рекомендовали вакцину против ВПЧ своим пациентам. Более молодые врачи, педиатры и врачи общей практики имели более низкий уровень достаточных знаний, положительное отношение к вакцине против ВПЧ и активно рекомендовали вакцину против ВПЧ.

Заключение. Уровень знаний врачей о раке шейки матки и ВПЧ можно повысить. Улучшение отношения и практики врачей может положительно повлиять на охват скринингом рака шейки матки и вакцинацией против ВПЧ в Казахстане.

Ключевые слова: вирус папилломы человека, вакцинация, рак шейки матки, знания, врач, Казахстан.