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Attitude of Israeli Mothers With Vaccination of Their Daughters Against Human Papilloma Virus

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The purpose of the study is to examine whether the model based on the Theory of Reasoned Action (TRA) succeeds in predicting mothers' intention to vaccinate their daughters against the human papilloma virus infection. Questionnaires were distributed among convenience sample of 103 mothers of daughters 18 years and younger. Approximately 65% of mothers intend to vaccinate their daughters. Behavioral beliefs, normative beliefs, and level of knowledge had a significant positive effect on mothers' intention to vaccinate their daughters. High levels of religiosity were found to negatively affect mothers' intention to vaccinate their daughters. The TRA combined with level of knowledge and level of religiosity succeeds in predicting mothers' behavioral intentions regarding vaccinating daughters. This indicates the significance of nurses' roles in imparting information and increasing awareness among mothers.

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INFECTION WITH THE human papilloma virus (HPV) is the primary cause of death by cervical cancer among women in developed countries (Bornstein, Toma, Tzarfati, & Ofir, 2007). According to data from the World Health Organization, 300 million people contract the HPV infection yearly (Bornstein et al., 2007). Every year, 493,000 women develop cervical cancer, and in around 230,000 of these cases, the disease proves fatal (Bornstein et al., 2007).

A vaccine preventing contraction of the HPV infection was introduced in many countries following its approval by the U.S. Food and Drug Administration (FDA) in June 2006. This vaccine is intended for girls aged 9–26 (Farrell & Rome, 2007). The Israel Pediatric Association recommended administration of the HPV vaccine in 2007, and consequently, the Ministry of Health began recommending vaccination of girls aged 9–26. The HPV infection has a tendency to spread epidemically, indicating the significance of complying with vaccination against the virus. The larger the

population vaccinated, the smaller the proliferation of the virus (Bornstein et al., 2007).

Review of Literature

HPV is transmitted through sexual contact (Safra, 2007). The prevalence of HPV among sexually active youth has reached 82% worldwide (Bornstein et al., 2007). Research indicates that the prevalence of the virus is rising throughout the world. In the United States, around 20 million people have already contracted the HPV. It is estimated that 5.5–6.2 million people are infected every year (Bornstein et al., 2007). The annual mortality rate is close to 3 in every 100,000 women. Young, sexually active adults are at a high risk for contracting HPV due to its prevalence among these age groups. At least 80% of sexually active women are at risk of contracting genital HPV during their lifetime (Lenselink et al., 2008). In Israel, the phenomenon is less prevalent; nonetheless, 500,000 men and women have been infected by the disease (7% of the population, which numbers 7 million).

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In more than 90% of cases, the infection disappears unaided in the span of 2 years; however, 10% of the women will develop a chronic infection, and they are at increased risk of developing advanced precancerous lesions of the cervix and even cancer, including cancers of related organs (Bornstein et al., 2007; Maymoni et al., 2007).

Women carrying the type 16 papillomavirus are at a higher risk for developing cervical cancer—a risk 434 times greater than women not carrying this virus (Bornstein et al., 2007). More than 50% of all women who have been infected with some type of HPV at least once may contract the virus again because the level of antibodies formed is very low and because the E6 and E7 genes of the papillomavirus depress the production of the interferon, which otherwise would activate their immune system (Maymoni et al., 2007).

Women who contract the virus are usually younger than 25 years. They contract a type of HPV that has no clinical manifestations, and they are therefore not aware of being infected (Safra, 2007). Following exposure to the virus, normal tissue becomes precancerous and years later might become cancerous. The HPV infection causes cervical cancer, which is the second prevalent type of cancer among women and the primary cause of cancer mortality among women worldwide (Bornstein et al., 2007).

A prophylactic vaccine against HPV was developed to prevent HPV infection and precancerous genital lesions due to HR-HPV genotypes 16 and 18 and genital warts due to low-risk HPV genotypes 6 and 11 (Lenselink et al., 2008). The vaccine consists of virus-like particles assembled from recombinant HPV coat proteins of which the carcinogenic contents have been removed (Bornstein et al., 2007). In June 2006, the U.S. FDA and in September 2006, the European Medicines Agency declared their approval of the vaccine, which was developed with the intention of preventing cervical cancer, precancerous lesions, and genital warts. In Israel, the HPV vaccine was developed mainly against the cancerous types of the virus type 16 and 18 since these are responsible for 70% of all cervical cancer (Lenselink et al., 2008). The HPV vaccine is considered safe, and it is characterized by a high level of tolerance and high efficacy (Bornstein et al., 2007; Lenselink et al., 2008). The vaccine elicits antibody responses against both types of the virus and thus prevents chronic HPV infection and related diseases (Bornstein et al., 2007). According to Safra (2007), the vaccine is estimated to decrease cancer morbidity and mortality by more than 60%, and vaccination of 12-year-old females against HPV is expected to lower their risk of contracting cervical cancer by 61.8% (Lenselink et al., 2008; Bornstein et al., 2007).

In Israel, the same vaccine is administered by intramuscular injection in a three-dose series, with the second and third doses administered 2 and 6 months after the first dose. It is offered to females in the eighth grade and recommended for girls who have not yet become sexually active. In Israel, a fee is charged for the vaccine; however, the various HMOs cover a certain percentage of the cost (Maymoni et al., 2007).

Factors Influencing Parents' Decision to Vaccinate Their Children

Various factors influence parents' intention to vaccinate their children, including parents' attitudes and beliefs on vaccination, their level of knowledge, objective social norms regarding vaccination, and normative beliefs and socio-demographic variables.

Waller, Marlow, and Wardle (2006) found that the variables with the most impact on parental intention to vaccinate their children are attitudes toward vaccination, the effect of vaccination, the price of vaccination, and the risk involved in vaccination. In general, parents' inclination to vaccinate their adolescent children depends on their perception of possible implications of refraining from doing so. Zimet et al. (2005) examined attitudes affecting parents' inclination to vaccinate their adolescent children. The study included attitudes toward vaccines against sexually transmitted diseases, including HPV. They found that the greater the parents' perception of the severity of the disease if not vaccinated and the greater their perception of the vaccine's efficacy, the more they were inclined to vaccinate their children.

In a study held in Australia, Marshall, Ryan, Robertson, and Baghurst (2007) asked parents and the general population about the significance of vaccines for preventing cervical cancer. They found that most respondents acknowledged the need to vaccinate both women and men. Parents thought that it is necessary to vaccinate boys and girls younger than 18 years and agreed that the optimal age for vaccination is 14–15. Waller et al. (2006) found that some parents agree that vaccination should be discussed with their children. Similarly, Lenselink et al. (2008) also found that parents who hypothetically objected to vaccinating their children believed that the child must be included in the decision more than parents who were in favor of vaccination.

Parents who had completed their children's vaccination plan were more inclined to consent to vaccinate their children against HPV than parents who had not previously vaccinated their children. Parents who theoretically agreed to vaccinate their daughters were found to be in favor of vaccination (Marshall et al., 2007). Chan, Cheung, and Chung (2006) found that parents were inclined to vaccinate their children against sexually transmitted infections when these diseases were found to have a higher prevalence among the children.

However, in contrast, other studies found that various attitudes had an impact on objecting to vaccination, for example, Weinstock, Berman, and Cates (2004) found that in the United States, sexually transmitted diseases are stigmatized, preventing respondents' vaccination against HPV. Thus, despite the prevalence of cervical cancer in the United States and respondents' wish to know more about HPV, they have developed concern and fear of vaccination.

Lenselink et al. (2008) found that parents objected to vaccinating their children because the vaccine had only recently been introduced and expressed greater intention to

vaccinate their children after it will be on the market for several years. The main concern of these parents was delayed side effects of the vaccine. [Marshall et al. \(2007\)](#) also found parents to express concern regarding the vaccine's safety. Parents stated that they would like to receive additional knowledge about the vaccine before using it.

[Kahn et al. \(2005\)](#) found that pediatricians stated similar barriers to vaccination. They claimed that parents' attitudes such as concern regarding vaccine safety and concern that their children are receiving too many vaccinations affected their intention to vaccinate. Other influence are parents who are not interested in discussing the HPV vaccine with their children to avoid the message that adolescent sexual relations are legitimate, in addition to their concern that as a result of vaccination their adolescent children would engage in unrestricted sexual behavior affected their intention to vaccinate. This was confirmed by both [Waller et al. \(2006\)](#) and [Chan et al. \(2006\)](#). [Waller et al. \(2006\)](#) interviewed 24 mothers of daughters in their qualitative research. Interview analysis found that some of the women expressed concern that their daughters would behave promiscuously as a result of vaccination against sexually transmitted diseases. In addition, as a result of this concern, they preferred to vaccinate their daughters at a later age to avoid discussing and exposing them to the subject. All these findings suggest that various attitudes and beliefs may have a positive or negative effect on parents' intentions to vaccinate their daughters.

[Marshall et al. \(2007\)](#) found that only 2% of respondents (parents and general population) knew that one of the reasons for the development of cervical cancer is contraction of the human papillomavirus. Women aged 45–54 expressed greater knowledge of the virus than men or 18–24 year olds. Having received information about the causes of cervical cancer and the possibility of preventing cervical cancer by vaccination, most respondents were found to express a more definite intention of becoming vaccinated. [Dempsey, Zimet, Davis, and Koutsky \(2006\)](#) acknowledge the effect of knowledge on parental intention to vaccinate their children. This study found that the more information provided on HPV vaccination, the greater respondents' intention to vaccinate their children. [Chan et al. \(2006\)](#) also found that the more information provided to Chinese mothers about vaccination, the greater their willingness to vaccinate their daughters. In addition, some respondents stated that lack of knowledge was the reason for their lack of consent to vaccination. All these findings support the positive effect of providing information on vaccination on mothers' intention to vaccinate their daughters.

Because the vaccine was only approved as recently as 3 years ago, no studies were found to have examined individuals' subjective perception of social norms regarding HPV vaccination. However, there are findings on the objective norms of general practitioners in developed countries with regard to the vaccine. Objective norms may affect the normative beliefs of individuals.

[Lenselink et al. \(2008\)](#), in their study performed in the Netherlands, found that parents expressed positive intention to vaccinate their children if recommended by the Ministry of Health. [Kahn et al. \(2005\)](#) examined the attitudes of pediatricians toward HPV vaccination in various U.S. medical centers. They reported that almost all physicians declared that they would act according to the recommendations of the various organizations for the control of infectious diseases and would recommend the vaccine and that they believe the vaccine to be safe and effective over time. Physicians reported that they are inclined to discuss with adolescent girls topics related to sexual activity and vaccines that may prevent the transmittal of sexual diseases.

[Lenselink et al. \(2008\)](#) found that parents with a higher (graduate) education or those employed in the medical professions had more knowledge of the HPV infection than people with a lower education or who are employed in nonmedical professions. In addition, differences were found between the knowledge of women and men. Women were found to have statistically significant greater knowledge of the vaccine than men. [Marshall et al. \(2007\)](#) arrived at similar findings. These researchers also found that people aged 45–54 had more knowledge of the vaccine than younger or older people and that higher socioeconomic level populations had more knowledge than those on lower socioeconomic levels. Despite the above, and assuming that more knowledge regarding the vaccine would increase willingness to become vaccinated, various sociodemographic variables such as age, gender, marital status, education, occupation, country of origin, religion, religiosity (degree of commitment to religion), gender of the child, or age of the child were not found to have an effect on parents' intention to vaccinate their children ([Marshall et al., 2007](#)).

Likewise, [Zimet et al. \(2005\)](#) found that the age of parents and children had no effect on readiness to be vaccinated against the HPV infection, and [Marshall et al. \(2007\)](#) found no differences between men and women in their intention to vaccinate either gender. A positive correlation was found between age, gender, and education—and the perceived need for vaccination of both men and women against the HPV infection. Men were more in favor of vaccination of both genders (83.6%) than women (82.7%). Women were more in favor of vaccinating their daughters than men of vaccinating their sons. The lower the level of education, the higher the intention to vaccinate both genders. In addition, the older the interviewees and the lower their socioeconomic level, the lower their intention to be vaccinated against HPV. In contrast, married women were more inclined to consent to vaccination than single men ([Marshall et al., 2007](#)). Likewise, [Zimet et al. \(2005\)](#) claims that women are more inclined than men to consent to vaccination because they have a higher relative risk of contracting HPV.

[Chan et al. \(2006\)](#), in a study performed in Hong Kong, found that mothers with a history of performing Pap smear tests expressed more intention of vaccinating their daughters, but in contrast to these findings, [Lenselink et al. \(2008\)](#), in a

study held in the Netherlands, found no correlation between mothers' Pap smear tests and their intention to vaccinate their children.

Theoretical Framework

The research model is based on the Theory of Reasoned Action (TRA) devised by Ajzen and Fishbein (1980). According to this theory, intention to perform a certain behavior is the determinant of specific behaviors. Intention is determined in accordance with the presence of behavioral beliefs, and normative beliefs concerning the behavior result in a decision concerning actual performance of a specific behavior. The researchers chose to focus on two of the model components: behavioral beliefs and normative beliefs. Behavioral beliefs are the individual's assumption that a certain behavior will lead to certain consequences. In other words, the individual estimates that acting in a certain way will have certain consequences, to which he or she attributes certain values. This is tantamount to instrumental scrutiny of subjective benefits and costs, which includes evaluation of the consequences and their significance for the individual. Normative beliefs reflect the individual's subjective evaluation (i.e., belief) of how "significant others" would like him or her to act in performance or avoidance of the specific behavior, considering his or her motivation to act according to their opinion. In addition, the effect of sociodemographic variables, level of knowledge, and past preventive behaviors was examined as well.

Purpose

The purpose of this study was to examine the relationship between mothers' sociodemographic variables, behavioral beliefs, normative beliefs, level of knowledge, and past preventive behaviors and their willingness to vaccinate their daughters against the HPV infection.

The question "Would sociodemographic traits, behavioral beliefs concerning the HPV vaccine, normative beliefs, level of knowledge, and past preventive behaviors (performing Pap smears) have an effect on mothers' willingness to vaccinate their daughters against the HPV infection?" was explored.

Methods

Research Design and Procedure

This descriptive, correlational, cross-sectional study examined the knowledge, normative beliefs, behavioral beliefs, intention-to-administer HPV vaccines, and self-reported screening behavior of mothers of daughters 18

years and younger. In addition, demographic and descriptive variables were included in the models to ensure a more holistic understanding of mothers' intention to vaccinate their daughters.

This study, which was approved by the University Research Ethics Board, was conducted in 2008.

Sample

The research was based on a convenience sample of 103 mothers of daughters 18 years and younger. The data were collected via questionnaires during community-based sessions for women in central Israel. Questionnaires were distributed to 130 mothers; however, only 103 (79.2%) fully completed questionnaires were returned.

Instruments

A structured questionnaire was used to collect data for the proposed study. The 42-item questionnaire was developed based on the TRA.

The questionnaire included data on sociodemographic traits, behavioral beliefs, normative beliefs, knowledge, and past preventive behaviors (performing Pap smears).

The questionnaire was administered to six pediatric nurses who examined its validity, and it has been reviewed by two nurse expertise for content validity. In addition, an initial pilot study was held with 20 questionnaires to examine its alpha Cronbach's internal consistency reliability. The alpha Cronbach's for the dimension of behavioral beliefs was .78, and the alpha Cronbach's for the dimension of normative beliefs was .83. Question 15 in the original questionnaire reduced the internal consistency level of questions regarding behavioral beliefs and was therefore dropped from the questionnaire. The chapter on sociodemographic data includes questions about age, marital status, number of children, education, religion, religiosity, and mothers' country of origin.

The behavioral beliefs subscale includes items such as "the HPV vaccine will cause my daughter to behave promiscuously," "our religion forbids premarital sexual relations, countering the need to vaccinate my daughter against the virus," and "the vaccine is expensive; therefore, I will not vaccinate my daughters."

The normative beliefs subscale includes items such as "my spouse supports vaccination of my daughter," "my daughter would like to be vaccinated," and "my general practitioner has recommended the vaccine." Responses to items were measured on a 5-point Likert Scale ranging from (1) *strongly disagree* to (5) *strongly agree*.

The knowledge subscale includes items such as "there is a connection between the HPV infection and cervical cancer" and "there is a connection between multiple sexual partners and contracting the HPV infection." Responses to items were measured on a scale ranging from (1) *disagree* to (2) *agree*.

Data Analysis

Data analysis was performed with the Statistical Package for Social Sciences. Descriptive statistics were used to depict the demographic characteristics of the sample and responses to the TRA and its subscales. Means and standard deviations of the responses were calculated. Pearson's correlation, *t* tests, and linear regression were used to determine the relationship between demographic characteristics and TRA.

Results

Demographic descriptive statistics for the study sample and variables are listed in Table 1 (*n* = 103). Approximately

Table 1 Descriptive Statistics for Mothers of Daughters 18 years and younger (*N* = 103)

Variable	<i>M</i> ± <i>SD</i>	<i>Mdn</i>	Minimum	Maximum
	41.3 ± 9.4	41	23	62
Age		<i>n</i>	%	
Marital status				
Single		4	3.9	
Married		92	89.3	
Divorced		5	4.9	
Widow		2	1.9	
No. of daughters				
1		52	50.5	
2		35	34.0	
3		13	12.6	
4		3	2.9	
Education				
Elementary		4	3.9	
Secondary		19	18.4	
Certification studies		20	19.4	
Tertiary		60	58.3	
Religion				
Jewish		85	82.5	
Christian		5	4.9	
Druze		2	1.9	
Muslim		11	10.7	
Religiosity				
Secular		71	68.9	
Traditional		27	26.2	
Religious		5	4.9	
Country of origin				
Israel		54	52.4	
Commonwealth of Independent States		30	29.1	
Europe		6	5.8	
USA		1	1.0	
Asia		10	9.7	
Africa		2	1.9	

half the respondents were born in Israel (52.4%) and 29.1% in the former Soviet Union; 82.5% are Jewish; and 10.7% are Muslim. Greater than half of the respondents (68.9%) define themselves as secular and 26.2% as traditional. Most of the respondents are married women (89.3%). The mean age of respondents is 41.3 with a standard deviation of 9.4 years and an age range of 23–62. Half the respondents have one daughter (50.5%); greater than half of the respondents have a graduate degree (58.3%).

About 65% of respondents have a high to very high intention of vaccinating their daughters, about 16% have a moderate intention of vaccinating their daughters, and about 20% have a low intention of vaccinating their daughters or do not intend to do so at all. Most of the mothers are accustomed to performing Pap smears on a routine basis (67%), compared to 31.1% who do not perform Pap smears at all. Among mothers who do perform Pap smear tests, 58.3% received negative results and 8.7% positive results.

Means and standard deviations were calculated to examine women's behavioral beliefs and normative beliefs, and Pearson's correlations were calculated to examine correlations between the various components of behavioral beliefs and normative beliefs—and mothers' intention of vaccinating their daughters. These findings are presented in Table 2.

Table 2 indicates a strong correlation between behavioral beliefs and mothers' intention to vaccinate their daughters ($r = .52, p < .001$). Mothers did not perceive the HPV vaccine as dangerous or as encouraging daughters' sexual promiscuity, and most believed that there is no religious barrier to vaccination. A negative correlation was found between these variables and intention to vaccinate daughters, that is, women who perceived the vaccine as dangerous to their health, contrary to their religion, or encouraging daughters' sexual promiscuity had a lower intention to vaccinate their daughters. Moreover, women claimed that although the vaccine is expensive, this would not prevent them from vaccinating their daughters, and indeed, no correlation was found between perceived cost of the vaccine and intention.

In addition, this table indicates a strong correlation between normative beliefs and intention to vaccinate daughters ($r = .58, p < .001$). Significant others influencing mothers' decision whether to vaccinate their daughters are first and foremost their spouses, then their daughters, and then friends. General practitioners had the least influence.

Examination of respondents' level of knowledge shows a mean score of 17 ($M = 17, SD = 2.3$), indicating a high level of knowledge among respondents. The maximal score is 20. Examination of the correlation between level of knowledge and intention to vaccinate indicates a moderately positive correlation ($r = .26, p < .01$), that is, the higher the level of knowledge, the higher the intention to vaccinate.

Religiosity was found to have a significant effect on intention to vaccinate daughters. In other words, a

Table 2 Means, Standard Deviations, and Pearson's Correlations Between the Various Components of Behavioral Beliefs and Normative Beliefs and Mothers' Intention to Vaccinate Their Daughters

	<i>M</i>	<i>SD</i>	Intention to Vaccinate
Behavioral beliefs	2.3	±0.5	0.52 ***
The HPV vaccine may endanger my daughter's health.	2.2	±1.2	-0.31 **
The HPV vaccine will cause my daughter to behave promiscuously.	1.4	±0.9	-0.23 *
Our religion forbids premarital sexual relations, countermanding the need to vaccinate my daughter against the virus.	1.6	±1.2	-0.21 *
The virus is expensive; therefore, I will not vaccinate my daughter.	1.6	±1.0	-0.08
Normative beliefs	2.5	±0.9	0.58 ***
General practitioner	2.8	±1.5	0.26 **
Friends	2.6	±1.5	0.43 **
Spouse	3.0	±1.6	0.67 **
Daughter	2.8	±1.5	0.46 **

* $p < .05$.** $p < .01$.*** $p < .001$.

moderately negative correlation was found between religiosity and intention to vaccinate ($r = -.35, p < .001$), that is, the more religious the mother, the lower the chance that she would vaccinate her daughter.

To examine differences between Jewish and Muslim mothers in their intention to vaccinate their daughters, *t* tests for independent samples were held. According to Table 3, there is a statistically significant difference ($t = 2.288, p < .05$) between Muslim and Jewish mothers in their intention to vaccinate their daughters. Jewish women were found to have a higher intention to vaccinate their daughters than Muslim mothers.

According to Table 4, examination of differences between women who routinely perform Pap screens and those who refrain from doing so indicates a statistically significant difference ($t = -4.387, p < .001$) between the intention of mothers who routinely perform Pap screens and those who do not, such that mothers who routinely perform Pap screens have a higher intention of vaccinating their daughters against HPV than mothers who do not perform routine screens.

Table 3 Findings of *T* Tests on Differences Between Jewish and Muslim Mothers in Their Degree of Intention to Vaccinate Their Daughters

Intention	<i>M</i>	<i>SD</i>	<i>T</i>
Jewish	3.81	1.31	2.28 *
Muslim	2.81	1.66	

* $p < .05$.**Table 4** Findings of *T* Tests on Differences Between Mothers Who Perform Pap Screens and Those Who Do Not in Their Intention to Vaccinate

Intention	<i>M</i>	<i>SD</i>	<i>T</i>
Do not perform Pap screens	2.84	1.50	-4.38 ***
Perform Pap screens	4.14	1.08	

*** $p < .001$.

To predict mothers' intention to vaccinate their daughters using the research model variables, a multiple linear regression analysis was held in the enter method and presented in Table 5. Based on the findings mentioned above, the variables of behavioral beliefs, normative beliefs, knowledge, and religiosity were entered into the regression. These variables were found to influence the level of intention to vaccinate daughters. This model accounted for 43% of the variance in intention to vaccinate daughters against HPV.

Discussion

This study examined the factors influencing mothers' intention to vaccinate their daughters against the HPV infection. For this purpose, a unique theoretical model was constructed based on the TRA devised by Ajzen and Fishbein (1980). This is the first study in Israel to examine mothers' intention to vaccinate their daughters against HPV based on this theoretical model.

The research findings indicate that most of the Israeli mothers (about 63%) in the sample demonstrated a high to very high intention of vaccinating their daughters against the HPV infection, whereas Chan et al. (2006) found such an intention among only 32% of Chinese mothers. This finding may express the high support of Israeli mothers for the vaccine.

Exploration of the factors influencing intention to vaccinate indicates that the more positive mothers' behavioral beliefs toward vaccinating their daughters against the HPV infection, the higher their intention to vaccinate their daughters. For example, the correlation between the risk involved in vaccination and mothers' intention to vaccinate their daughters

Table 5 Linear Regression Findings for Predicting Mothers' Intention to Vaccinate Their Daughters

Variable	β	<i>SE</i>	<i>t</i>	<i>p</i>
Behavioral beliefs	0.17	0.21	-1.73	.03*
Normative beliefs	0.51	0.10	6.56	.00**
Level of knowledge	0.15	0.04	1.78	.04*
Religiosity	-0.24	0.19	-2.93	.00**

Note: $R^2 = 43, \%F = 18.7$.Note: * $p \leq .05$.Note: ** $p < .001$.

was examined, and a negative correlation was found between the perceived risk of vaccination and mothers' intention to vaccinate their daughters against the HPV infection. Thus, the greater the perceived risk of the vaccine, the lower mothers' intention to vaccinate their daughters. [Marshall et al. \(2007\)](#) also found that parents expressed concern about the vaccine's safety and preferred to receive additional knowledge of the vaccine before consenting to its administration. The finding may stem from the fact that the vaccine is new and its long-term side effects as yet unknown and that when vaccinating their daughters, parents are assuming responsibility for their daughter's bodies. In addition, this research found a correlation between mothers' concern of promiscuity on the part of their daughters following vaccination and their intention to vaccinate their daughters against the HPV infection. This finding is compatible with [Waller et al. \(2006\)](#) and [Chan et al. \(2006\)](#), who found a correlation between the two parameters, whereas [Waller et al. \(2006\)](#), in their qualitative study, even found that women preferred to vaccinate their daughters at a more advanced age to avoid discussing and exposing their daughters to the subject.

Mothers' normative beliefs regarding vaccination were found to have a positive effect on their intention to vaccinate their daughters. In other words, mothers who perceive their acquaintances as supporting the HPV vaccine will have a higher intention of vaccinating their daughters. The study found that the most significant others influencing such decisions are spouse and daughters and finally physicians, similar to [Lenselink et al. \(2008\)](#).

This study also found that level of knowledge has an effect on mothers' intention to vaccinate. In other words, the higher the mothers' level of knowledge about the HPV infection and about the vaccine, the higher their intention to vaccinate their daughters. This is compatible with [Dempsey et al., \(2006\)](#) and [Chan et al. \(2006\)](#), who claimed that lack of knowledge was the reason for respondents' objection to vaccination. A possible explanation of these findings is that mothers who are aware of the dangers inherent in contracting the virus are more invested in preventing their daughters' exposure to the virus. Moreover, mothers who know that the vaccine is safe will have a greater intention of vaccinating their daughters than mothers who doubt the vaccine's safety.

Mothers who demonstrated awareness of health issues and preventive behavior in the past, that is, are accustomed to performing routine Pap smears, will have more intention of vaccinating their daughters than mothers who are not accustomed to performing screens. This study found a positive correlation between the two variables, and this is supported by [Chan et al. \(2006\)](#), who found in their Hong Kong study that mothers with a history of performing Pap smears expressed higher intention of vaccinating their daughters. However, [Lenselink et al. \(2008\)](#), in their Netherlands study, found no correlation between mothers' Pap smears and their intention to vaccinate their children. A possible explanation of these findings is that people who practice preventive behaviors have high health motivation, as

a result of which, they will elect to perform varied health behaviors for themselves and their children.

Of all sociodemographic variables examined, the variables with the greatest influence were religion and religiosity. Religious and Muslim women had the lowest intention of vaccinating their daughters against the HPV infection. These findings differ from those of [Marshall et al. \(2007\)](#), who found no effect of sociodemographic variables (including religiosity) on parents' intention to vaccinate their children against the HPV infection. It is possible that Israel's religious population will not express interest in the vaccine based on the belief that girls do not engage in sexual activity at a young age and certainly are not exposed to multiple partners. The fact that Muslim mothers were less inclined to vaccinate their daughters than Jewish mothers probably stems from the religious majority among Muslim society compared to the secular majority within the Jewish sector, as assessed by the sample analysis of this study.

Limitations

The sample is a convenience sample and does not use random sampling. All respondents who consented to complete the questionnaire were included in the study, and there is a high probability of selection bias. In addition, this study was limited to central Israel, restricting the implications of the research results for other parts of Israel. Another limitation is that the vaccine has only recently been implemented in Israel, and thus, it was not possible to examine actual behavior.

Conclusions and Implications

Prophylactic vaccination against contracting HPV is performed in childhood and is extremely significant for preventing cervical cancer. Young women are particularly vulnerable to cervical dysplasia, the precursor to cervical cancer, due to the sexually transmitted nature of HPV. As a result, it is very important to clarify the factors influencing mothers' decision to vaccinate their daughters. Future research should be conducted on factors affecting decisions of mothers who indeed vaccinated their daughters. Research findings show that most mothers intend to vaccinate their daughters in the future. This study uses an innovative model of exploring health behaviors, which combines the model of rational action with respondents' level of knowledge and religiosity.

In addition, the study shows how important it is for nurses to raise the knowledge level of mothers, their spouses, and daughters regarding HPV vaccination, particularly among religious and Muslim populations.

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