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Mothers' intention to vaccinate their daughter against human papillomavirus in Taiwan

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ABSTRACT

The uptake of HPV vaccination is < 10% in Taiwan and little is known about mothers' intention to vaccinate daughters against HPV. The aims of this study were to explore mothers' reasons for and against vaccinating their daughters against HPV. A total of 511 women were obtained from a regional hospital in central Taiwan. Descriptive analysis and multivariate logistic regression were employed. The authors found the most frequent reason given by mothers for not vaccinating their daughters was "vaccination price is too high". Mothers with high intention to vaccinate their daughters were more likely than low-intention mothers to believe that HPV vaccination is safe and effective and to accept recommendations from others and the media. When mothers were asked whether they were willing to pay for vaccinating their daughter if HPV vaccination were not free, the percentage of high-intention mothers dropped from 88.9% to 69.8%, and the percentage of low-intention mothers dropped precipitously from 60.2% to 17.9%. Findings can be used by policy makers in Taiwan to plan appropriate activities and strategies to encourage mothers to have daughters receive the HPV vaccine.

Key Words: Human papillomavirus, Vaccine, Mothers, Daughters, Intention

1. INTRODUCTION

Cervical cancer is the second cause of female cancer mortality in Asia as well as worldwide.^[1] While comprehensive screening by Pap exam has decreased the mortality from cervical cancer among Taiwanese women over the last 20 years, cervical cancer is still the seventh leading cancer in women.^[2] Among 2,175 million Taiwanese women over age 30 who received Pap exams in 2013, pre-cancer was detected in 9,996 and cancer in 4,191.^[2] Cervical cancer has been linked to human papilloma virus (HPV), and HPV vaccination is most effective against cervical cancer in women if they receive it before they become sexually active and are exposed to HPV.^[3,4] Thus, HPV vaccines are recommended

for adolescent girls to prevent cervical cancer (Gardasil[®] and Cervarix[™]) and genital warts (Gardasil[®]).^[5,6] Vaccination with Gardasil[®] (quadrivalent human papillomavirus recombinant vaccine) was 90% to 100% effective in preventing precancerous cervical, vaginal, and vulvar lesions and genital warts, which were caused by infection with the relevant HPV types (6, 11, 16, or 18) in women aged 15 to 26 years who were uninfected prior to vaccination.^[7-9] Romanowski et al. (2009) findings show excellent long-term efficacy, high and sustained immunogenicity, and favorable safety of the HPV-16/18 AS04-adjuvanted vaccine up to 6.4 years.^[9] In 2014, CDC published a report analyzing health events reported to VAERS (Vaccine Adverse Event Report-

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ing System) following Gardasil vaccination from June 2006 through March 2014. About 92% of the Gardasil reports were classified as non-serious. The most common adverse events reported were syncope (fainting), dizziness, nausea, headache, fever, and injection site reactions (pain, swelling, and redness).^[10,11] In Taiwan, the most common adverse events were swelling and redness at the injection site, rash, mild fever, headache, and dizziness.^[2]

These two HPV vaccines, Gardasil[®] and Cervarix[™] were approved by Taiwan in 2006 and 2008, respectively.^[2,12,13] Both HPV vaccines are administered as a 3-dose series.^[5] The first vaccination injection is followed by a second injection 1-2 months later, and the third injection 6 months after the first one.^[5] A 3-dose series of HPV vaccination costs 12,000 New Taiwan dollars (NTD) (approximately US\$375),^[14] whereas a suggested fair price for HPV vaccination in Taiwan is 500 NTD (approximately US\$16).^[15] The recommended age ranges for HPV vaccination in Taiwan are 9-26 years for Gardasil and 10-25 years for Cervarix.^[12,13] Because HPV vaccination is not covered by Taiwan's national health insurance, we considered that one hurdle for mothers' acceptance of vaccinating a daughter against HPV would be the high cost of vaccination as suggested for Taiwan^[16] and reported in Hong Kong^[17] and Morocco.^[18] Considering that adolescent girls are at the optimum age for HPV vaccination to prevent cervical cancer, five of 13 counties in Taiwan have started providing HPV vaccination free of charge to female teenage students.^[12,19]

Since parents play an important role in the decision to vaccinate a daughter against HPV,^[20,21] their health-related beliefs and experiences regarding HPV will influence whether the daughter is vaccinated.^[21,22] For example, US mothers' decisions to vaccinate their daughters were influenced by their belief in the benefit of HPV vaccination^[20,21] and exposure to media and marketing regarding HPV vaccines, especially television commercials.^[21] Media such as web sites/the Internet and news stories^[23] as well as perceived beliefs of significant others^[22] and drug company advertising^[24] may improve parents' beliefs and knowledge about HPV vaccine. In addition, physician recommendations play a significant role in parents' decision to vaccinate their daughters against HPV;^[22-25] However, the uptake of HPV vaccination is less than 10% in Taiwan^[26] and little is known about mothers' intention to vaccinate daughters against HPV. Because the vaccine manufacturer's media-information campaign has targeted mothers in Taiwan.

The aim of the current study was to explore mothers' reasons for and against vaccinating their daughters against HPV as well as associations between their intention to vaccinate their

daughters and beliefs about HPV vaccination, influence by others' and media recommendations, and HPV vaccination cost considerations.

2. METHOD

2.1 Sample and procedures

A convenience sample was recruited from mothers attending a regional hospital in central Taiwan and having at least one daughter 9-26 years old. This age range was chosen because it represents girls and women for whom the quadrivalent vaccine is licensed in Taiwan.^[12,13]

2.2 Measures

Data were collected from mothers by questionnaire on three categories of variables: demographic characteristics, including whether or not daughter(s) had received HPV vaccine, reasons for or against vaccinating their daughters, and beliefs, intention, sources of influence, and cost considerations about HPV vaccination. Questions for the second and third categories of variables were developed based on the relevant literature, as included (1) reasons for or against (unwillingness to vaccinate) vaccinating daughters were adapted from a published list.^[27] Mothers were allowed to choose/give more than one reason for non-vaccination; (2) beliefs about the HPV vaccine were assessed by two items: "the HPV vaccine is safe," and "the HPV vaccine effectively prevents cervical cancer." Responses can range from 1 (strongly disagree) to 5 (strongly agree).^[28] Cronbach's alpha in this study was 0.80; (3) intention was assessed with the single item: "I am willing to vaccinate my daughter against HPV." Responses can range from 1 (strongly disagree) to 5 (strongly agree). A single item to measure intention is supported by previous HPV research^[29] as a reliable and valid measure of intention.

2.3 Statistical analysis

Data were analyzed by descriptive statistics and the chi-square test using SPSS version 21.0 for Windows (SPSS Inc., Chicago, IL). Chi-square tests were used to examine the associations between intention to vaccinate daughters and beliefs about the HPV vaccine; influence by recommendations from others, the media, and Internet; and HPV vaccination cost considerations. Multivariate logistic regression analysis was used to determine predictors of mothers' intention to vaccinate their daughters.

2.4 Ethical Approval

This study was approved by the Jen-Ai Hospital's Institutional Review Board (No: 100-11). Data were collected between December 2011 and January 2012 by the second author who explained the study purpose and assured participants' anonymity and confidentiality of responses. Those

who agreed to participate signed informed consent and were given a small gift (a cash coupon worth 100 NTD [approximately US\$3]).

3. RESULTS

Sample characteristics

The sample of 511 mothers had a mean age of 45.25 years ($SD = 5.95$), with the majority in the 40-49 year age bracket (53.6%) and having < a high school education (58.1%; see Table 1). The largest proportion of mothers had a monthly household income of 20,000 to 40,000 NTD (48.5%), and only 22.7% of mothers had a family history of gynecologic cancer. The majority of mothers had one daughter < 26 years old (66.9%) and only 38 mothers' daughters had received the HPV vaccine (7.4%). For details, see Table 1.

Table 1. Sample characteristics (N = 511)

Characteristic	Mean	SD	n	%
Age, years	45.25	5.95		
≤29			4	0.8
30-39			90	17.6
40-49			274	53.6
≥50			143	28.0
Education				
≤High school			297	58.1
College			96	18.8
Baccalaureate degree			98	19.2
≥Graduate degree			20	3.9
Household income (NTD per month)				
< 20,000			150	29.4
20,000-40,000			248	48.5
40,000-60,000			58	11.3
≥ 60,000			55	10.8
Family history of gynecologic cancer				
Yes			116	22.7
No			395	77.3
Number of daughters ≤ 26 years				
1			342	66.9
>1			169	33.1
Daughters received HPV vaccine				
Yes			38	7.4
No			473	92.6

Note. NTD: New Taiwan dollars (30 NTD = 1 USD)

Among the 473 mothers who had not vaccinated their daughters against HPV, the most frequent reason for non-vaccination was “Vaccination price is too high (n = 179, 37.8%),” followed by “Do not understand HPV vaccine” (n = 170, 35.9%) (see Table 2). The third most frequent reason was “Unsure if vaccine will work because it is new” (n = 133, 28.1%). The least frequent reason was “Could not find place to vaccinate” (1.7%). For details, see Table 2.

Of the 38 mothers who had their daughters vaccinated against HPV, the majority had one daughter (63.2%), and the largest proportion had their daughters vaccinated at 21-26 years old

(44.7%). The most frequent reason for choosing to vaccinate their daughters was “HPV vaccine effectively prevents cervical cancer” (n = 35, 92.1%). For details, see Table 3.

Table 2. Mothers' reasons for not vaccinating their daughters (n = 473)

No.	Reason	n (%) [§]
1	Vaccine price is too high	179 (37.8)
2	Do not understand information about HPV vaccine	170 (35.9)
3	Unsure if vaccine will work because it is new	133 (28.1)
4	Afraid of potential side effects	116 (24.5)
5	No information about HPV vaccination	89 (18.8)
6	Other	79 (16.7)
7	The vaccine will encourage sexual activity	10 (2.1)
8	Could not find place to vaccinate	8 (1.7)

Note. [§] Total n may exceed 473 as mothers could choose/give more than one reason.

Table 3. Mothers' reasons for vaccinating their daughters (n = 38)

Item	n (%) [§]
Number of daughters	
1	24 (63.2)
2	11 (28.9)
3	3 (7.9)
Daughter's age when vaccinated, years	
11-15	9 (23.7)
16-20	12 (31.6)
21-26	17 (44.7)
Mothers' reasons for vaccinating their daughters	
HPV vaccine is effective in preventing cervical cancer	35 (92.1)
HPV vaccine is safe	12 (31.6)
Other	4 (10.5)

Note. [§] Total n may exceed 38 as mothers could choose/give more than one reason.

Mothers whose daughters had not been vaccinated against HPV (n = 473) were categorized as high intention to vaccinate their daughters if they rated 4-5 (agree-strongly agree) on the item asking if they intended to have their daughter vaccinated against HPV. Mothers whose daughters had been vaccinated (n = 38) were not included in this analysis. Mothers with high intention (n = 199, 42.1%) and those with low intention (n = 274, 57.9%) were compared by chi-square test in terms of beliefs about HPV vaccination, influence by others' or media recommendations to have their daughter vaccinated, and HPV vaccination cost considerations.

As shown in Table 4, the two groups of mothers did not differ in age, education, and number of daughters < 26 years old. However, high- and low-intention mothers differed significantly by monthly household income and family history of gynecologic cancer. More high-intention mothers had a monthly household income between 20,000 and 40,000 NTD than low-intention mothers ($\chi^2 = 23.22, p < .001$). More low-intention mothers had no family history of gynecologic cancer than high-intention mothers ($\chi^2 = 6.07, p < .05$).

Table 4. Variables associated with mothers’ intention to vaccinate their daughters

Variable	High intention	Low intention	P
	n=199 (42.1%) n (%)	n=274 (57.9%) n (%)	
Age, years			.773
≤29	1 (0.5)	3 (1.1)	
30-39	37 (18.6)	52 (19.0)	
40-49	112 (56.3)	144 (52.6)	
≥50	49 (24.6)	75 (27.4)	
Education			.905
≤High school	112 (56.3)	159 (58.1)	
College	38 (19.1)	53 (19.3)	
Baccalaureate degree	40 (20.1)	53 (19.3)	
≥Graduate degree	9 (4.5)	9 (3.3)	
Household income (NTD per month)			<.001
<20,000	35 (17.6)	102 (37.2)	
20,000-40,000	116 (58.3)	112 (40.9)	
40,000-60,000	26 (13.1)	29 (10.6)	
≥60,000	22 (11.1)	31 (11.3)	
Family history of gynecologic cancer			.014
Yes	57 (28.6)	52 (19.0)	
No	142 (71.4)	222 (81.0)	
Number of daughters ≤ 26 years			.218
1	140 (70.4)	178 (65.0)	
>1	59 (29.4)	96 (35.0)	
Beliefs about HPV vaccination			
HPV vaccine is safe			<.001
1-2 (strongly disagree-disagree)	2 (1.0)	16 (5.8)	
3 (neither disagree or agree)	25 (12.6)	143 (52.2)	
4-5 (agree-strongly agree)	172 (86.4)	115 (42.0)	
HPV vaccine effectively prevents cervical cancer			<.001
1-2 (strongly disagree-disagree)	3 (1.5)	9 (3.3)	
3 (neither disagree or agree)	24 (12.1)	98 (35.8)	
4-5 (agree-strongly agree)	172 (86.4)	167 (60.9)	
Influence by another person’s recommendation			
Family or friend			<.001
1-2 (strongly disagree-disagree)	3 (1.5)	36 (13.1)	
3 (neither disagree-neither agree)	40 (20.1)	128 (46.7)	
4-5 (agree-strongly agree)	156 (78.4)	110 (40.1)	
Teacher			<0.001
1-2 (strongly disagree-disagree)	7 (3.5)	45 (16.4)	
3 (neither disagree or agree)	47 (23.6)	144 (52.6)	
4-5 (agree-strongly agree)	145 (72.9)	85 (31.0)	
Doctor			<.001
1-2 (strongly disagree-disagree)	3 (1.5)	25 (9.1)	
3 (neither disagree or agree)	36 (18.1)	127 (46.4)	
4-5 (agree-strongly agree)	160 (80.4)	122 (44.5)	
Nurse			<.001
1-2 (strongly disagree-disagree)	2 (1.0)	25 (9.1)	
3 (neither disagree or agree)	36 (18.1)	127 (46.4)	
4-5 (agree-strongly agree)	161 (80.9)	122 (44.5)	
Influence by media recommendation			<.001
Poster in hospital			
1-2 (strongly disagree-disagree)	11 (5.5)	40 (14.6)	
3 (neither disagree or agree)	62 (31.2)	149 (54.4)	
4-5 (agree-strongly agree)	126 (63.3)	85 (31.0)	
Newspaper/magazine			<.001
1-2 (strongly disagree-disagree)	11 (5.5)	45 (16.4)	
3 (neither disagree or agree)	55 (27.6)	146 (53.3)	
4-5 (agree-strongly agree)	133 (66.8)	83 (30.3)	
Internet			<.001
1-2 (strongly disagree-disagree)	25 (12.6)	69 (25.2)	
3 (neither disagree or agree)	81 (40.7)	150 (54.7)	
4-5 (agree-strongly agree)	93 (46.7)	55 (20.1)	
HPV vaccination cost consideration			
Would pay oneself to vaccinate			<.001
1-2 (strongly disagree-disagree)	10 (5.0)	82 (29.9)	
3 (neither disagree or agree)	50 (25.1)	143 (52.2)	
4-5 (agree-strongly agree)	139 (69.8)	49 (17.9)	
Would vaccinate if free of charge			<.001
1-2 (strongly disagree-disagree)	0 (0.0)	14 (5.1)	
3 (neither disagree or agree)	22 (11.1)	95 (34.7)	
4-5 (agree-strongly agree)	177 (88.9)	165 (60.2)	

Note. Respondents were categorized as high intention if they rated 4-5 on the intention item. NTD: New Taiwan dollars (30 NTD = US \$1)

Regarding beliefs about HPV vaccination, high-intention mothers were more likely than low-intention mothers to believe that the HPV vaccine is safe ($\chi^2 = 95.60$, $p < .001$) and effectively prevents cervical cancer ($\chi^2 = 37.00$, $p < .001$). Indeed, most high-intention mothers agreed or strongly agreed that the HPV vaccine is safe ($n = 172$, 86.4%) and effectively prevents cervical cancer ($n = 172$, 86.4%), whereas only 115 (42%) and 167 (60.9%) low-intention mothers agreed or strongly agreed with these beliefs, respectively (see Table 4).

Regarding the influence of another person's recommendation to have their daughters vaccinated against HPV, most high-intention mothers agreed or strongly agreed that they would be influenced by nurses' recommendation ($n = 161$, 80.9%), followed by recommendations from doctors ($n = 160$, 80.4%), family or friends ($n = 156$, 78.4%) and teachers ($n = 145$, 72.9%). However, the minority of low-intention mothers agreed or strongly agreed that they would be influenced by nurses' and doctors' recommendation ($n = 122$, 44.5%) to have daughters vaccinated against HPV, followed by recommendations of family or friends ($n = 110$, 40.1%) and teachers ($n = 85$, 31.0%). High-intention mothers were more likely to agree or strongly agree than low-intention mothers that they would be influenced by recommendations from nurses ($\chi^2 = 71.02$, $p < .001$), doctors ($\chi^2 = 62.90$, $p < .001$), family or friends ($\chi^2 = 71.89$, $p < .0001$), and teachers ($\chi^2 = 82.88$, $p < .001$) (see Table 4).

Regarding the influence of media recommendations to have their daughters vaccinated against HPV, the majority of high-intention mothers agreed or strongly agreed that they would be influenced by recommendations from the media ($n = 133$, 66.8%), followed by posters in hospital ($n = 126$, 63.3%) and the Internet ($n = 93$, 46.7%). However, the minority of low-intention mothers agreed or strongly agreed that they would be influenced to have their daughters vaccinated against HPV by the recommendation of a hospital poster ($n = 85$, 31.0%), followed by recommendations from the media ($n = 83$, 30.3%) and Internet ($n = 55$, 20.1%). High-intention mothers were more likely than low-intention mothers to agree or strongly agree that they would be influenced by recommendations from the media ($\chi^2 = 63.11$, $p < .001$), hospital posters ($\chi^2 = 49.69$, $p < .001$), and Internet ($\chi^2 = 40.08$, $p < .001$). For details, see Table 4.

Regarding HPV vaccination cost considerations, the majority of high-intention mothers ($n = 139$, 69.8%) agreed or strongly agreed that they would pay themselves to have their daughters vaccinated against HPV if the vaccine were not covered by national health insurance or government subsidy, while only a minority of low-intention mothers

($n = 49$, 17.9%) agreed or strongly agreed to paying themselves. High-intention mothers were more likely than low-intention mothers to pay themselves to have their daughters vaccinated against HPV if the vaccine were not free ($\chi^2 = 135.77$, $p < .001$). If HPV vaccines were free of charge, the majority of high-intention ($n = 177$, 88.9%) and low-intention ($n = 165$, 60.2%) mothers agreed or strongly agreed to having their daughters vaccinated against HPV. However, high-intention mothers were more likely than low-intention mothers to have their daughters vaccinated against HPV if HPV vaccines were free of charge ($\chi^2 = 49.32$, $p < .001$) (see Table 4).

To determine predictors of mothers' intention to vaccinate their daughters, we used multivariate logistic regression analysis with significant associations between intention to vaccinate daughters and beliefs about the HPV vaccine, influence by recommendations from others and the media, and HPV vaccination cost considerations as cutoffs for selecting determinants. In the multivariate logistic regression model, we entered seven variables: household income, family history of gynecologic cancer, beliefs about HPV vaccination, influence by others' recommendation, influence by media recommendation, would pay oneself to vaccinate, would vaccinate if free of charge. As shown in Table 5, the best-fitting model (Hosmer and Lemeshow test, $\chi^2 = 4.566$, $df = 8$, $p = .803$) correctly predicted 57.9% of the cases. This result implies that the odds of mothers' intention to vaccinate their daughters were related to three independent variables: beliefs about HPV vaccination, influence by others' recommendation, and would pay oneself to vaccinate. For each point increase in beliefs about HPV vaccination, the odds of intending to vaccinate one's daughters increased by 181.0% (odds ratio [OR] = 2.810, 95% confidence interval [CI] = 1.64-4.81, $p < .001$). Likewise, for each point increase in influence by others' recommendation, the odds of intending to vaccinate one's daughters increased by 176.7% (OR = 2.767, 95% CI = 1.64-4.66, $p < .001$) (see Table 5). For each point increase in paying oneself to vaccinate, the odds of intending to vaccinate one's daughters increased by 501.6% (OR = 6.016, 95% CI = 3.59-10.08, $p < .001$). Finally, predicting mothers' intent to vaccinate their daughters was not significantly associated with household income, family history of gynecologic cancer, and willingness to vaccinate if free of charge (see Table 5).

4. DISCUSSION

Among the 511 mother respondents, only 38 (7.4%) had their daughter receive the HPV vaccines, consistent with a low uptake of HPV vaccines in Taiwan.^[26] Moreover, fewer than one-quarter of these mothers' daughters (23.7%) were vacci-

nated between 11 and 15 years old, consistent with survey results from US nurses who had less intention to vaccinate their daughters < 13 years old than their older daughters.^[21] These findings highlight the need for educational interven-

tions to target mothers of teenage daughters to increase the uptake rate of HPV vaccines.

Table 5. Logistic regression analysis for predictors of mothers' intent to vaccinate their daughters[§]

Variable	β	Odds ratio (95% confidence interval)
Household income (NTD per month)		
>40,000	0.23	1.26 (0.73, 2.16)
≤40,000	1 (ref) [#]	
Family history of gynecologic cancer		
Yes	0.25	1.29 (0.75, 2.21)
No	1 (ref) [#]	
Beliefs about HPV vaccination		
Agree-strongly agree (4-5)	1.03 ^{***}	2.81 (1.64, 4.81)
Strongly disagree-neither (1-3)	1 (ref) [#]	
Influence by others' recommendation		
Agree-strongly agree (4-5)	1.02 ^{***}	2.77 (1.64, 4.66)
Strongly disagree-neither (1-3)	1 (ref) [#]	
Influence by media recommendation		
Agree-strongly agree (4-5)	0.10	1.10 (0.63, 1.92)
Strongly disagree-neither (1-3)	1 (ref) [#]	
Would pay oneself to vaccinate		
Agree-strongly agree (4-5)	1.79 ^{***}	6.02 (3.59, 10.08)
Strongly disagree-neither (1-3)	1 (ref) [#]	
Would vaccinate if free of charge		
Agree-strongly agree (4-5)	0.02	1.02 (0.55, 1.93)
Strongly disagree-neither (1-3)	1 (ref) [#]	
Constant	-2.41 ^{***}	0.09

Note. [§] Respondents were categorized as high intention if they rated 4-5 on the intention item. [#] ref indicates reference group NTD: New Taiwan dollars (30 NTD = US \$1). χ^2 : 188.324, df = 7, Hosmer & Lemeshow: p = 0.803, -2log likelihood: 455.451, Cox & Snell R^2 : 0.328, Nagelkerke R^2 : 0.44. ^{***} p < .001.

Taiwanese mothers whose daughters had not been vaccinated against HPV did not vaccinate their daughters because of the high price of vaccination, lack of HPV knowledge, and concerns about side effects and effectiveness of vaccination, consistent with previous reports.^[18,25] In addition, less than half of our sample of mothers (42.1%) had a high intention to vaccinate their daughter against HPV. In contrast, 67%-97% of mothers from Korea,^[30] Indonesia,^[31] Kenya,^[32] Thailand^[33] and New Zealand^[34] intended to vaccinate their daughters against HPV.

Although the HPV vaccines have been shown to prevent precancerous cervical lesions,^[35] the uptake rate in Taiwan has remained < 10%. In fact, the high price was considered the greatest hurdle to vaccinating daughters, as previously reported.^[18,27,31] The percentage of Taiwanese mothers with high intention to vaccinate their daughters dropped from 88.9% to 69.8% when mothers were asked whether they were willing to pay to vaccinate their daughter if HPV

vaccination were not covered by national health insurance or subsidized by the government, while the percentage of low-intention mothers dropped precipitously from 60.2% to 17.9%. Although five county governments in Taiwan have started giving HPV vaccines to female teenage students free of charge, the remaining eight county governments still do not offer free vaccination.^[12,19] To increase the uptake of HPV vaccine by mothers of teenage girls in Taiwan, the government should increase its budget for cervical cancer prevention and subsidize HPV vaccination.

Another common reason for mothers' unwillingness to vaccinate daughters against HPV was mothers' not understanding the HPV vaccines. Our finding that high-intention mothers were more likely than low-intention mothers to believe that HPV vaccine is safe and effectively prevents cervical cancer suggest that disseminating HPV knowledge to mothers is important. We also found that doctors and nurses' recommendations played a significant role in mothers' decision

to vaccinate their daughters against HPV, as reported.^[22–25] However, the previous reports focused on physicians' recommendations with little mention of nurses' role. Because nurses are the most visible and frontline personnel providing HPV knowledge to mothers, our results suggest that nurses should share HPV vaccine knowledge with mothers while they are waiting for treatment in gynecological clinics and explain the importance of vaccinating their adolescent daughters against HPV. Doing this will not only increase the uptake of daughters' HPV vaccination, but also that of mothers themselves. Another strategy to foster uptake is to encourage doctors and nurses to strongly recommend HPV vaccination to mothers of adolescent daughters. HPV knowledge could also be disseminated to mothers through newspapers, magazines or posters in private clinics and hospitals, consistent with previous studies.^[23,24] However, this strategy may not be suitable for low-intention mothers as they were less likely to be influenced by others' and media recommendations to vaccinate a daughter against HPV.

The results of our study are subject to some limitations. First, our results are based on data from a convenience sample of 511 mothers attending a regional hospital in central Taiwan. Thus, our findings may not generalize to all mothers in Taiwan. Second, the intention to adopt the HPV vaccine for

daughters was examined among mothers only. Future studies should assess influences on Taiwanese fathers' intention for daughters' vaccination against HPV.

5. CONCLUSIONS

The findings of this study highlight that the cost of HPV vaccination is a major obstacle to Taiwanese mothers with low intention to have their daughters vaccinated against HPV. To increase the uptake of HPV vaccine in Taiwan, the vaccination cost should be covered by national health insurance or government subsidy. In addition, doctors and nurses should recommend HPV vaccination to high-intention mothers. These findings can be used by policy makers in Taiwan to plan appropriate activities and strategies to encourage mothers to have daughters receive the HPV vaccine, and in turn to increase the uptake of HPV vaccines for teenage girls.

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CONFLICTS OF INTEREST DISCLOSURE

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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