Improvement of Parent’s Awareness, Knowledge, Perception, and Acceptability of HPV Vaccination After an Educational Intervention

Mei Neni Sitaresmi (✉ msitaresmi@ugm.ac.id)
Universities Gadjah Mada

Nisrina Maulida Rozanti
Universitas Gadjah Mada

Abdul Wahab
Universitas Gadjah Mada

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Abstract

Background

Regardless of the disease burden of Human Papilloma Virus (HPV), the vaccine has not been included in the Indonesia National Immunization Program. Since 2017 there was a demonstration program of the HPV vaccination in Yogyakarta Province. This vaccine was given to female elementary school students in 5th and 6th grades. This study aimed to assess whether an educational intervention about the risks of HPV and the vaccine increases the parental awareness, knowledge, and perceptions toward HPV and the vaccine acceptability.

Methods

We conducted a pre-post educational intervention study in July 2017 before the implementation of the HPV vaccination demonstration program, in Kulon Progo District, Yogyakarta Province. Parents of female elementary school students grades 5th and 6th were selected using a school-based proportional random sampling. A pediatric resident provided a structured-educational intervention program. Parents were required to complete validated self-administered questionnaires before and after the intervention program.

Results

A total of 506 parents participated. Before the educational intervention program, parents' awareness of HPV infection and the vaccines were low. Only 49.2% of parents had heard HPV infection, and 48.8% had never heard about the vaccine. After the educational intervention, there were significant improvements in parent's awareness, knowledge, and perceptions of HPV infection, cervical cancer, and HPV vaccination (all \( p < 0.001 \)). HPV vaccine's acceptability increased from 74.3–87.4% \( (p < 0.001) \). There was a significant correlation between increasing HPV vaccine acceptability with the improvement of awareness, knowledge, and perception toward HPV infection, cervical cancer and HPV vaccination \( (r = 0.32 \text{ to } 0.53, p < 0.001) \). After the educational intervention, better knowledge and positive perceptions of HPV vaccination were predictive of HPV vaccine's acceptability with OR 1.90 (95%CI:1.40–2.57) and OR 1.31(95%CI:1.05–1.63), respectively.

Conclusions

A structured educational intervention program conducted by qualified health providers is effective in improving parental awareness, knowledge, and perceptions toward HPV as well as the acceptability of the vaccine. There was a significant correlation between improving the parental knowledge and perceptions of HPV vaccine with increasing acceptability of the HPV vaccine.
Background

Globally, cervical cancer ranks the third most common cancer in women, with a total estimated 569,847 diagnosed cases of invasive cervical carcinoma with 311,365 deaths from the disease annually (1). In Indonesia, cervical cancer is the second most common cancer and the leading cause of death among women aged 15–40 years, with about 32,469 newly diagnosed cases annually (2). HPV infection occurs among the age of 15–59 years, and half of those cases occur within the age of 15–24 years, during the sexually active ages. Cervical cancer is linked to HPV infection. Low-risk types (HPV 6 and 11) can cause genital warts and low-grade cervical changes, whereas high-risk types (HPV 16 and 18) can cause high-grade cervical abnormalities that lead to cancers (3). The World Health Organization (WHO) recommended introducing HPV vaccination as part of a coordinated and comprehensive strategy to prevent cervical cancer and other diseases caused by HPV (4).

As one proactive way to increase HPV vaccine coverage, the Global Alliance for Vaccines and Immunization (GAVI) supports low-middle income countries in Southeast Asia, including Indonesia, to conduct the HPV Demonstration Program. This program was initiated in the provinces where the burden of cervical cancer cases was the highest and the provinces were ready to implement the HPV vaccination program. The first place was in Jakarta Special Province (October 2016), and this effort was continued in the Special Region of Yogyakarta Province (2017), Surabaya (2018), Makassar (2019), and Manado (2019). The quadrivalent HPV vaccine was added to an existing school childhood immunization program (BIAS) for girl students of 5th (the first dose) and 6th grade (the second dose) of elementary school. If the program is successful, then it will be an initial step to add the HPV vaccine into the National Immunization Program (NIP) (5). The WHO recommended 2 doses of HPV vaccine, explaining that a two-dose HPV vaccine schedule provides satisfactory immunological outcomes in adolescent girls less than 15 years old (6).

Because children in this age need parental consent for the vaccination, the acceptance of the HPV vaccine is highly dependent on the knowledge, perceptions, and approval of their parents (7), (8), (9). A systematic review found several factors associated with parents’ acceptance of HPV vaccination for their children including: perceived susceptibility to HPV infection, benefits of vaccination, the safety of the vaccine, social-environmental factors (e.g., social norms, media influence, doctor’s recommendation), and parental factors (educational level, household income, expenses, and attitudes) (10).

The WHO recommended countries which are introducing the HPV vaccine into their NIP should invest in a comprehensive communication plan to first build community awareness and acceptance for the vaccine and the program. This plan includes clear program and communication objectives, understanding community knowledge, attitudes and practices, and defined target audiences. Communication efforts should reach all key target audiences, especially parents (11). Parents’ misperceptions and concerns about the vaccine may affect their acceptance and coverage of the vaccine (12). Inadequate knowledge is one of the significant obstacles to increase HPV vaccine acceptability (13), (14). Prior studies in Indonesia reported that parents had a poor baseline knowledge about HPV infection,
cervical cancer, and the HPV vaccine (15), (16). Educating parents was demonstrated to be an effective method to improve vaccine acceptability by increasing their knowledge and positive perceptions toward vaccination (17),(18).

To our knowledge, no study in Indonesia has assessed the impact of an education intervention on parental knowledge, perceptions, and acceptability of HPV vaccination. This study aimed to evaluate whether an educational intervention about HPV risks and the HPV vaccine increases the parental awareness, knowledge, and perceptions regarding HPV and the HPV vaccination acceptability.

**Methods**

We conducted a one group pre-test, post-test design study in Kulon Progo District, one of 2 districts in Yogyakarta Province, where the demonstration program was implemented, from July to August 2017, before the implementation of the HPV vaccination demonstration program. This research was part of a larger study assessing knowledge, perceptions, and acceptability of parents and teachers regarding HPV related to the disease and the vaccine. Parents of female elementary school students grades 5th and 6th were selected using a school-based proportional random sampling. A study information statement was sent to the parents, and they were invited to participate in the study. We excluded parents who cannot read and write.

After collecting socio-demographic and baseline data on knowledge, perceptions, and acceptability on HPV infection and the vaccine, an educational intervention was provided to the group of parents in the classroom. The intervention consists of a PowerPoint (PPT) presentation provided by a trained pediatric resident, followed by an interactive discussion. The session lasted around an hour. The presentation explained about HPV infection, cervical cancer, and HPV vaccination. The post-intervention data were collected immediately after the educational intervention. Data were collected using validated self-administered questionnaires, which consisted of awareness (4 questions), knowledge and perceptions about HPV infection (14 and 6 questions), knowledge and perceptions about cervical cancer (3 and 2 questions), and knowledge and perceptions about HPV vaccination (5 and 2 questions). For the assessment of knowledge scores, if the answer was correct then it was given a value of 1 and if the answer was incorrect then a value of 0. Questions about perceptions used a 5-point Likert scale (ranging from strongly agree to strongly disagree). Acceptability was measured by a dichotomous item asking whether they would allow their daughters to receive the HPV vaccine, free of charge (yes or no). This questionnaire had been tested for validity and reliability. Ethical approval was attained from the Ethics Committee of the Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia (KE/FK/0815/EC/2017). We obtained informed consent from all participants (parents). Participation was voluntary, and the responses were anonymous.

Descriptive statistics were used to describe the distribution, frequency, and percentage of variables. The statistical significance of the pre-/post- test intervention was assessed using McNemar and Wilcoxon Signed-Rank tests. Logistic regression analysis was used to determine the associations between
potential predictors and vaccine acceptability. All analyses were performed with two-sided tests, and a value of $p < 0.05$ was considered significant.

**Results**

Of the 546 parents who were invited, 513 parents attended the educational intervention program (response rate was 94%), seven parents were excluded due to inability to read and write, resulting in a total data set of 506 participants. The majority of the respondents are mothers (92.8%), with a median age of 40 years, and the majority are Moslem (98.2%). Forty-three participants (8.8%) experienced a history of cancer in their family, and 4.4% mentioned that their daughter had already received the HPV vaccination (Table 1).
Table 1
Characteristics of respondents

| Characteristics                     | n    | %   |
|-------------------------------------|------|-----|
| Gender (n=497)                      |      |     |
| Male                                | 36   | 7.2 |
| Female                              | 461  | 92.8|
| Age (n=488)                         |      |     |
| <45 years old                      | 342  | 70.1|
| >45 years old                      | 146  | 29.9|
| Religion (n=498)                    |      |     |
| Islam                              | 489  | 98.2|
| Non-Islam                          | 9    | 1.8 |
| Education (n=494)                   |      |     |
| Basic education                    | 222  | 44.9|
| Higher education                   | 272  | 55.1|
| Employment Status (n=506)           |      |     |
| Employed                            | 343  | 67.8|
| Unemployed                          | 163  | 32.2|
| Health insurance (n=506)            |      |     |
| Yes                                 | 385  | 76.1|
| No                                  | 121  | 23.9|
| Number of children in family (n=488)|      |     |
| <=2                                 | 79   | 16.2|
| >2                                  | 409  | 83.8|
| monthly Expense (n=483)             |      |     |
| >1500000                            | 264  | 54.7|
| <=1500000                           | 219  | 45.3|
| History of cancer in the family (n=488)|  |   |
|    | Yes | 43  | 8.8 |
|----|-----|-----|-----|
| No | 445 | 91.2|

**Awareness, knowledge, and perceptions of HPV infection, cervical cancer, and HPV vaccination before the education intervention program**

The majority of the parents had heard about sexually transmitted infections (STIs) (72.7%) and cervical cancer (73.7), but only 46.2% of them had ever heard about HPV infection, while 35.2% mentioned that HPV infection was one of the STIs and 45.0% associated HPV with cervical cancer. The majority (76.5%) of respondents already knew that the vaccination could prevent infection, but only 44.1% of parents had ever heard of the HPV vaccination (Table 2).
Table 2
Parent’s knowledge before and after intervention program

| Awareness and knowledge | Correct response | Before | After | \( p \) |
|-------------------------|------------------|--------|-------|------|
|                         |                  | n (%)  | n (%) |      |
| **Awareness**           |                  |        |       |      |
| Heard STIs (Yes)        |                  | 368 (72.7) | 404 (79.8) | < 0.001 |
| Heard HPV infection (Yes) |            | 234 (46.2) | 349 (69.0) | < 0.001 |
| Heard Ca cervix (Yes)   |                  | 373 (73.7) | 411 (81.2) | < 0.001 |
| Heard HPV vaccine (Yes) |                  | 223 (44.1) | 354 (70.0) | < 0.001 |
| **Knowledge of STIs**   |                  |        |       |      |
| Included in STIs        |                  |        |       |      |
| HPV (Yes)               |                  | 142 (35.2) | 317 (78.7) | < 0.001 |
| HIV (Yes)               |                  | 261 (64.4) | 338 (83.5) | < 0.001 |
| Syphilis (Yes)          |                  | 152 (40.0) | 284 (74.7) | < 0.001 |
| Gonorrhea (Yes)         |                  | 84 (22.6) | 237 (63.9) | < 0.001 |
| Herpes simplex virus (Yes) |              | 104 (27.9) | 261 (70.0) | < 0.001 |
| **Causes of STIs**      |                  |        |       |      |
| Having sex with STIs patient (Yes) | | 287 (66.6) | 368 (85.4) | < 0.001 |
| Kissing with STIs patient (Yes) | | 83 (20.9) | 45 (11.3) | < 0.001 |
| Swimming in the pool with STIs patient (No) | | 97 (25.8) | 255 (67.8) | < 0.001 |
| Hugging with STIs patient (No) | | 131 (34.6) | 259 (68.3) | < 0.001 |
| **HPV-related diseases** |                  |        |       |      |
| Cervical cancer (Yes)   |                  | 192 (45.0) | 345 (80.8) | < 0.001 |
| Genital warts (Yes)     |                  | 96 (24.6) | 285 (72.9) | < 0.001 |
| Oral cancer (Yes)       |                  | 83 (21.2) | 286 (73.1) | < 0.001 |
| Awareness and knowledge | Correct response |
|-------------------------|-----------------|
| Urinary Tract Infection (UTIs) (No) | 64 (17.1) | 160 (42.8) | < 0.001 |
| Bladder cancer (No) | 46 (12.3) | 104 (27.7) | < 0.001 |

**Knowledge about Cervical Cancer**

| Knowledge about Cervical Cancer | Correct response |
|---------------------------------|-----------------|
| Keep clean environment can reduce risk of Ca Cervic (No) | 76 (17.8) | 177 (41.5) | < 0.001 |
| Cervical cancer can occur in women and men (No) | 183 (42.7) | 216 (50.3) | < 0.001 |
| Cervical cancer is caused by HPV infection (Yes) | 235 (55.3) | 359 (84.5) | < 0.001 |

**Knowledge about HPV Vaccination**

| Knowledge about HPV Vaccination | Correct response |
|---------------------------------|-----------------|
| Vaccination is one way to prevent infections (Yes) | 325 (76.5) | 379 (89.2) | < 0.001 |
| HPV vaccine does not give protection from cervical cancer (No) | 174 (42.1) | 285 (69.0) | < 0.001 |
| HPV vaccine can be given to women and men (Yes) | 87 (22.0) | 261 (65.9) | < 0.001 |
| HPV vaccine is given to children (No) | 58 (17.1) | 142 (41.8) | < 0.001 |
| HPV vaccine is given to Adolescent (Yes) | 224 (58.5) | 326 (85.1) | < 0.001 |

At baseline, the majority of parents already have a strong perception of the severity of cervical cancer. Most parents were "agree/strongly agree" that cervical cancer is a dangerous cancer (87.8%), and every woman was at risk of having cervical cancer (72.6%). However, the perception of the risk of having HPV infection was lower with only 40.3% aware. The perceptions of the benefit and safety of the HPV vaccine was high (78.6% and 69.7%, respectively) (Table 3).
| Perception                                                                 | agree/strongly agree | Before n (%) | After n (%) | p     |
|---------------------------------------------------------------------------|----------------------|--------------|-------------|-------|
| Perception toward HPV infection                                           |                      |              |             |       |
| HPV infection is a common STIs in women                                   | 266 (57.7)           | 368 (80.5)   | < 0.001     |       |
| All person, both women and men are at risk for having HPV infection       | 186 (40.3)           | 365 (81.8)   | < 0.001     |       |
| HPV infection can cause cervical cancer                                   | 280 (61.5)           | 381 (84.3)   | < 0.001     |       |
| HPV infection is a mayor cause of women death                             | 276 (61.5)           | 362 (81)     | < 0.001     |       |
| Behavioural can prevent HPV infection                                    |                      |              |             |       |
| No sex before marriage                                                    | 420 (88.2)           | 430 (94.7)   | < 0.001     |       |
| HPV vaccination                                                           | 385 (84.8)           | 411 (92.6)   | < 0.001     |       |
| Perception toward cervical cancer                                         |                      |              |             |       |
| Cervical cancer is a dangerous cancer                                      | 416 (87.8)           | 437 (95.8)   | < 0.001     |       |
| Every women is at risk of developing cervical cancer                       | 337 (72.6)           | 394 (86.6)   | < 0.001     |       |
| Perception toward HPV vaccination                                         |                      |              |             |       |
| I believe HPV vaccination is useful for preventing cervical cancer         | 367 (78.6)           | 415 (92.7)   | < 0.001     |       |
| I believe HPV vaccine is safe                                             | 317 (69.7)           | 402 (91.0)   | < 0.001     |       |
Factors associated with HPV vaccine's acceptability after the intervention education

In the bivariate analysis, we found that knowledge and perceptions of HPV infection, cervical cancer, and HPV vaccine were predictive of vaccine acceptability. There was no correlation between the sociodemographic characteristics of the respondents with HPV vaccination acceptability. In the multivariate analysis, we found that better knowledge of HPV vaccination and more positive perceptions of HPV vaccine were predictive of vaccine acceptability with OR 1.90 (95% CI: 1.40–2.57) and OR 1.31 (95% CI: 1.05–1.63), respectively (Table 5).

Table 5
Bivariate and multivariate analysis of awareness, knowledge, perception and acceptability of HPV vaccine: after intervention program

| Analysis                        | Bivariate analysis | Multivariate analysis |
|---------------------------------|--------------------|-----------------------|
|                                 | OR (95% CI)        | p                     | OR (95% CI)        | p                     |
| Awareness                       | 1.56 (1.22–2.00)   | 0.000                 | 0.86 (0.60–1.25)   | 0.448                 |
| Knowledge of STIs               | 1.21 (1.13–1.29)   | 0.000                 | 1.05 (0.92–1.12)   | 0.479                 |
| Knowledge about Cervical Cancer | 2.09 (1.48–2.96)   | 0.000                 | 0.78 (0.94–0.59)   | 0.787                 |
| Knowledge about HPV Vaccination | 2.70 (1.70–2.53)   | 0.000                 | 1.90 (1.40–2.57)   | 0.000                 |
| Perception about HPV infection  | 1.13 (1.07–1.18)   | 0.000                 | 0.97 (0.89–1.06)   | 0.599                 |
| Perception about cervical cancer| 1.30 (1.11–1.52)   | 0.000                 | 0.93 (0.75–1.15)   | 0.525                 |
| Perception about HPV vaccination| 1.62 (1.35–1.92)   | 0.000                 | 1.31 (1.05–1.63)   | 0.016                 |

Considerations for accepting HPV vaccinations were free of charge (according to 95.5% of respondents), the vaccine was included in NPI (according to 97.1% of respondents), the vaccine is considered safe by Moslem standards or *halal* (98.0%), scientifically safe (97.0) and effective in preventing the disease (97.7%). The three most important considerations were free of charge, the vaccine is *halal*, and the vaccine is effective.

Impact of the educational intervention program

After the educational intervention, there were significant improvements in parents' awareness, knowledge, and perceptions of HPV infection, cervical cancer, and the vaccine, *p* < 0.001 (Tables 2, 3 and 4). Parental acceptability of the HPV vaccination for their children increased significantly (from 74.3–87.4%; *p* < 0.001). There was a significant correlation between increasing vaccine acceptability with improvement of
Discussion

This research was a community-based study to assess whether a structured educational program can improve parental awareness, knowledge, and perceptions about HPV infection, cervical cancer, and HPV vaccination as well as acceptability of HPV vaccination. Before the intervention, most of the parents had poor baseline knowledge and some negative perceptions of HPV-related information. After the educational intervention, there was a significant improvement in parents’ HPV-related knowledge and perceptions as well as their intention to permit the HPV vaccine for their children.

|                              | Mean (SD) | Median | p       |
|------------------------------|-----------|--------|---------|
| **Awareness**                |           |        |         |
| Before                       | 2.36 (1.21) | 2      | < 0.001 |
| After                        | 3.00 (1.24) | 4      |         |
| **Knowledge of STIs**        |           |        |         |
| Before                       | 4.11 (3.80) | 3      | < 0.001 |
| After                        | 7.65 (4.64) | 10     |         |
| **Perception of HPV infection** |       |        |         |
| Before                       | 22.80 (7.03) | 24     | < 0.001 |
| After                        | 24.79 (8.88) | 27     |         |
| **Knowledge of cervical cancer** |        |        |         |
| Before                       | 1.14 (0.95) | 1      | < 0.001 |
| After                        | 1.51 (0.99) | 2      |         |
| **Perception of cervical cancer** |       |        |         |
| Before                       | 7.67 (2.47) | 8      | < 0.001 |
| After                        | 8.03 (2.93) | 9      |         |
| **Knowledge of HPV vaccination** |       |        |         |
| Before                       | 1.95 (1.48) | 2      | < 0.001 |
| After                        | 3.05 (1.72) | 3      |         |
| **Perception of HPV vaccination** |       |        |         |
| Before                       | 7.31 (2.57) | 8      | < 0.001 |
| After                        | 7.81 (3.07) | 9      |         |

Awareness (r = 0.33, p < 0.001), knowledge of HPV infection, cervical cancer and HPV vaccination (r = 0.35, 0.35, 0.47, p < 0.001, respectively) and perceptions of the HPV infection, cervical cancer and HPV vaccination (r = 0.36, 0.35, 0.53, p < 0.001, respectively).
At the baseline, we found that most of our participants had heard about STIs and cervical cancer, but less than half of them had never heard about HPV infection and the vaccine. A previous qualitative study assessing parental knowledge and perceptions of HPV and cervical cancer prevention in rural Central Java, Indonesia (2015) found that most respondents have limited knowledge of HPV and the vaccine as well as the relationship between HPV and cervical cancer (15). Compared to a study 4-years earlier which was conducted in the same province (Yogyakarta Province) in 2013, there was almost no improvement in parental awareness of HPV vaccination (44% and 47%), and the percentage of parents who reported their children had received the vaccine (8.0% and 4.4%) (16). Since the vaccine has not been included in Indonesia NIP then this may be the reason why the community is not very aware of the availability of the vaccine and this causes the low vaccine uptake. These findings are similar to previous studies in developing countries where HPV vaccination has not been included in their NIP (18), (19), (20).

Our study found that even before the educational intervention, parents already had a strong perception of the danger of cervical cancer. However, the perceptions of the susceptibility of HPV infection was considered low.

There were several factors related to the acceptability of HPV vaccination. From the regression analysis, we found that better knowledge and positive perceptions of the HPV vaccination were significantly associated with higher acceptability. In line with our study, previous reports have shown that parents’ knowledge about HPV was positively correlated with HPV vaccination acceptability (9), (12). Perceived risks of HPV infection, perceived vaccine benefits, and vaccine safety were associated with the acceptability of HPV vaccination. Perceptions that their children were at greater risk of getting cancer indicated more desire to permit their children to get the HPV vaccine. Parents wanting to protect their children from cervical cancer and other HPV related diseases as the perceived benefits of HPV vaccination, had a strong relationship with the intention to vaccinate. On the other hand, parents who were not sure about HPV vaccine efficacy and afraid of any side effects which might be harmful to their children were less likely to accept the vaccine (21), (22), (23), (24), (25), (26).

We found that besides the vaccine’s benefits and safety, free of charge, the vaccine being included in NIP, and the vaccine considered halal (permissible under Islamic Shariah Law) were important considerations for accepting the vaccine. Including HPV vaccine in the NIP and providing health insurance could eliminate the cost barriers. Because the majority of our study population is Muslim, the halal issue is an important consideration for accepting the vaccine. Previously, the non-halal status was reported as a barrier to the rotavirus vaccine acceptability in Yogyakarta, Indonesia. Engagement of religious leaders is needed to facilitate the bridge between immunization programs and the community, particularly during the introduction of a new vaccine (27).

Earlier studies found that parents need HPV-related information to decide whether to accept or refuse the HPV vaccination (8), (13), (28). In line with the WHO recommendations (11), a systematic review of knowledge, attitudes, and barriers toward HPV vaccination in developing economic countries of South-East Asia Region emphasized the importance of educational campaigns before the vaccine is included
in the NIP to improve vaccine uptake (21). Parents should be provided with more detailed information about HPV infection, cervical cancer, and HPV vaccination, which would help parents avoid any misunderstandings and to change parents toward a positive attitude. In line with previous studies, our study found that a structured education program improved parent's knowledge, and perception as well as their acceptability. A one-hour educational presentation was effective in improving parent’s knowledge and had an important impact on vaccine acceptance (29). A study in China indicated that health educational seminars could effectively increase the parental knowledge level about vaccinations (17). A school-based intervention study assessed the effect of an hour PPT presentation/educational intervention on HPV knowledge and attitudes towards HPV and its vaccine among junior school students in Chengdu, China. The results of the study demonstrated the effectiveness of this intervention in improving HPV knowledge among students and in increasing their willingness to be vaccinated (30).

The educational intervention conducted in our study, in the form of a presentation by professional health educators, was shown to significantly improve the parents' knowledge and perceptions about HPV. Giving educational campaigns could increase parental knowledge and perceptions about HPV, concurrently with physician recommendations and nationally funded vaccination programs (20). A systematic scoping review (2019) regarding communication concerning HPV vaccinations in low and middle-income countries found that physicians were important components to deliver information about HPV and give parents a recommendation to get HPV vaccination for their children (22). Another systematic review conducted by Radisic et al. (2017) found that uptake of HPV vaccination may be facilitated by encouraging health care provider endorsement (10).

This research has some limitations. First, this one group pre-test -post-test design study without a control group did not allow us to confirm any causal relations between the intervention and outcomes. A pre- and post-test without follow-up also could not determine the long-term effectiveness of the educational intervention on HPV vaccination acceptability. Further studies with longer follow-up are needed to evaluate the long-term and actual effectiveness of improving parents’ knowledge and perceptions about the HPV vaccination. The strength of this study is that it assessed the effectiveness of an education intervention before the implementation of the HPV vaccination demonstration program, which included a representative sample of parents in the Kulon Progo District. The results of this study can provide important evidence to the policy-makers about the importance of health education.

**Conclusion**

Parental knowledge and perceptions toward HPV and the vaccine was considered insufficient. A structured educational intervention program conducted by qualified health providers is effective in improving parental awareness, knowledge, and perceptions toward HPV as well as the acceptability of the vaccine. There was a significant correlation between improving the parental knowledge and perceptions of HPV vaccine with increasing acceptability of the HPV vaccine.

**Abbreviations**
Declarations

Ethics approval and consent to participate

Ethical approval was attained from the Ethics Committee of the Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia (KE/FK/0815/EC/2017). We obtained informed consent from all participants (parents). Participation was voluntary, and the responses were anonymous.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Competing interests

The authors have no competing interests to declare.

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None

Authors’ contributions

MNS developed study design. MNS and NMR performed data collection. MNS, NMR, AW contributed to the interpretation and data analysis. MNS developed the main draft manuscript. All authors reviewed, gave comment, and approved the final manuscript.

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