


Psychological reactions of adolescent schoolgirls to human papillomavirus vaccination in western Uganda: A comparative cross-sectional study

Health Psychology Open
July-December 2015: 1–10
© The Author(s) 2015
Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/2055102915602910
hpo.sagepub.com


Andrew Kampikaho Turiho, Elialilia S Okello,
Wilson W Muhwezi, Noeline Nakasujja and Anne R Katahoire

Abstract

Schoolgirls in two Ugandan districts were recently vaccinated against human papillomavirus that causes most cervical cancer. This cross-sectional comparative study used mixed research methods to assess influence of human papillomavirus vaccination on adolescents' worrisome thoughts about being vaccinated and psychological distress. Vaccination predicted worrisome thoughts among the recently vaccinated (adjusted odds ratio: 1.65, confidence interval: 1.13–2.41; $p=0.01$). Vaccination predicted distress (1.75, confidence interval: 1.09–2.82; $p=0.02$), particularly among those recently vaccinated (1.92, confidence interval: 1.27–2.89; $p=0.001$) and those who experienced worrisome thoughts (1.80, confidence interval: 1.06–3.07; $p=0.02$). Parental communication mitigated distress (0.50, confidence interval: 0.35–0.72; $p=0.000$).

Keywords

adolescent schoolgirls, human papillomavirus vaccination, psychological distress, Uganda, worrisome thoughts

Introduction

Every year, about 500,000 women develop cervical cancer, which is associated with certain types of human papillomavirus (HPV) and about 274,000 die from the disease globally (World Health Organization (WHO), 2007). Two HPV prophylactic vaccines, Cervarix and Gardasil, have turned out to be 90 percent effective in safely preventing HPV types 16 and 18 infections, which together account for about 70 percent of worldwide cervical cancer cases (Program for Appropriate Technology in Health (PATH), 2009). The HPV is primarily sexually transmitted (Lenselink et al., 2008). The HPV vaccines are mostly targeted on young adolescent girls and they are most effective if given to HPV-unexposed girls. Research has captured diverse fears about HPV vaccination of young adolescent girls. Some of the fears are related to safety and unknown side effects; the possibility of jeopardizing the future fertility of vaccinated girls; and the misunderstanding in some environments that the vaccinations are meant to control fertility or reduce the population of certain groups (Agosti and Goldie, 2007; Katahoire et al., 2008; PATH, 2009; Remes

et al., 2012). Moreover, many children loathe injections because they are painful, frightening, and psychologically stressful (French et al., 1994). Fear of HPV vaccination is known to be associated with significant distress among targeted adolescents (Bernard et al., 2011). Previous research on psychological distress in Ugandan adolescents mainly focused on war- and HIV/AIDS-affected children (Atwine et al., 2005; McMullen et al., 2012; Musisi and Kinyanda, 2009; Okello et al., 2007). The possibility of psychological distress in adolescents facing potentially fear-provoking HPV vaccinations has not been studied in Uganda. The psychosocial paradigm of stress–distress relationship holds that external stressors, if unchecked, do disrupt an individual's psychological equilibrium and induce physiological and/or psychological responses in the form of distress

Makerere University, Uganda

Corresponding author:

Andrew Kampikaho Turiho, Department of Psychiatry, School of Medicine, Makerere University, P O Box 7072 Kampala, Uganda.
Email: akturiho@chs.mak.ac.ug; turiho@mail.com



(Ensel and Lin, 1991). In this study, we considered HPV vaccinations and the associated worries to constitute stressful events, which are threatening and undesirable rather than life readjustment due to change per se (Vinokur and Selzer, 1975). Research has demonstrated a consistency in the relation between life stress (life events) and distress (Ensel and Lin, 1991; Muhwezi et al., 2007). From 2008 to 2011, cohorts of adolescent girls from primary schools in Ibanda and Nakasongola districts, Uganda were vaccinated annually against HPV. The vaccination was part of a demonstration project by the Uganda Government and PATH to evaluate different HPV vaccine delivery strategies. A school-based HPV vaccine delivery strategy was adopted in Ibanda district targeting girls enrolled in primary grade 5 (P5). In Nakasongola district, the HPV vaccine was delivered during the routine Child Days Plus (CDP) program, targeting girls of at least 10 years. Each eligible girl was to receive three doses of the vaccine administered in Month 1, Month 2, and Month 6 (PATH et al., 2010). The purpose of this study was to assess adolescent girls' psychological distress in Ibanda district, following HPV vaccination. Based on the psychosocial paradigm of stress–distress relationship, it was hypothesized in the research for this article that girls vaccinated against HPV compared to unvaccinated girls were more likely to have had worrisome thoughts about vaccination and to experience high psychological distress.

Methods

Design

This comparative, mixed methods cross-sectional study was conducted between November and December 2011. Girls vaccinated against HPV were drawn from Ibanda district while unvaccinated participants for comparison were selected from Mbarara district.

Participants

Primary school education in Uganda occurs over 7 years, beginning with Primary 1 (P1) and ending with Primary 7 (P7). The participants in this study were girls enrolled in Primary 5 (P5) and Primary 6 (P6). Vaccinated P6 study participants had completed their vaccination 13 months before, while their P5 colleagues completed vaccination 1 month prior to the date of data collection. During data analysis, the latter were considered as recently vaccinated. Using multi-stage sampling, 16 selected schools in Ibanda district and the same number in Mbarara district were stratified by rural–urban location. In Ibanda district, all assenting P5 and P6 girls present on the day of the survey that had received at least one dose of the HPV vaccine were recruited. Similar criteria were followed for the unvaccinated comparison group in Mbarara district. A sample size

of 800 girls was determined for the survey using the formula for sample size calculation to compare two proportions in terms of risk (Pandey, 1999). Of the 800 girls targeted, 777 (444 in Ibanda district and 333 in Mbarara district) participated. There were 23 non-responders including those who were absent from school and those who did not return their parents' consent forms. Five focus group discussions (FGDs) each with 8–12 vaccinated girls in P5 or P6 were conducted one per school in Ibanda district, involving five schools that had not been sampled for the survey. FGD participants aged 13–16 years were selected purposively with the help of teachers, targeting self-confident and uninhibited girls who could talk freely in a group. Girls who participated in FGDs had to have been vaccinated against HPV so as to capture their observations and experiences during vaccination.

Data collection

A survey questionnaire and FGDs were used to collect data. Selected girls were assembled in a room on the day of the survey. A pre-tested and translated self-administered questionnaire was used. Each girl filled the questionnaire under close supervision of the first author (A.K.T.) and research assistants who also explained to them the purpose and procedure of the survey. Data were collected first in Ibanda district before Mbarara district. FGDs were conducted by A.K.T. and a research assistant after survey data collection in Ibanda district.

Measures

Independent variables were socio-demographic characteristics (age, class attended, kind of school, location of school, having parents, and perceived parental communication) and HPV vaccination status. Dependent variables were worrisome thoughts about being vaccinated and level of psychological distress. Moderator variable was knowledge of HPV and HPV vaccine. Each variable was assessed through responses to a set of questions or statements. The variables were analyzed as dichotomous.

HPV vaccination status was assessed by asking respondents whether they had ever been vaccinated against HPV. Worrisome thoughts were assessed by asking respondents whether they had ever felt very worried about having been vaccinated or going to be vaccinated.

Psychological distress was assessed using the self-administered Strengths and Difficulties Questionnaire (SDQ) for children aged 3–16 years (Goodman, 1997). The SDQ has 25 items, some positive and others negative. The items are divided between five scales each with five items: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. The first four scales are added together to generate a Total Difficulties Scale (TDS) based on 20 items with

scores ranging from 0 to 40. A cut-off score of 20 is usually used to identify likely “cases” with non-specific mental health disorders. In this study, TDS scores ranged from 1 to 30. In order to make our findings comparable with other studies (Abbo et al., 2013; Kinyanda et al., 2013; Moscardino et al., 2012) that used the SDQ to assess adolescent psychological distress in the same country, Uganda, we adopted a cut-off score of 16 to indicate adolescents’ high psychological distress. Scores 1–15 were banded to denote low psychological distress, whereas scores 16–30 were banded to denote high psychological distress.

Knowledge was assessed through responses to 13 factual statements based on information from the print materials used for community sensitization prior to HPV vaccination. Perceived parental communication was assessed by asking respondents how often their parents or guardians talked to them about their future and the dangers of pre-marital sex.

Data analysis

Quantitative data were analyzed for 769 girls. Data for eight girls were excluded from the analysis when their age (17–19 years) was found to be above 16 years, the upper age limit for the version of SDQ used in this study. Data were entered and cleaned using EpiData, and then analyzed using SPSS v. 16.0 (SPSS Inc., 2007). Univariate analysis was done to generate frequencies and percentages for categorical variables. Means and standard deviations (SDs) were generated for continuous variables. The independent samples t-test was the statistical test used to compare the continuous variables. Since our sample was clustered by schools, we conducted complex sample analyses by applying sampling weights to the statistics (means, percentages, and odds ratios (ORs)) to take care of the effect of the sampling design. At bivariate level, we evaluated relationships between independent and dependent variables using the Pearson χ^2 test to determine statistical significance of observed differences. We performed complex samples logistic regression to test the hypothesis that girls vaccinated against HPV were more likely to report worrisome thoughts about vaccination and high psychological distress. In the analysis, we compared proportions of girls vaccinated against HPV with proportions of unvaccinated girls. Relevant ORs with corresponding confidence intervals (CIs) set at 95 percent were determined. Level of statistical significance was set at 0.05.

Qualitative data were transcribed, word processed, and entered into ATLAS.ti GmbH (1993) for coding and analysis. Codes were developed based on the broad themes identified from the data. The codes were used to retrieve segments of the data. Memos were written describing the patterns and variations in the different segments of retrieved data. Data matrices were drawn out of the retrieved data

sets according to the plan of analysis. Qualitative data were used to interpret quantitative data.

Ethical issues and approval

The research was approved by the Higher Degrees Research and Ethics Committee of the then Makerere University Medical School and the Uganda National Council for Science and Technology. Additional approvals were obtained from relevant local government and school authorities. Prior to the interviews, written assent and consent were obtained from the targeted girls and their parents, respectively.

Results

Socio-demographic characteristics of respondents

The overall age range of girls was 9–16 years. The mean age of vaccinated girls (13.4 years, SD=1.36) and unvaccinated girls (13.3 years, SD=1.32) was similar. Table 1 compares vaccinated and unvaccinated girls in terms of socio-demographic characteristics. Vaccinated girls were significantly more likely to perceive high parental communication (crude OR: 1.74, CI: 1.00–3.05; $p=0.05$).

Bivariate analysis

Worrying about vaccination. Table 2 shows respondents’ likelihood to report worrisome thoughts about being vaccinated according to their background characteristics. Overall, fewer girls (270 out of 769 or 35%) responded affirmatively; the majority (65%) reported no worrisome thoughts about being vaccinated. Compared to unvaccinated girls, those vaccinated against HPV were more likely to report worrisome thoughts about vaccination and the difference was almost significant (crude OR: 1.74, CI: 0.90–3.23; $p=0.10$). Compared to P6 girls, P5 girls were significantly more likely to report worrisome thoughts about vaccination (crude OR: 1.61, CI: 1.12–2.32; $p=0.01$).

Psychological distress. Table 3 shows respondents’ likelihood to report high psychological distress according to their background characteristics. Consistent with expectation, more girls vaccinated against HPV (173 out of 440 or 39.3%) compared to unvaccinated girls (91 out of 329 or 27.7%) had high psychological distress and the difference was statistically significant (crude OR: 1.70, CI: 1.04–2.77; $p=0.04$). Compared to P6 girls, P5 girls were significantly more likely to be highly distressed (crude OR: 2.05, CI: 1.31–3.21; $p=0.003$). Girls who perceived high parental communication were significantly less likely to be distressed (crude OR: 0.52, CI: 0.37–0.70; $p=0.001$). Consistent with expectation, a significant proportion of girls with

Table 1. Socio-demographic characteristics of vaccinated and unvaccinated respondents.

Socio-demographic characteristics	HPV vaccination status (N= 769)		Crude ORs (95% CI)
	Vaccinated (n=440) (%)	Unvaccinated (n=329) (%)	
Age			
Younger adolescent (9–12 years)	111 (25.2)	94 (28.6)	0.84 (0.53–1.34)
Older adolescent (13–16 years)	329 (74.8)	235 (71.4)	
Class attended			
Primary 5 (P5)	171 (38.9)	139 (42.2)	0.87 (0.47–1.61)
Primary 6 (P6)	269 (61.1)	190 (57.8)	
Kind of school			
Exclusively day	307 (69.8)	286 (86.9)	0.35 (0.04–3.03)
Both day and boarding	133 (30.2)	43 (13.1)	
Location of school			
Rural	318 (72.3)	264 (62.0)	1.60 (0.28–9.14)
Urban	122 (27.7)	125 (38.0)	
Having parents			
Orphan	86 (19.5)	83 (25.2)	0.72 (0.48–1.08)
Has both parents	354 (80.5)	246 (74.8)	
Parental communication			
High	377 (85.7)	254 (77.4) ^a	1.74 (1.00–3.05)*
Low	63 (14.3)	74 (22.6)	

HPV: human papillomavirus; CI: confidence interval; ORs: odds ratios.

For all socio-demographic variables, second column odds are divided by third column odds.

^aColumn figures do not add up to 329 due to a missing case.

*Significant at $p \leq 0.05$.

worrisome thoughts about vaccination (66 out of 270 or 24.8%) compared to girls without such thoughts (79 out of 499 or 15.2%) were highly distressed (crude OR: 2.01, CI: 1.18–3.45; $p=0.01$).

Logistic regression

Worrisome thoughts about vaccination and level of psychological distress. Variables entered in the first model of logistic regression to predict adolescents' worrisome thoughts about vaccination were HPV vaccination status and class attended. As shown in Table 4, HPV vaccination did not predict worrisome thoughts about vaccination even after controlling for class attended. The odds of a vaccinated girl reporting worrisome thoughts increased but the difference was not significant ($p=0.09$). Being in P5 predicted worrisome thoughts about vaccination even after controlling for HPV vaccination status (adjusted OR: 1.65, CI: 1.13–2.41; $p=0.01$). Variables entered in the second model to predict level of psychological distress were the significant background variables in bivariate analysis and worrisome thoughts about being vaccinated. As shown in Table 4, vaccination against HPV (adjusted OR: 1.75, CI: 1.09–2.82; $p=0.02$) and experiencing worrisome thoughts about vaccination (1.80, CI: 1.06–3.07; $p=0.02$) each predicted high psychological distress even after adjusting for other variables in the model. High distress was more likely if the vaccinated girls were in P5 (1.92, CI: 1.27–2.89; $p=0.001$). On

the other hand, vaccinated girls were less likely to be psychologically distressed if they perceived high parental communication even after adjusting for other variables entered in the model (0.50, CI: 0.35–0.72; $p=0.000$).

Discussion

Worrisome thoughts about vaccination

Contrary to our expectation, HPV vaccination was not a strong predictor of adolescents' worrisome thoughts about vaccination except among P5 girls (recently vaccinated). Our qualitative results showed that the introduction of the HPV vaccine had triggered several negative rumors that were likely to worry the targeted adolescents. Apparently, much of the reported worry especially concerning pain and possible physical harm from injection was anticipatory, which is a normal response to a perceived threat but an unnecessary psychological trauma if no real threat exists (Bernard et al., 2011). Qualitative findings indicated that the fear of pain and possible physical harm from injection was usually short-lived, suggesting that time was protective. Some girls were said to have missed the initial vaccine dosages out of fear only to accept later after realizing that those who had taken the vaccine had not been harmed. This behavior toward the HPV vaccine has previously been noted among both adolescents and their parents in other studies (Katahoire et al., 2013; Watson-Jones et al., 2012).

Table 2. Relationship of the respondents' characteristics with experience of worrisome thoughts about vaccination.

Respondents' characteristics	Worrisome thoughts about vaccination (N=769)		p value	Crude ORs (95% CI)
	Worrisome thoughts reported (n=270)	No worrisome thoughts reported (n=499)		
HPV vaccination status				
Vaccinated (n=440) (%)	177 (40.2)	263 (59.8)	0.10	1.71 (0.90–3.23)
Unvaccinated (n=329) (%)	93 (28.3)	236 (71.7)		
Age				
Younger adolescent (9–12 years) (n=205) (%)	81 (40.9)	124 (59.1)	0.20	1.27 (0.87–1.85)
Older adolescent (13–16 years) (n=564) (%)	189 (35.3)	375 (64.7)		
Class attended				
Primary 5 (n=310) (%)	122 (43.5)	188 (56.5)	0.01	1.61 (1.12–2.32)**
Primary 6 (n=459) (%)	148 (32.3)	311 (67.7)		
Kind of school				
Exclusively day (n=593) (%)	184 (31.8)	409 (68.2)	0.08	0.44 (0.18–1.11)
Both day and boarding (n=176) (%)	86 (51.5)	90 (48.5)		
Location of school				
Rural (n=522) (%)	181 (35.7)	341 (64.3)	0.72	0.86 (0.37–2.00)
Urban (n=247) (%)	89 (39.1)	158 (60.9)		
Having parents				
Orphan (n=169) (%)	70 (41.9)	99 (58.1)	0.11	1.32 (0.93–1.86)
Has both parents (n=600) (%)	200 (35.4)	400 (64.6)		
Parental communication				
High (n=631) (%)	220 (36.6)	411 (63.4) ^a	0.83	0.95 (0.58–1.54)
Low (n=137) (%)	50 (37.8)	87 (62.2)		
Knowledge of HPV and HPV vaccine				
Knowledgeable (n=123) (%)	45 (37.2)	78 (62.8)	0.92	1.03 (0.64–1.65)
Not knowledgeable (n=646) (%)	225 (36.6)	421 (63.4)		

HPV: human papillomavirus; CI: confidence interval; ORs: odds ratios.

For all respondents' characteristics, second column odds are divided by third column odds.

^aColumn total does not add up to 499 due to a missing case.

**Significant at $p \leq 0.01$.

This finding underscores a need for future HPV vaccination programs to provide for second chance of dose 1 for girls who initially avoid the vaccination out of fear but change their minds later after learning from the experience of their vaccinated colleagues that the vaccine is not harmful.

Psychological distress

As expected in this study, HPV vaccination predicted high psychological distress. Comparable studies that assessed adolescent psychological distress in Uganda using the SDQ and a cut-off TDS score of 16 to indicate clinically significant distress were conducted on adolescent samples drawn from largely high-risk populations in war-affected northern and north-eastern Uganda. Compared to the findings of those studies, the 39.3 percent prevalence of clinically significant distress among vaccinated adolescents in our study is clearly higher than the 18.3 percent among non-abducted adolescents but lower than the 51.2 percent among war-abducted adolescents in a war-affected district (Okello et al.,

2007); it is higher than the 23.1 percent among males and 29.7 percent among females from two war-affected and two non-war-affected districts (Abbo et al., 2013); and it is greater than the 33.7 percent among never abducted adolescents but less than the 67.7 percent among child soldiers in a war-affected district (Moscardino et al., 2012). Our finding showing relatively high prevalence of distress among vaccinated girls is inconsistent with previous studies of children aged 7–11 years undergoing other vaccinations (cited in Cohen et al., 1999). It was observed from those studies that as children grow older they acquire more sophisticated and logical thinking processes and are able to understand the rationale for medical procedures. Consequently, they tend to experience decreased worry, distress, and pain (Cohen et al., 1999). However, our findings are largely in agreement with findings of a qualitative study of adolescent girls' response to HPV vaccination under a school-based vaccine delivery arrangement (Bernard et al., 2011), which reported that fear and distress were commonplace. The study cited negative rumors or misinformation among the major factors behind

Table 3. Relationship of the respondents' characteristics with level of psychological distress.

Respondents' characteristics	Level of psychological distress (N = 769)		Crude ORs (95% CI)
	High (n = 264)	Low (n = 505)	
HPV vaccination status			
Vaccinated (n = 440) (%)	173 (39.3)	267 (60.7)	1.70 (1.04–2.77)*
Unvaccinated (n = 329) (%)	91 (27.7)	238 (72.3)	
Age			
Younger adolescent (9–12 years) (n = 205) (%)	70 (36.7)	135 (63.3)	1.05 (0.64–1.72)
Older adolescent (13–16 years) (n = 564) (%)	194 (35.7)	370 (64.3)	
Class attended			
Primary 5 (n = 310) (%)	133 (45.9)	177 (54.1)	2.05 (1.31–3.21)**
Primary 6 (n = 459) (%)	131 (29.3)	328 (70.7)	
Kind of school			
Exclusively day (n = 593) (%)	200 (35.2)	393 (64.8)	0.89 (0.36–2.19)
Both day and boarding (n = 176) (%)	64 (38.0)	112 (68.0)	
Location of school			
Rural (n = 522) (%)	173 (33.9)	349 (66.1)	0.76 (0.37–1.54)
Urban (n = 247) (%)	91 (40.4)	156 (59.6)	
Having parents			
Orphan (n = 169) (%)	64 (39.7)	105 (60.3)	1.23 (0.85–1.79)
Has both parents (n = 600) (%)	200 (34.9)	400 (65.1)	
Parental communication			
High (n = 631) (%)	200 (33.3)	431 (66.7) ^a	0.52 (0.37–0.70)***
Low (n = 137) (%)	64 (49.1)	73 (50.9)	
Knowledge of HPV and HPV vaccine			
Knowledgeable (n = 123) (%)	39 (32.0)	84 (68.0)	0.81 (0.51–1.27)
Not knowledgeable (n = 646) (%)	225 (36.8)	421 (63.2)	
Worrisome thoughts about vaccination			
Worrisome thoughts present (n = 270) (%)	119 (46.2)	151 (53.8)	2.01 (1.18–3.45)*
Worrisome thoughts absent (n = 499) (%)	145 (29.9)	354 (70.1)	

HPV: human papillomavirus; CI: confidence interval; ORs: odds ratios.

For all background variables, second column odds are divided by third column odds.

^aRow figures do not add up to 632 due to a missing case.

*Significant at $p \leq 0.05$.

**Significant at $p \leq 0.01$.

***Significant at $p \leq 0.001$.

Table 4. Predictors of adolescents' worrisome thoughts about vaccination and psychological distress derived by complex samples logistic regression analysis.

Respondents' characteristics	Outcomes	
	Worrisome thoughts about vaccination present	High psychological distress
	Adjusted ORs (95% CI)	Adjusted ORs (95% CI)
Vaccinated against HPV	1.75 (0.92–3.33)	1.75 (1.09–2.82)*
P5 class	1.65 (1.13–2.41)**	1.92 (1.27–2.89)***
High parental communication	–	0.50 (0.35–0.72)***
Worrisome thoughts present	–	1.80 (1.06–3.07)*

HPV: human papillomavirus; CI: confidence interval; ORs: odds ratios.

Number of observations = 768.

*Significant at $p \leq 0.05$.

**Significant at $p \leq 0.01$.

***Significant at $p \leq 0.001$.

the girls' fear response. In our study, qualitative results show various negative beliefs the vaccinated adolescents had about HPV vaccination, which were largely based on rumors and misinformation. Different FGD participants heard rumors that those vaccinated could become barren or would face a greater risk of life-threatening childbirth complications, HPV vaccination was a disguised plot to gradually kill those vaccinated in unexplained ways, HPV vaccine causes cervical cancer that would ultimately kill the vaccinated person, and that those vaccinated would in future give birth to only twins. Some of the vaccinated girls worried that it would alter their menstrual cycles. The rumors, though not backed by scientific evidence, are potential sources of distress if they are perceived as real. The positive association between major stressors (such as negative life events) and psychological distress has been previously confirmed among adolescents in studies not related to HPV vaccination (Huang et al., 2009; McMullen et al., 2012; Qouta et al., 2007) and among adults (Jackson and Finney, 2002; Mak et al., 2005; Muhwezi et al., 2007; Tein et al., 2000). Life events are especially distressing if they are viewed as undesirable, uncontrollable, and unpredictable. Distress is predicted by the perception and the interpretation of events (as negative) rather than by the occurrence of events themselves (Jackson and Finney, 2002). In the context of HPV vaccination, it has been reported that being informed about and well prepared for vaccination may reduce the propagation of myths, rumors, and other fear-promoting factors (Bernard et al., 2011). Future HPV vaccination programs should include sensitization strategies to counteract the negative rumors about the vaccinations so as to mitigate fear and anxiety among targeted adolescents. In particular, future sensitization programs need to explore the strategy of peer involvement to mitigate targeted adolescents' fear and anxiety. This suggestion is informed by this study's qualitative findings showing that some vaccinated girls were mainly encouraged by their friends to get vaccinated against the HPV without fully understanding the vaccination, implying that peer influence may have mitigated some of the fears associated with the vaccination. Moreover, in the study by Bernard and colleagues (Bernard et al., 2011), girls' concern about their possible reactions in front of peers seemed to amplify fear in some cases, yet having friends available in the vaccination room to support them by holding arms or talking to them had the reverse effect. Peer influence is a known positive and negative factor in shaping adolescent attitudes about HPV vaccine (Gamble et al., 2010; Katz et al., 2013).

High psychological distress was especially likely if the girls were recently vaccinated, consistent with findings of another study that reported high levels of distress among children during immunization in different settings (Cohen et al., 1997). High distress was also likely if the vaccinated girls reported worrisome thoughts about being

vaccinated. This is in agreement with findings of the study (Bernard et al., 2011), which concluded that fear of HPV vaccination was a near universal experience among adolescents undergoing HPV vaccination in a school setting and was often associated with significant distress. Some girls in our study's FGDs reported that while being prepared for HPV vaccination, they felt anxious that it would cause pain, bleeding, and irritation based on what they heard from their friends at school. Many reported experiencing pain and swelling at the injection site, which initially caused worries of probable long-term physical damage. These and other known adverse effects like dizziness and headache have been reported in other studies (Katahoire et al., 2013) but they are usually brief and non-serious (WHO, 2012). Since this study's findings suggest that both distress and worry especially about pain and possible physical harm from injection were largely short-term phenomena, there is a need for a psychosocial component in future HPV vaccinations to identify and address the affected adolescents' immediate psychosocial needs. Health workers who administer the vaccines should be trained in basic cognitive and behavioral interventions that have been found to be effective in mitigating pain and distress during immunizations such as child distraction, encouraging the child to adopt the stress-reduction behavior, imagery, preparation/information, modeling, rehearsal, and desensitization (Bernard et al., 2011; Cohen et al., 1997; French et al., 1994; Uman et al., 2008). Also, future sensitization prior to HPV vaccinations should clearly articulate the non-serious nature of the vaccine's known adverse effects, their remedies, and their brevity so as to minimize worry and possible distress among the targeted adolescents.

Perceiving high parental communication mitigated adolescent girls' distress associated with HPV vaccination. This finding supports results of studies (Jackson et al., 1998; Raveis et al., 1998), unrelated to HPV vaccination, which show positive correlation between parent-adolescent communication and adolescent psychological well-being. Our finding is in agreement with the study of adolescent girls undergoing HPV vaccination (Bernard et al., 2011), where the responsible nurses reported that parents who discussed HPV vaccination with their adolescent girls helped to prepare them for the experience. It is likely that in our study, the parents/guardians of vaccinated adolescents who communicated highly with them included HPV vaccination in their discussion with the adolescents and prepared them for the vaccination, leading to parental communication's mitigation of the adolescents' psychological distress. Future HPV vaccination programs should invest adequately in sensitization of parents and encouraging them to talk about vaccination with their adolescents so as to make vaccination a positive experience for the adolescents.

Study limitations

There was a possibility of recall bias among P6 girls who were interviewed 1 year after vaccination. This was minimized during assessment for psychological distress by asking respondents how things had been in the last 6 months. One vaccination cohort (P6) was studied 1 year after completion of vaccination while the other (P5) was studied 1 month after vaccination. This was a limitation because some of the psychological reactions to the vaccinations may have subsided or cleared by the time of field data collection for this study. Moreover, girls who may have developed clinically significant psychological distress during vaccination were denied opportunity for early detection and treatment. Future vaccination programs need to include psychological distress assessment to further evaluate time pattern of clinically significant distress and to enable the affected girls to get timely therapeutic intervention. The age design of the study whereby the same age cohort was simultaneously studied poses a limitation, whereby cause–effect relationships between variables could not be evaluated. Longer term follow-up studies involving more than one age cohort will be needed in future to be able to assess adolescents' long-term psychological reactions to HPV vaccinations. A major limitation of the study was the assessment of worrisome thoughts by asking respondents whether they had ever felt very worried about having been vaccinated or going to be vaccinated without delving into aspects such as content and degree of worry. All respondents who responded affirmatively to the question were treated as homogenous during data analysis, which may not be true in reality. This limited the ability of the study to make recommendations for focused clinical interventions to deal with adolescents' anxiety associated with the vaccination. Furthermore, by not specifying worry content, the study left a possibility that the worry reported by respondents could have been induced by some of the topics covered in the study questionnaire such as cervical cancer and dangers of pre-marital sex and the future, which may be independently related to worry about HPV vaccination. Future studies should adopt standard instruments for assessment of worrisome thoughts whose findings would provide firm basis for recommendation of clinical interventions to deal with the affected adolescents' anxiety. Selection of FGD participants with the help of their teachers targeting girls sharing certain characteristics may have biased the qualitative results since those girls could have shared attitudes associated with shared characteristics. The effect of this was minimized by organizing FGDs in five different schools. The main strength of this study is its relatively large sample size that increased the power of the study tests.

Conclusion

We set out to assess the influence of HPV vaccination on adolescents' experience of worrisome thoughts about

vaccination and levels of psychological distress. HPV vaccination predicted experience of worrisome thoughts only among recently vaccinated adolescents. Several HPV vaccination-related fears were reported qualitatively among vaccinated girls. HPV vaccination predicted high psychological distress, more so if the adolescents had completed their vaccination doses recently, and had experienced worrisome thoughts about being vaccinated. Perceiving high parental communication mitigated psychological distress among adolescent girls vaccinated against HPV. This study makes several recommendations for future HPV vaccination program design and research based on findings, related literature, and study limitations.

Acknowledgements

We recognize Professor F. Mirembe and Dr C. Banura, Principal Researcher and Senior Researcher, respectively, in the Young Women's HPV Project for reading the research work and advising at the different stages.

All data for this research are freely accessible and are contained in the manuscript. Further data are not able to be publicly shared as the data were collected without consent for public sharing by the Higher Degrees Research and Ethics Committee of the Makerere University Medical School (now College of Health Sciences; REC REF 2011-200) and the Uganda National Council for Science and Technology (REF SS 2478). Requests for further data should be addressed to Andrew Kampikaho Turiho, the Corresponding Author on akturiho@chs.mak.ac.ug or turiho@mail.com. Any interested researcher would be able to obtain a de-identified, minimal dataset pending ethical approval.

Declaration of conflicting interests

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

Funding

This study was principally funded by the Uganda National Council for Science and Technology through the Millennium Science Initiative/College of Health Sciences (CHS) Young Women's HPV Project based in CHS, Makerere University. The authors received other financial support from the Carnegie Corporation of New York—Makerere University Next Generation of African Academicians (NGAA) Project (2012). The study also received training support by grant no. 5R24TW008886 supported by OGAC, NIH, and HRSA.

References

- Abbo C, Kinyanda E, Kizza RB, et al. (2013) Prevalence, comorbidity and predictors of anxiety disorders in children and adolescents in rural north-eastern Uganda. *Child and Adolescent Psychiatry and Mental Health* 7: 21.
- Agosti JM and Goldie SJ (2007) Introducing HPV vaccine in developing countries—Key challenges and issues. *New England Journal of Medicine* 356: 1908–1910.
- ATLAS.ti GmbH (1993) *The Knowledge Workbench* (6.1.1 edn). Berlin: ATLAS.ti GmbH.

- Atwine B, Cantor-Graae E and Bajunirwe F (2005) Psychological distress among AIDS orphans in rural Uganda. *Social Science & Medicine* 61: 555–564.
- Bernard DM, Cooper Robbins SC, Mccaffery KJ, et al. (2011) The domino effect: Adolescent girls' response to human papillomavirus vaccination. *Medical Journal of Australia* 194: 297–300.
- Cohen LL, Blount RL and Panopoulos G (1997) Nurse coaching and cartoon distraction: An effective and practical intervention to reduce child, parent, and nurse distress during immunizations. *Journal of Pediatrics Psychology* 22: 355–370.
- Cohen LL, Cohen RJ, Blount RL, et al. (1999) Comparative study of distraction versus topical anesthesia for pediatric pain management during immunizations. *Health Psychology* 18: 591–598.
- Ensel WM and Lin N (1991) The life stress paradigm and psychological distress. *Journal of Health and Social Behavior* 32: 321–341.
- French GM, Painter EC and Coury DL (1994) Blowing away shot pain: A technique for pain management during immunization. *Pediatrics* 93: 384.
- Gamble HL, Klosky JL, Parra GR, et al. (2010) Factors influencing familial decision-making regarding human papillomavirus vaccination. *Journal of Pediatrics Psychology* 35: 704–715.
- Goodman R (1997) The Strengths and Difficulties Questionnaire: A research note. *Journal of Child Psychology and Psychiatry* 38: 581–586.
- Huang JP, Xia W, Sun CH, et al. (2009) Psychological distress and its correlates in Chinese adolescents. *Australian and New Zealand Journal of Psychiatry* 43: 674–681.
- Jackson PB and Finney M (2002) Negative life events and psychological distress among young adults. *Social Psychology Quarterly* 65: 186–201.
- Jackson S, Bijstra J, Oostra L, et al. (1998) Adolescents' perceptions of communication with parents relative to specific aspects of relationships with parents and personal development. *Journal of Adolescence* 21: 305–322.
- Katahoire AR, Jitta J, Arube-Wani J, et al. (2008) *An Assessment of the Readiness for Introduction of a Cervical Cancer Vaccine in Uganda* (Formative Research Report). Kampala, Uganda: Child Health and Development Center, Makerere University.
- Katahoire AR, Wani AJ, Murokora D, et al. (2013) Acceptability of HPV vaccine among young adolescent girls in Uganda: Young people's perspectives count. *International Journal of Child and Adolescent Health* 6: 211–218.
- Katz IT, Nkala B, Dietrich J, et al. (2013) A qualitative analysis of factors influencing HPV vaccine uptake in Soweto, South Africa among adolescents and their caregivers. *PLoS ONE* 8: e72094.
- Kinyanda E, Kizza R, Abbo C, et al. (2013) Prevalence and risk factors of depression in childhood and adolescence as seen in 4 districts of north-eastern Uganda. *BMC International Health and Human Rights* 13: 19.
- Lenselink CH, Gerrits MM, Melchers WJ, et al. (2008) Parental acceptance of human papillomavirus vaccines. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 137: 103–107.
- McMullen JD, O'Callaghan PS, Richards JA, et al. (2012) Screening for traumatic exposure and psychological distress among war-affected adolescents in post-conflict northern Uganda. *Social Psychiatry and Psychiatric Epidemiology* 47: 1489–1498.
- Mak WWS, Chen SX, Wong EC, et al. (2005) A psychosocial model of stress—Distress relationship among Chinese Americans. *Journal of Social and Clinical Psychology* 24: 422–444.
- Moscardino U, Scrimin S, Cadei F, et al. (2012) Mental health among former child soldiers and never-abducted children in Northern Uganda. *The Scientific World Journal* 2012: 367545 (7 pp.).
- Muhwezi WW, Ågren H, Neema S, et al. (2007) Life events and depression in the context of the changing African family: the case of Uganda. *World Cultural Psychiatry Research Review* 2: 10–26.
- Musisi S and Kinyanda E (2009) Emotional and behavioural disorders in HIV seropositive adolescents in Urban Uganda. *East African Medical Journal* 86: 16–24.
- Okello J, Onen TS and Musisi S (2007) Psychiatric disorders among war-abducted and non-abducted adolescents in Gulu district, Uganda: A comparative study. *African Journal of Psychiatry* 10: 225–231.
- Pandey RM (1999) Approaches to sample size calculation in comparative studies. *Indian Journal of Pediatrics* 66: 533–538.
- Program for Appropriate Technology in Health (PATH) (2009) *Shaping a Strategy to Introduce HPV Vaccines in Uganda: Formative Research Results from the HPV Vaccines: Evidence for Impact Project*. Seattle, WA: PATH.
- Program for Appropriate Technology in Health (PATH), Uganda National Expanded Programme on Immunization (UNEPI) and Child Health and Development Centre (CHDC) (2010) *HPV Vaccine Demonstration Project Operations* (Research Report). Seattle, WA: PATH.
- Qouta S, Punamäki R-L, Montgomery E, et al. (2007) Predictors of psychological distress and positive resources among Palestinian adolescents: Trauma, child, and mothering characteristics. *Child Abuse & Neglect* 31: 699–717.
- Raveis VH, Karolynn S and Karus D (1998) Children's psychological distress following the death of a parent. *Journal of Youth and Adolescence* 28: 165–180.
- Remes P, Selestine V, Chungalucha J, et al. (2012) A qualitative study of HPV vaccine acceptability among health workers, teachers, parents, female pupils, and religious leaders in northwest Tanzania. *Vaccine* 30: 5363–5367.
- SPSS Inc. (2007) *SPSS for Windows, Version 16.0*. Chicago, IL: SPSS Inc.
- Tein J-Y, Sandier IN and Zautra AJ (2000) Stressful life events, psychological distress, coping, and parenting of divorced mothers: A longitudinal study. *Journal of Family Psychology* 14: 27–41.
- Uman LS, Chambers CT, Mcgrath PJ, et al. (2008) A systematic review of randomized controlled trials examining psychological interventions for needle-related procedural pain and distress in children and adolescents: An abbreviated Cochrane review. *Journal of Pediatrics Psychology* 33: 842–854.

- Vinokur A and Selzer ML (1975) Desirable versus undesirable life events: Their relationship to stress and mental distress. *Journal of Personality and Social Psychology* 32: 329–337.
- Watson-Jones D, Tomlin K, Remes P, et al. (2012) Reasons for receiving or not receiving HPV vaccination in primary schoolgirls in Tanzania: A case control study. *PLoS ONE* 7: e45231.
- World Health Organization (WHO) (2007) *Cervical Cancer, Human Papillomavirus (HPV) and HPV Vaccines: Key Points for Policy-Makers and Health Professionals*. Geneva: WHO Press.
- World Health Organization (WHO) (2012) *Information Sheet: Observed Rate of Vaccine Reactions. Human Papillomavirus Vaccine*. Geneva: Global Vaccine Safety, Immunization, Vaccines and Biologicals. Available at: http://www.who.int/vaccine_safety/initiative/tools/