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Effect of Educational Intervention on Knowledge and Attitudes Regarding Human Papillomavirus Infection and Its Vaccination among Nursing Students

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Abstract **Background:** Human papillomavirus (HPV) is the commonest viral sexually transmitted infection in the world and the leading cause of cervical cancer. **Aim:** of this study was to evaluate the effect of educational intervention on knowledge and attitudes regarding human papillomavirus infection and its vaccination among nursing students. **Design:** Quasi-experimental design was utilized. **Sample:** A purposive sample of 200 female nursing students who registered in the first academic year at Faculty of Nursing Benha University. **Setting:** The study was carried out at Faculty of Nursing Benha University. **Tools:** Data were collected through two main tools: A self-administered questionnaire to assess students' general characteristics and knowledge regarding HPV infection and its vaccination, and Modified Likert's Scale to assess students' attitude regarding HPV infection and its vaccination. **Results**: showed that the mean age of studied sample 17.87±0551years. There was improvement with highly statistically significant difference observed in students' knowledge and attitude regarding HPV infection and its vaccination at post-intervention phase compared with pre-intervention phase ($p<0.001$). There was positive statistical correlation between total knowledge and total attitude regarding human papilloma virus infection and its vaccination at pre-intervention phase ($P> 0.05$). While, there was a highly positive statistical significant correlation between total knowledge and total attitude regarding human papilloma virus infection and its vaccination at post-intervention phase ($p<0.001$). **Conclusion:** The educational intervention enhanced student's knowledge and positively changed their attitude regarding human papilloma virus infection and its vaccination. **Recommendation:** Dissemination of educational program among all female university students regarding human papilloma virus infection and vaccination to prevent the risk of infection and cervical cancer.

Keywords: *human papillomavirus, HPV education, HPV vaccine, HPV knowledge and attitudes, cervical cancer*

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1. Introduction

Human papillomavirus (HPV), a mainly sexually transmitted infection, is responsible for 99.7% of cases of cervical cancer [1]. Epidemiological and molecular studies have established the strong association of HPV infection with cervical cancer [2]. Cancer of the cervix is the second commonest genital tract malignancy in the female [3]. Approximately half a million new cases of cervical cancer occur globally every year with an estimated 85% in developing countries and an estimated 270,000 women died of this disease [4].

Human papillomavirus is one of the most common sexually transmitted infections in the world, which can also spread through vaginal, anal or oral sex with someone who is infected with the virus. Moreover, the possible non-sexual modes of transmission of HPV include, skin to skin contact and from infected mother to infant during birth [5].

Worldwide, an estimated 630 million persons are infected with human papilloma virus. The prevalence of HPV infections peaks in adolescence in both genders and increases every year from 14 to 24 years of age; it is estimated that approximately one-quarter of HPV infections are acquired by adolescents [6]. Most of these infections are transient and asymptomatic. However, some HPV types cause warts on the skin or around the genital area and several—in particular, HPV 16 and HPV 18, so-called high risk HPVs—can lead to high-grade lesions and eventually to HPV-associated cancers [7].

These viruses are species specific and infect the basal epithelial cells of the skin and mucous membranes, causing different types of warts and a genital cancer [2]. Human papillomavirus related neoplasms include cervical,

vulvar, vaginal, penile, anal, rectal and oropharyngeal cancer. More than 80% of HPV-associated cancers affect the cervix, so most of the scientific evidence of vaccines is related to the cervical disease [8].

Human papillomavirus is a virus with more than 150 subtypes identified, including nearly 40 that may directly infect the genitals. There are a few high-risk types such as types 16 and 18, which may produce cervical cell abnormalities, and these types are precursors to oral and genital carcinomas [9]. The risk of future human papillomavirus related cancers remains high in individuals unvaccinated against HPV. Human Papillomavirus vaccination is an effective approach for primary prevention of cervical cancer and presents an opportunity to reduce the burden from cervical cancer in a number of countries [10].

Human papillomavirus vaccine is unique and its introduction is challenging in many ways – it is the first vaccine developed to prevent any cancer, the vaccine is gender specific, it targets adolescent females who are difficult to reach by any health intervention programs [11]. Estimates suggest that introducing HPV vaccination at 12 years of age alongside the regular cervical screening program could reduce lifetime cervical cancer incidence by up to 94%. The screening test used for many years has been the Papa Nikolaou test (Pap smear) [12].

There are currently three prophylactic HPV vaccines. Gardasil®, known as a tetravalent vaccine, which prevents infections from HPV types 6, 11, 16 and 18 and is approved for women aged 9 to 45 years and men aged nine to 26 years. Cervarix®, also called bivalent vaccine, is effective against HPV types 16 and 18 and is approved for women aged nine and over, with no upper age bracket [13]. Gardasil 9® vaccine provides coverage for nine HPV types (6, 11, 16, 18, 31, 33, 45, 52, 58), showing potential coverage of approximately 90% of vulvar, vaginal, cervical and anal cancers [14].

The safety and efficacy of prophylactic HPV vaccines against types 16, 18, 11, 6 and even 16/18 related cervical intra-epithelial neoplasia and adenocarcinoma are well established. Worldwide, the available preparations of the prophylactic vaccines are expensive and there is need to educate the populace on the importance and justify the long term cost effectiveness [15].

HPV vaccines targeting girls aged 9-13 years and, more recently, boys aged 11-14 years in two doses with a 6-month interval, and recommended also for those aged from 13 to 18 regardless of sexual activity [16]. Although, vaccines have been demonstrated to be more effective when given to girls before they become sexually active [17]. It is also available for people living with HIV, transplanted and oncological patients under chemotherapy and radiotherapy, aged 9-26 years, in three doses [18].

Nurses play essential and very important role in preventing HPV infection and cervical cancer because the nurses are responsible to provide health education and promotion services for the students by organizing educational programs, conferences, distributing booklets or brochures to increase students' knowledge, positively change the attitude and create awareness regarding HPV infection as well as recommending all students to receive preventive immunization including the HPV vaccination [19].

So, it is important to understand the knowledge and attitude of adolescents regarding HPV infection and vaccination and its association with cervical cancer [19]. So, this present study investigated effect of educational intervention on knowledge and attitudes regarding human papillomavirus infection and its vaccination among nursing students.

1.1. Significance of the Study

Worldwide, an estimated 561,200 new cancer cases (5.2 % of all new cancers) were attributable to Human Papilloma Virus infection, making HPV one of the most infectious causes of cancer. Additionally, 84% of new cervical cancers were found in the developing countries, compared with about 50 %of all new cancers. Globally, there are about 500,000 new cases and 250,000 deaths due to cervical cancer each year. Almost all cervical cancer cases (99%) are caused by human papillomavirus infection [20]. Egypt has a population of 25.76 million women aged 15 years and older who are at risk of developing human papillomavirus infection and cervical cancer [21].

Primary prevention is now also achievable through HPV vaccination, which is responsible for 99.7 % of cervical cancer cases worldwide. Two safe and efficient vaccines have been in use for over a decade [22]. So, it is necessary to improve nursing students' knowledge and attitudes regarding HPV infection and its vaccination through receiving adequate education starting from their first day at the college, and practice it efficiently, because they are the most vulnerable group of HPV infection, so they should be educated before starting their sexual life. In addition, nursing students could transfer this information to their family members, peers, and other women in the community, thus contributing to public health.

1.2. Aim of the Study

The study aims to evaluate the effect of educational intervention on knowledge and attitudes regarding human papilloma virus infection and its vaccination among nursing students.

1.3. Research Hypotheses

To achieve the aim of this research, the following research hypotheses were formulated:

H1: Nursing students will exhibit better knowledge regarding HPV infection and its vaccination after applying educational intervention.

H2: There will be significant improvement of positive attitude among nursing students regarding HPV infection and its vaccination after applying educational intervention.

2. Subjects and Method

2.1. Research Design

A quasi-experimental design (pre- post test, one group) was utilized to achieve the aim of the present study.

2.2. Setting

This study was conducted at the Faculty of Nursing, Benha University.

2.3. Subjects

2.3.1. Sample Type and Criteria

Purposive sample of female nursing students who registered in the first academic year at Faculty of Nursing Benha University, were included in the current study according to **inclusion criteria:** Female students who registered in first academic year and agreed to participate in the research and are available at the time of data collection.

2.3.2. Sample Size and Technique

The study included (200) female students who registered in the first academic year (2018-2019). All female students were assessed for knowledge and attitudes regarding HPV infection and its vaccination before and after applying the educational intervention (pre-post test).

2.4. Tools of Data Collection

Two main tools were used for data collection as following:

First tool: A structured Self-administered Questionnaire: It was designed by the researchers after reviewing related literature and was written in simple Arabic language. It comprised two main parts:

Part 1: Socio-demographic data of the studied students. It consisted of (5) items such as (age, residence, marital status, mother's educational level and special courses on human papillomavirus and its vaccination).

Part 2: Knowledge of the studied students regarding HPV infection and its vaccination. This part was utilized before and after applying the educational sessions (pre/posttest format), it included (26) multiple choice questions which divided into two portions.

1. To measure students' knowledge regarding HPV infection, it included (13) questions (HPV definition and characteristic, types of HPV, etiology, most vulnerable sex, high risk group, methods of transmission, symptoms and signs, complications, methods of prevention, methods of early detection, methods of diagnosis, preparation for HPV, Treatment of HPV, Role of nurse in increasing awareness to prevent HPV infection).
2. To measure students' knowledge regarding HPV vaccination which comprised of (13) questions as (Definition of HPV vaccination, Component of HPV vaccine, Importance of HPV vaccination, Targeted audience HPV vaccination, Recommended age, types of vaccine, Doses of vaccine, Method of administration, Reasons for exclusion of some people from HPV vaccination, Safety of vaccine, Extent of protection of vaccination, Side effects of vaccine, Role of nurse in increasing awareness about HPV vaccination).

2.4.1. Scoring System

Each item was assigned a score of (1) given when the answer was correct, a score (0) was given when the answer was incorrect or (I don't know). In addition, women's **total knowledge score** was converted into total percent and graded as the following:

- Good: (≥ 75% correct answers).
- Average: (50 - < 75% correct answers).
- Poor: (< 50% correct answers).

Second tool: Modified Likert's Scale was used to assess the attitude of the studied students regarding HPV infection and its vaccination. It was translated into Arabic language and modified by the researchers to have broader study about students' attitude. The scale consisted of (20) statements from three-point (likert scale type).

2.4.3. Scoring System

To obtain the outcome of attitude scale, each statement scored as following: (2) if the response was "agree", (1) if it was "sometimes" and (Zero) if it was "disagree". The total score is expressed as a percentage.

The total score of attitude was classified into:

-Positive attitude: ≥ 75%

-Negative attitude: < 75%

2.5. Method

2.5.1. Tools Validity & Reliability

The tools were thoroughly reviewed by three experts in maternal & newborn health nursing and obstetricians for content validation. As per their opinions, modifications were done. Reliability of the tools was performed to confirm its consistency. The reliability was done by Cronbach's Alpha coefficient test which revealed that each of the two tools consisted of relatively homogenous items, which it was 0.79.

2.5.2. Ethical Considerations

All ethical issues were assured, an official permission was granted from the Dean of the Faculty of Nursing. Each student was informed about the purpose of the study then a written consent was obtained from nursing students who were willing to participate in the study before starting the data collection. Confidentiality and anonymity was ensured throughout the study process, and the students were assured that all data was used only for research purpose. Each student was informed that participation is voluntary and free to withdraw from the study at any time.

2.5.3. The Pilot Study

The pilot study was carried out on 10% of total sample (20 students). It was conducted to evaluate the simplicity, feasibility, clarity and applicability of the developed tools, also to find out the possible obstacles and problems that might face the researchers and interfere with data collection, and to estimate the time needed for data collection. According to the results of the pilot study, required modifications were done in the form of adding or omission of some questions and change types of some questions from open ended questions to closed ended questions. The students involved in the pilot were excluded from the study.

2.6. Procedure

The following phases were adopted to fulfill the aim of the current study; preparatory, assessment, planning, implementation, and evaluation phases. These phases were carried out from the beginning of October 2018 to the end of March 2019 covering six months.

2.6.1. Preparatory Phase

The preparatory phase was the first phase of the study, the researchers carried out through review of local and international related literature about the various aspects of the research problem. This helped the researchers to be acquainted with magnitude and seriousness of the problems, and guided the researchers to prepare the required data collection tools. The tool was distributed to three experts in the field, these included two maternity nursing professors and one obstetrician, the aim was to test its appropriateness, comprehensiveness, clarity, importance and applicability. The jury recommended omissions of some items or addition which were done.

2.6.2. Approvals

An official approval to conduct the study was obtained by submission an official letter issued to the Dean of Faculty of Nursing at Benha University in order to obtain the agreement to conduct the study after explaining its purpose.

2.6.3. Assessment Phase

This phase encompassed interviewing the students to collect baseline data, in the educational lecture hall at the faculty of nursing – Benha university, at the beginning of interview the researchers greeted each student, explained the purpose, duration, and activities of the study. The student received the self-administered questionnaire (first tool) to assess students' socio-demographic characteristics and knowledge regarding HPV infection and its vaccination. Then, the student received modified Likert's scale sheet (second tool) to assess their attitude regarding HPV infection and its vaccination (Pre-test). The data obtained during this phase constituted the baseline for further comparison to evaluate the effect of applying the educational intervention. Average time for the completion of each student self-administered questionnaire and modified Likert's scale sheet was around (55-60 minutes).

2.6.4. Planning Phase

Based on baseline data obtained from assessment phase and relevant review of literature, the educational intervention was developed by the researchers in a form of printed Arabic booklet to satisfy the studied students' deficit knowledge and change their negative attitude regarding HPV infection and its vaccination. Therefore, at the end of educational sessions each student should be acquiring essential knowledge needed to improve their knowledge and positively change their attitude regarding HPV infection and its vaccination.

2.6.5. Implementation Phase

Implementation of an educational sessions took (24) weeks period. The researchers sought to facilitate the way of teaching before applying the educational sessions. The students were classified into 7 subgroups {each group involved 20 students}, this distribution according to their free times, theoretical lectures and practical sections in order to facilitate their attendance to the sessions and to achieve their study duties. These sessions were applied at the educational lecture hall at the faculty of nursing – Benha University. The content was divided into four interactive sessions "twice per week" for two consecutive weeks, for each group of students. Each session was conducted for (2) hours, during which, The PowerPoint presentation was done, followed by a group discussion and distribution of educational booklet to all students. Feedback was given in the beginning of each session about the previous one. Simple explanation Language, recent teaching strategy and media, educational booklet were used in addition to pens and notes were provided to the students for getting feedback to facilitate students' understanding and attract their attention. The educational booklet contains all the updated information regarding HPV infection and its vaccination with illustrated images. The content of sessions was as following:

First session: HPV definition and characteristic, types of HPV, etiology, most vulnerable sex, high risk group, methods of transmission, symptoms and signs, complications.

Second session: Methods of prevention, methods of early detection, methods of diagnosis, preparation for HPV, treatment of HPV, role of nurse in increasing awareness to prevent HPV infection

Third session: Definition of HPV vaccination, component of HPV vaccine, importance of HPV vaccination, targeted audience HPV vaccination, recommended age, types of vaccine, doses of vaccine, method of administration.

Fourth session: Reasons for exclusion of some people from HPV vaccination, safety of vaccine, extent of protection of vaccination, side effects of vaccine, role of nurse in increasing awareness about HPV vaccination.

2.6.6. Follow up and Evaluation Phase

At the final session for each group, the researchers asked the students to apply post-test by using the same format of knowledge questionnaires and attitude scale to compare their knowledge attitude regarding HPV infection and its vaccination before and after applying the educational sessions.

2.6.7. Limitation of the Study

Sometimes it was difficult to assemble the entire group for the educational sessions because of their different times of their practical sections.

3. Statistical Analysis

Data were verified prior to computerized entry. The Statistical Package for Social Sciences (SPSS version 20.0) was used. Descriptive statistics were applied (e.g., mean, standard deviation, frequency and percentages). Test of significance (chi square) was applied to test the study hypothesis. A statistically significant difference was considered at p-value $p \leq 0.05$, a highly statistically significant difference was considered at p-value $p \leq 0.001$, and non-significant difference obtained at $P > 0.05$.

4. Results

Table 1 shows socio demographic characteristics of the studied sample. It was clear that about three quarters (75%) of studied sample were in age group 17 years with a mean age of 17.87±0.551years. As regards the residence, more than three quarters (76%) of them lived in rural areas. Furthermore, the majority of them (98%) were single. Regarding educational level of their mothers, (84.5%) of them had middle education. Moreover; all studied sample didn't attend any special scientific courses on human papillomavirus infection and its vaccination.

Table 1. Distribution of the studied sample according to their socio-demographic characteristics (n=200)

Personal characteristics	No	%
Age:		
17-	40	20.0
18-	151	75.0
19-	4	2.0
≥20	5	2.5
Mean ± SD = 17.87±0.551		
Residence:		
Urban	48	24.0
Rural	152	76.0
Marital status:		
Single	196	98.0
Married	4	2.0
Divorced	0	0.0
Widowed	0	0.0
Mother's education:		
Illiterate	3	1.5
Primary	7	3.5
Middle	169	84.5
High	21	10.5
Attendance of any special scientific courses on human papillomavirus infection and its vaccination:		
Yes	0	0.0
No	200	100.0

Table 2 illustrates that there was a highly statistical significant difference between the results of post-test compared to pre-test in favor of post-test regarding all items of students' knowledge regarding human papilloma virus infection with p<0.001.

Table 3 clears that there was a highly statistical significant difference between the results of post-test compared to pre-test in favor of post-test regarding all items of studied sample knowledge regarding human papilloma virus vaccination with p<0.001.

Table 4 reveals that there was a highly statistical significant difference between the results of post-test compared to pre-test in favor of post-test regarding all items of studied sample total knowledge regarding human papilloma virus infection and its vaccination with p<0.001.

Figure 1 displays that, (4.5%) and (84%) of studied sample had good knowledge regarding human papilloma virus infection and its vaccination at pre-intervention and post-intervention phases respectively. While, it was revealed that (94%) and (4.5%) of studied sample had poor knowledge regarding human papilloma virus infection and its vaccination at pre-intervention and post-intervention phases respectively.

Table 5 illustrates that there was a highly statistical significant difference between the results of post-test compared to pre-test in favor of post-test regarding all items of studied sample attitude regarding human papilloma virus infection with p<0.001.

Table 6 indicates that there was a highly statistical significant difference between the results of post-test compared to pre-test in favor of post-test regarding all items of studied sample attitude regarding human papilloma virus vaccination with p<0.001.

Table 7 reveals that there was a highly statistical significant difference between the results of post-test compared to pre-test in favor of post-test regarding all items of studied sample total attitude regarding human papilloma virus infection and its vaccination with p<0.001.

Table 2. Distribution of studied sample regarding their knowledge about human papillomavirus infection at Pre- intervention, Post- intervention phases (n=200)

Knowledge items	Pre-intervention				Post-intervention				Chi - square test	P-value
	correct		Incorrect or don't know		correct		Incorrect or don't know			
	No	%	No	%	No	%	No	%		
Definition of HPV:	50	25.0	150	75.0	179	89.5	21	10.5	169.9	< 0.001**
Types of HPV:	25	12.5	175	87.5	166	83.0	34	17.0	199.2	< 0.001**
Most vulnerable for HPV infection:	53	26.5	147	73.5	186	93.0	14	7.0	183.8	< 0.001**
Risk factors of HPV infection:	53	26.5	147	73.5	172	86.0	28	14.0	143.8	< 0.001**
Method of transmission of HPV infection:	37	18.5	163	81.5	184	92.0	16	8.0	218.4	< 0.001**
Symptoms of HPV infection:	24	12.0	176	88.0	176	88.0	24	12.0	231.0	< 0.001**
Complication of HPV infection:	37	18.5	163	81.5	191	95.5	9	4.5	241.9	< 0.001**
Methods of prevention of HPV infection:	24	12.0	176	88.0	168	84.0	32	16.0	207.6	< 0.001**
Early detection of HPV infection:	26	13.0	174	87.0	167	83.5	33	16.5	199.0	< 0.001**
Diagnosis of HPV infection:	10	5.0	190	95.0	145	72.5	55	27.5	191.9	< 0.001**
Preparation of HPV test:	10	5.0	190	95.0	140	70.0	60	30.0	180.2	< 0.001**
Treatment of HPV infection:	8	4.0	192	96.0	168	84.0	32	16.0	259.0	< 0.001**
Role of nurse in increasing awareness to prevent HPV infection?	34	17.0	166	83.0	178	89.0	22	11.0	208.1	< 0.001**

**A Highly Statistical significant p ≤ 0.001.

Table 3. Distribution of studied sample regarding their knowledge about human papillomavirus vaccination at Pre- intervention, Post-intervention phases (n = 200)

Knowledge items	Pre-intervention				Post-intervention				Chi - square test	P-value
	correct		Incorrect or don't know		correct		Incorrect or don't know			
	No	%	No	%	No	%	No	%		
Definition of HPV vaccination:	44	22.0	156	78.0	175	87.5	25	12.5	173.1	< 0.001**
Component of HPV vaccine:	21	10.5	179	89.5	159	79.5	41	20.5	192.3	< 0.001**
Importance of HPV vaccination:	53	26.5	147	73.5	182	91.5	18	9.0	171.6	< 0.001**
Targeted audience HPV vaccination:	49	24.5	151	75.5	170	85.0	30	15.0	147.7	< 0.001**
Recommended age of HPV vaccination:	26	13.0	174	87.0	179	89.5	21	10.5	234.2	< 0.001**
Types of HPV vaccine:	21	10.5	179	89.5	172	86.0	28	14.0	228.2	< 0.001**
Doses of HPV vaccine:	34	17.0	166	83.0	185	92.5	15	7.5	230.0	< 0.001**
Method of administration of HPV vaccine:	20	10.0	180	90.0	164	82.0	36	18.0	208.6	< 0.001**
Reasons for exclusion of some people from HPV vaccination:	21	10.5	179	89.5	164	82.0	36	18.0	205.6	< 0.001**
Safety of HPV vaccine:	8	4.0	192	96.0	139	69.5	61	30.5	184.5	< 0.001**
Extent of protection of HPV vaccination:	11	5.5	189	94.5	137	68.5	63	31.5	170.2	< 0.001**
Side effects of HPV vaccination:	5	2.5	195	97.5	162	81.0	38	19.0	253.3	< 0.001**
Role of nurse in increasing awareness about HPV vaccination?	27	13.5	173	86.5	174	87.0	26	13.0	216.0	< 0.001**

**A Highly Statistical significant $p \leq 0.001$.

Table 4. Distribution of studied sample regarding their total knowledge score about human papillomavirus infection and its vaccination at Pre-intervention, Post- intervention phases (n = 200)

Knowledge items	Pre- intervention		Post-intervention		Chi - square test	P value
	No	%	No	%		
Human papilloma virus infection						
Good	10	5.0	178	89.0		
Average	3	1.5	13	6.5	140.7	< 0.001**
Poor	187	93.5	9	4.5		
Human papilloma virus vaccination						
Good	6	3.0	167	83.5		
Average	7	3.5	24	12.0	117.8	< 0.001**
Poor	187	93.5	9	4.5		
Total						
Good	9	4.5	168	84.0	171	
Average	3	1.5	23	11.5		< 0.001**
Poor	188	94.0	9	4.5		

**A Highly Statistical significant $p \leq 0.001$.

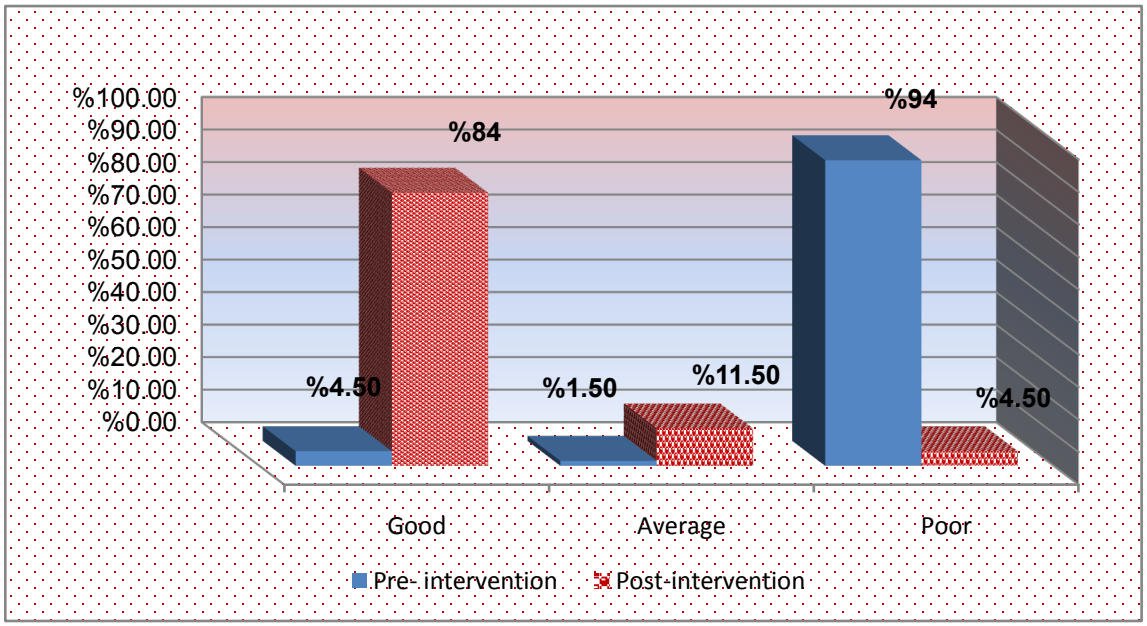

Figure 1. Percentage distribution of studied sample regarding their total knowledge score about human papillomavirus infection and its vaccination at pre and post intervention phases (n = 200)

Table 5. Distribution of studied sample regarding their attitude about human papillomavirus infection at Pre- intervention, Post- intervention phases (n = 200)

Attitude statement	Pre-intervention						Post-intervention						Chi-square test	P-value
	Agree		Sometimes		Disagree		Agree		Sometimes		Disagree			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
1. I would like to talk about sexually transmitted diseases, including human papilloma virus.	38	19.0	53	26.5	109	54.5	154	77.0	19	9.5	27	13.5	135.5	< 0.001**
2. Pap smear is an important tool for early detection of HPV and cervical cancer	34	17.0	58	29.0	108	54.0	129	64.5	37	18.5	34	17.0	98.5	< 0.001**
3. Pap smears continuously reduce the chances of dying from cervical cancer	44	22.0	51	25.5	105	52.5	155	77.5	24	12.0	21	10.5	127.6	< 0.001**
4. Non-Pap smear can lead to serious health problems due to lack of early detection	29	14.5	62	31.0	109	54.5	130	65.0	45	22.5	25	12.5	119.5	< 0.001**
5. Cervical screening is important for any married woman at the age of 21	37	18.5	55	27.5	108	54.0	144	72.0	22	11.0	34	17.0	115.9	< 0.001**
6. The cervical screening is not related to complaints of symptoms or problems	4	2.0	22	11.0	174	87.0	138	69.0	23	11.5	39	19.5	212.0	< 0.001**
7. One of the reasons why women do not turn to cervical screening is fear of the results of the examination	54	27.0	59	29.5	87	43.5	135	67.5	32	16.0	33	16.5	67.02	< 0.001**
8. Conducting a Pap smear is inexpensive, painless and takes a few minutes	16	8.0	64	32.0	120	60.0	171	85.5	9	4.5	20	10.0	241.3	< 0.001**

**A Highly Statistical significant $p \leq 0.001$.

Table 6. Distribution of studied sample regarding their attitude about human papillomavirus vaccination at Pre- intervention, Post- intervention phases (n = 200)

Attitude statement	Pre-intervention						Post-intervention						Chi-square test	P-value
	Agree		Sometimes		Disagree		Agree		Sometimes		Disagree			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
1. Human papilloma virus (HPV) vaccination is highly efficient and safe.	27	13.5	60	30.0	113	56.5	182	91.0	6	3.0	12	6.0	240.7	< 0.001**
2. Vaccination against HPV will reduce the number of visits to the Pap smear test	36	18.0	52	26.0	112	56.0	158	79.0	34	17.0	8	4.0	170.6	< 0.001**
3. Receiving a human papillomavirus vaccine is better than getting a Pap smear test every year	9	4.5	12	6.0	179	89.5	166	83.0	6	3.0	28	14.0	253.0	< 0.001**
4. Vaccination against human papillomavirus protects cervical cancer	48	24.0	59	29.5	93	46.5	130	65.0	45	22.5	25	12.5	78.8	< 0.001**
5. The vaccination reduces the frequency the Pap smear	16	8.0	66	33.0	118	59.0	145	72.5	24	12.0	31	15.5	173.7	< 0.001**
6. It is important to have vaccination against HPV in immunization programs in Egypt if approved within the Ministry of Health vaccination schedule only	88	44.0	39	19.5	73	36.5	142	71.0	22	11.0	36	18.0	29.9	< 0.001**
7. (HPV) vaccination is expensive and should be provided free of charge by the Ministry of Health.	96	48.0	36	18.0	68	34.0	140	70.0	31	15.5	29	14.5	24.2	< 0.001**
8. Adolescents should be encouraged to be vaccinated against HPV	25	12.5	63	31.5	112	56.0	125	62.5	40	20.0	35	17.5	112.1	< 0.001**
9. Teens should be given sex education before vaccination against human papillomavirus	28	14.0	59	29.5	113	56.5	150	75.0	26	13.0	24	12.0	154.2	< 0.001**
10. Boys should be vaccinated against human papillomavirus (HPV) despite the lack of compliance with it	4	2.0	37	18.5	159	79.5	124	62.0	40	20.0	36	18.0	190.2	< 0.001**
11. I would like to receive vaccination against human papillomavirus	3	1.5	21	10.5	176	88.0	138	69.0	22	11.0	40	20.0	214.9	< 0.001**
12. The HPV vaccine can increase risky sexual behaviors among adolescents and stimulate initiation of sexual activity early in life.	3	1.5	50	25.0	147	73.5	142	71.0	25	12.5	33	16.5	213.7	< 0.001

**A Highly Statistical significant $p \leq 0.001$.

Table 7. Distribution of studied sample regarding their total attitude score about human papillomavirus infection and its vaccination at Pre- intervention, Post- intervention phases (n = 200)

Knowledge items	Pre- intervention		Post-intervention		Chi - square test	P value
	No	%	No	%		
Human papilloma virus infection						
Positive	20	10.0	147	73.5	165.8	< 0.001**
Negative	180	90.0	53	26.5		
Human papilloma virus vaccination						
Positive	28	14.0	171	85.5	204.4	< 0.001**
Negative	172	86.0	29	14.5		
Total						
Positive	74	37.0	160	80.0	76.1	< 0.001**
Negative	126	63.0	40	20.0		

**A Highly Statistical significant p ≤ 0.001.

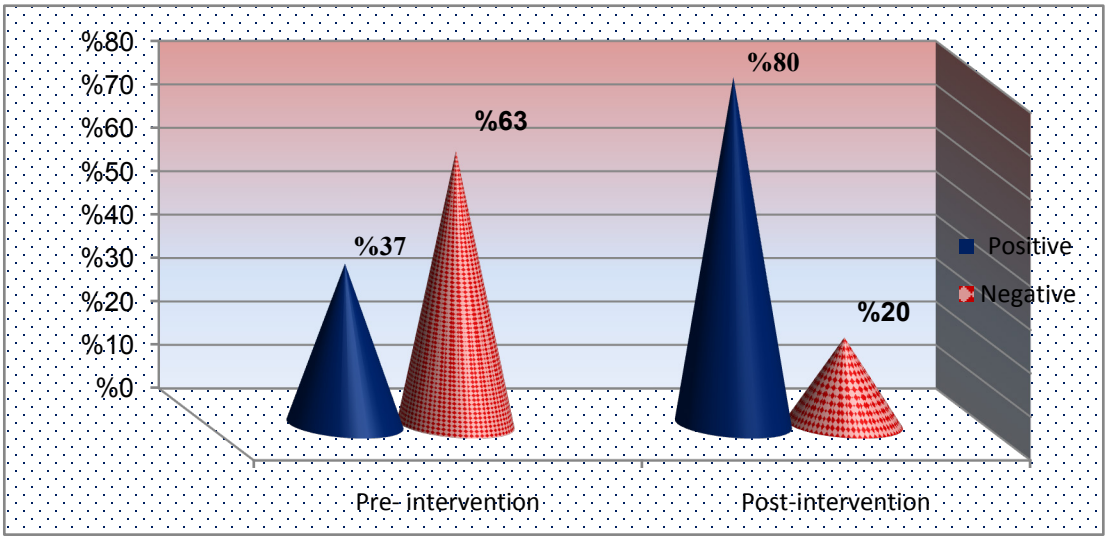

Figure 2. Percentage distribution of studied sample regarding their total attitude score about human papillomavirus infection and its vaccination at pre and post intervention phases (n = 200)

Table 8. Relation between total knowledge score regarding human papillomavirus infection and its vaccination and selected personal characteristics of the studied sample (n = 200)

Personal characteristics	Total knowledge Total knowledge post															
	Pre-intervention								post-intervention							
	Poor		Average		Good		Chi - square test	P-value	Poor		Average		Good		Chi-square test	P-value
	No	%	No	%	No	%			No	%	No	%	No	%		
Age																
17-	36	19.1	0	0.0	4	44.5	4.65		3	33.3	6	26.1	31	18.5		
18-	143	76.2	3	100.0	5	55.5		.589	6	66.7	15	65.2	130	77.4	6.78	.341
19-	4	2.1	0	0.0	0	0.0			0	0.0	0	0.0	4	2.4		
≥20	5	2.6	0	0.0	0	0.0			0	0.0	2	8.7	3	1.7		
Marital status:																
Single	184	97.9	3	100.0	9	100.0	.261	.878	9	100	23	100.0	164	97.6	.777	.678
Married	4	2.1	0	0.0	0	0.0			0	0.0	0	0.0	4	2.4		
Residence:																
Urban	44	23.4	2	66.7	2	22.2	3.04	.218	4	44.4	2	8.7	42	25.0	5.10	078
Rural	144	76.6	1	33.3	7	77.8			5	55.6	21	91.3	126	5.0		
Educational level of mother:																
Illiterate	3	1.6	0	0.0	0	0.0	11.16	.083	0	0.0	1	4.3	2	1.2		
Primary	5	2.6	0	0.0	2	22.2			0	0.0	0	0.0	7	4.2	5.35	.499
Middle	159	84.6	3	100.0	7	77.8			9	100.0	21	91.4	139	82.7		
High	21	11.2	0	0.0	0	0.0			0	0.0	1	4.3	20	11.9		

*A Statistical significant p ≤ 0.05
**A Highly Statistical significant p ≤ 0.001.

Table 9. Correlation between total knowledge and total attitude score of the studied sample regarding human papillomavirus infection and its vaccination at pre and post intervention phases (n = 200)

Variables	Total attitude			
	pre		post	
	r	P value	r	P value
Total knowledge	.159	< 0.05*	.509	.000 < 0.01**

*Correlation is significant at (P ≤ 0.05)
**Correlation is highly significant at (P ≤ 0.001).

Figure 2 displays that, (37%) and (80%) of studied sample had positive attitude regarding human papilloma virus infection and its vaccination at pre-intervention and post-intervention phases respectively. On the other hand, it was revealed that (63%) and (20%) of studied sample had negative attitude regarding human papilloma virus infection and its vaccination at pre-intervention and post-intervention phases respectively.

Table 8 clarifies that, there was no statistically significant relation between total knowledge score regarding human papilloma virus infection and its vaccination at pre-intervention & post-intervention phases and personal characteristics of the studied sample (age, residence, marital status and mother's education) (P> 0.05).

Table 9 clarifies that; there was positive statistical correlation between total knowledge and total attitude regarding human papilloma virus infection and its vaccination at pre-intervention phase (P> 0.05). While, there was a highly positive statistical significant correlation between total knowledge and total attitude regarding human papilloma virus infection and its vaccination at post-intervention phase (p<0.001).

5. Discussion

Worldwide, an estimated 630 million persons are infected with human papillomavirus (HPV) [18]. The prevalence of HPV infections peaks in adolescence in both genders and increases every year from 14 to 24 years of age; HPV infection has alarming proportions and is a predisposing factor for several types of cancers, including cervical, vaginal, anal and oropharyngeal cancer. Additionally, the development of highly effective HPV vaccines is an important breakthrough as it offers great potential to reduce the incidence of cervical cancer caused by HPV infection [22].

Regarding socio-demographic characteristics of the studied sample, the current study results revealed that about three quarters of studied sample were in age group 17 years with a mean age of 17.87±0551years. This result is slightly lower than the result of Chang et al. [23] in their study about "Effect of an educational intervention on HPV knowledge and vaccine attitudes among urban employed women and female undergraduate students in China: a cross-sectional study", found that the mean age of the studied students was 20.4 ± 1.2 years. Also this finding was supported by Barry and Amherst [24] who conducted "Increasing knowledge about HPV and the HPV vaccine amongst adolescents and adults through a school-based setting: a capstone project, University of Massachusetts Amherst", indicated that 62% of studied students were 17years old and 16% were 16 years old. Increasingly, this finding was matched with Kwang et al. [25] who studied "Effect of an educational intervention on knowledge of human papillomavirus vaccination among pre-university students in Malaysia", revealed that the mean age of studied students was 18.0±0.20 years old

As regards the residence, the finding of the present study clarified that more than three quarters of them lived in rural areas. Concerning the marital status of studied students, the majority of them were single. This finding was agreement with Kwang et al. [25] who clarified that most of studied students were still single (99.8%) and also, this result matched with Monteiro et al. [22] who conducted "Knowledge on the HPV vaccine among university students", indicated that approximately 95% were single.

Regarding educational level of mothers of the studied sample, more than three quarters of their mothers had middle education. This finding was also congruent with Ganczak et al. [18] who studied "Factors that predict parental willingness to have their children vaccinated against HPV in a country with low HPV vaccination coverage", founded that the majority of parents (84.4%) had final education levels of high school. Additionally, Kikelomo et al. [26] who studied "Knowledge, practice and acceptability of HPV vaccine by mothers of adolescent girls in Ilorin, Nigeria", showed that 58.1% had at least secondary school education. Moreover; the results of current study revealed that all studied sample didn't attend any special scientific courses on human papillomavirus infection and its vaccination. This finding was supported by Ganczak et al. [18] who showed that almost half of the sample (201; 44.7%) had never heard of HPV. Such similarity in the results can be attributed to the similarities in the properties of the studied samples

On investigating knowledge of studied sample regarding human papillomavirus infection and its vaccination, the results of present study illustrated that there was improvement in the level of all knowledge items regarding human papilloma virus infection and its vaccination, where the minority and the majority of studied sample had good knowledge regarding human papilloma virus infection and its vaccination at pre-intervention and post-intervention phases respectively. While, it was revealed that the majority and the minority of students had poor knowledge regarding human papilloma virus infection and its vaccination at pre-intervention and post-intervention phases respectively. These results were observed as a highly statistical significant difference between the results of post-test compared to pre-test in favor of post-test regarding all items of students' knowledge regarding human papilloma virus infection with p<0.001 and human papilloma virus vaccination with p<0.001 .This may be due to the female university students' ability to gain knowledge easily and they are interested in the research topic. These results can be explained by the fact that the designed educational program services are yet inadequate in Egypt especially in topics of sexually transmitted disease due to Egyptian culture.

The results of current study were nearly as the same as the results of Kwang et al. [25] who demonstrated that almost half (48.3%) of the students had poor knowledge, with a score less than 5, and only 51 (8.8%) exhibited

good knowledge, with a score of 11 and above. After educational intervention, the number of students with poor knowledge was reduced to 177 (29.3%) and the number of students who exhibited good knowledge increased to 148 (25.5%). Students from the intervention group demonstrated significant higher total scores in knowledge regarding HPV infection (p=0.000) and 'HPV vaccination (p=0.000) during post-intervention as compared to the control group.

Additionally, the results of current study were confirmed by Chang et al. [23] who studied "Effect of an educational intervention on HPV knowledge and vaccine attitudes among urban employed women and female undergraduate students in China: a cross-sectional study", found that baseline HPV knowledge was low among studied students where (12%) of them had heard of HPV, while only (21%) of students knew that HPV is related to cervical cancer. After educational instruction, (59%) of students knew the relationship between HPV and cervical cancer ($\chi 2 = 278.5$, $p < 0.001$). Post-intervention, vaccine knowledge increased from (73%) in studied students to (82%), ($p<0.001$). Increasingly, Barry and Amherst [4] illustrated that there was an increase in knowledge about HPV infection and the HPV vaccine after implementation of educational intervention. Moreover, Vermandere et al. [27] who studied "Implementation of an HPV vaccination program in Eldoret, Kenya: results from a qualitative assessment by key stakeholders", concluded that the link between HPV infection and Cervical cancer was poorly understood by studied sample and they are feeling uncomfortable to discuss HPV infection & cervical cancer and not considering it as important resulting in hampered information flow. The significantly improved level of knowledge had emphasized on the effect of the educational intervention on improving knowledge.

Furthermore, Kikelomo et al. [26] concluded that there is poor and suboptimal knowledge of HPV and practice of vaccination among studied sample in Ilorin, where (34.3%) knew HPV to be sexually transmitted infection and 40.4% knew it was the cause of cervical cancer. While 35.1% were aware of HPV vaccine, less than half (44.9%) were willing to be vaccinated. Also, Williams et al. [28] who studied "Attitudes towards human papillomavirus vaccination: a qualitative study of vaccinated and unvaccinated girls aged 17–18 years", stated that girls' knowledge of HPV was surprisingly limited and some had not even heard of HPV. Those who had heard of HPV did not know much about it, and there was poor understanding of the causal link between HPV and cervical cancer. However, when prompted about the link between HPV and cervical cancer, some girls were able to remember basic details about HPV. This agreement of current study results with the results of this study could be due to similar demographic characteristics of the studied population, educational tools and methods used for the education. So, further information and education is recommended.

Finally, the above mentioned results can be concluded as there was a highly statistical significant difference between the results of post-test compared to pre-test in favor of post-test regarding all items of students' total knowledge regarding human papilloma virus infection and its vaccination with $p<0.001$. So, there is a need for all stakeholders to step up awareness creation for HPV infection and improved HPV vaccination through more educational programs, mass media or university and pre- university curriculum.

Concerning attitude, the results of current study displayed that, about one third and the majority of studied sample had positive attitude regarding human papilloma virus infection and its vaccination at pre-intervention and post-intervention phases respectively. On the other hand, it was revealed that about two third and one fifth of students had negative attitude regarding human papilloma virus infection and its vaccination at pre-intervention and post-intervention phases respectively. Moreover, the current study illustrated that there was a highly statistical significant difference between the results of post-test compared to pre-test in favor of post-test regarding all items of students' attitude regarding human papilloma virus infection with $p<0.001$ and regarding human papilloma virus vaccination with $p<0.001$. This may be due to interventional sessions provided the participants with valuable information that can positively affect their beliefs which in turn positively affect their attitude.

These findings were also congruent with Barry and Amherst [24] who showed that there was an increase in positive attitude about HPV infection and the HPV vaccine. Furthermore, Chang et al. [23] concluded that attitudes and acceptability towards the HPV infection and vaccine increased significantly in post-intervention phase when compared with pre-intervention phase. Increasingly, the result of current study agrees with Kamada et al. [29] who studied "What information can change the attitude toward the human papillomavirus vaccine, in Nagoya, Japan Society?", illustrated that most of the respondents (180/247) did not know about the natural history of cervical cancer and Only 36% believe that HPV is the cause of cervical cancer, although 63% believe that HPV vaccine would prevent cervical cancer. Few respondents had positive attitude regarding adverse events following immunization.

These results were similar to Williams et al. [28] who mentioned that the studied sample had negative attitude towards five subthemes regarding HPV infection and vaccination, which were peers' opinions, deciding to have the vaccine and discussing it with others, practical issues, issues relating to sexual behavior and safety and efficacy of the vaccine. So, Williams et al summarized that information leaflets were recommended to ensure improving knowledge and attitude of HPV and raising awareness of the efficacy and safety of HPV vaccination. Moreover, Moraros et al. [30] who studied "A Pilot Study: HPV Infection Knowledge & HPV Vaccine Acceptance among Women Residing in Ciudad Juárez, México", stated that eighty-six percent of the women respondents had not heard of the HPV vaccine where only 8% stated that the vaccine would protect them against the virus, and another 8% declared that if vaccinated they would live longer and healthier lives. These results of negative attitude may be due to respondents had very little knowledge of the HPV infection and vaccine. On the other hand, the results of current study were inconsistence with Ganczak et al. [18] who clarified that attitudes regarding HPV were positive among respondents, even though awareness and knowledge of HPV were low.

Ultimately, it can be concluded that there was a highly statistical significant difference between the results of post-test compared to pre-test in favor of post-test regarding all items of students' total attitude regarding human papilloma virus infection and its vaccination with p<0.001. This can be explained by the fact that improved knowledge leads to a positive changing in attitudes and beliefs of studied sample. This also supports the necessary need for publishing health educational intervention especially regarding issues such as HPV which is mainly sexually transmitted disease.

The result of present study indicated that, there was no statistically significant relation between total knowledge score regarding human papilloma virus infection and its vaccination at pre-intervention & post-intervention phases and personal characteristics of the studied sample (age, residence, marital status and mother's education) (P> 0.05). This can be due to the fact that the sample was homogeneous and similar in most personality traits and therefore there is no relationship between personal traits and level of knowledge. This result come in disagreement with Jeyachelvi et al. [31] who studied "Human papillomavirus infection and its vaccines: knowledge and attitudes of primary health clinic nurses in Kelantan, Malaysia", stated that among the factors tested only participant's level of education showed a statistically significant association with the HPV knowledge score (p <0.001). Furthermore, Adejuyigbe et al. [32] who studied "Cervical cancer and human papilloma virus knowledge and acceptance of vaccination among medical students in Southwest Nigeria", showed that older age and higher levels of study were significantly associated with good knowledge of HPV.

In relation to correlation between total knowledge and total attitude, the findings of present study clarified that there was positive statistical correlation between total knowledge and total attitude regarding human papilloma virus infection and its vaccination at pre-intervention phase. While, there was a highly positive statistical significant correlation between total knowledge and total attitude regarding human papilloma virus infection and its vaccination at post-intervention phase. The result of current study was in agreement with Kikelomo et al. [26] who stated that respondents with good knowledge of HPV and cervical cancer were more positive in their attitude and willing regarding HPV infection and vaccination respondents with poor knowledge (P <0.001). This can be attributed to the fact that improved knowledge is in turn improving attitudes and beliefs and vice versa, which underlines the importance of educational programs. On the other hand, this result came contrary to the result of Jeyachelvi et al. [31] who illustrated that the participants have favorable attitudes towards HPV vaccination; however they have significant knowledge deficit and major misunderstanding in critical knowledge items. This dissimilarity of present study result with the result of this study could be due to different demographic characteristics, traditions and believes of the studied population.

6. Conclusion

Based on the results of the present study, there was a highly statistical significant difference between the results of pre-test compared to post-test in favor of post-test regarding students' knowledge in relation to human papilloma virus infection and its vaccination with (p<0.001). Furthermore, there was significant improvement in students' attitude at post-test phase compared with pre-test phase (p<0.001). Moreover, there was positive statistical correlation between total knowledge and total attitude regarding human papilloma virus infection and its vaccination at pre-intervention phase (P>0.05). While, there was a highly positive statistical significant correlation between total knowledge and total attitude regarding human papilloma virus infection and its vaccination at post-intervention phase (p<0.001). These study findings were supported the study hypotheses.

7. Recommendations

Based on the findings of the current study, the following recommendations can be suggested:

- Dissemination of educational program among all female university students regarding human papilloma virus infection and vaccination to prevent the risk of infection and cervical cancer.
- Distribution of booklet for all university students to improve their awareness regarding importance of HPV vaccination.
- HPV vaccination should be recommended for each female before marriage.

Further researches: Replication of the research on a large probability sample (including males) is recommended to achieve more generalization.

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