

Knowledge on HPV Infection, Vaccine and Cervical Cancer among Medical Students in Morocco

Abdoul Salam Diarra¹, Nadia Benaicha¹, Mariam Atassi¹, Ikram Yazghich¹, Samira El Fakir¹, Mohamed Berraho¹, Chakib Nejari¹, Azucena Bardaji², Nabil Tachfouti^{1*}

¹Laboratory of Epidemiology, Clinical Research and Community Health Faculty of Medicine and Pharmacy, University Sidi Mohammed Ben Abdellah, Fez, Morocco

²ISGlobal, Barcelona Ctr. Int. Health Res. (CRESIB), Hospital Clínic - Universitat de Barcelona, Spain

Original Research Article

*Corresponding author
Nabil Tachfouti

Article History

Received: 16.05.2018

Accepted: 25.05.2018

Published: 30.05.2018

DOI:

10.21276/sjams.2018.6.5.62



Abstract: The main objective of this study was to assess the level of medical students' knowledge about cervical cancer and HPV. Methods: Cross-sectional study was conducted on a representative sample of medical students in Fez University. Data were collected using anonymous self-administered questionnaire; knowledge level was assessed using a score. The mean age of the 328 participants was 20.8 ± 2.2 and 68.2% were females. Most respondents were aware of cervical cancer and HPV (68.8%) and its vaccination (56.9%). Only 5.8% of respondents received training sessions on cervical cancer prevention. More than two tiers (69.4%) of participants had good knowledge and the mean score of knowledge was 17.2 ± 4.3 points (29-items) out of 29. Proportion of good knowledge among student was 69.4%, it was significantly higher among second cycle students; 87.7% versus 54.0% among first cycle ones ($p < 0.001$). Similarly, it was higher among students attending training sessions on cervical cancer prevention; 74.4% versus 56.8% ($p = 0.04$). In multivariate analysis, only level of study remained significantly associated with good knowledge (OR=1.8 CI: [1.3-2.3]). This study showed that the levels of participants' knowledge are insufficient. It will be necessary to provide regular training sessions.

Keywords: Cervical cancer, Human papillomavirus, Medical student's knowledge, Fez- Morocco.

INTRODUCTION

Worldwide, cervical cancer is the fourth most common cancer in women, and the seventh overall, with an estimated 528,000 new cases in 2012. It represents 12% of all female cancers in the less developed regions. There were an estimated 266,000 deaths from cervical cancer worldwide in 2012 and accounting for 7.5% of all female cancer deaths [1-4].

Its association with early sexual activity and sexual promiscuity [5]. It has been suggested that cervical cancer might be caused by sexual transmission of an infectious agent. The human papillomavirus (HPV) has been identified as the leading candidate for the sexually transmitted etiological factor in cervical cancer. More than 70% of cervical cancer cases are linked to HPV 16 and HPV 18 [6- 7].

In many counties, 20% to 40% of sexual active young women have detectable latent HPV infection [8]. The peak incidence of HPV infection occurs in most

populations within 5-10 years of the first sexual experience. Annual number of new genital HPV infection cases is estimated at 30 million worldwide, the highest prevalence rates are reported in women aged 20-24 years [9]

Strategies to prevent cervical cancer include precancerous lesions screening, and HPV infection vaccination. Licensed vaccines against HPV 16 and 18 and other HPV subtypes are available and recommended in most high-income and several middle-income countries. Two vaccine types are available; quadrivalent targets HPV 6, 11, 16 and 18 and bivalent targets HPV types 16 and 18. Both of them have a high efficacy against HPV types 16 and 18 related cervical intraepithelial neoplasia (CIN) and cervical cancers [10].

Many studies showed that administering broad-spectrum HPV vaccines to adolescents in developed countries such as France, Iceland, Norway,

Switzerland, UK and USA has decreased the prevalence of cervical cancer, thus proving successful as a preventive measure [11].

The Kingdom of Morocco is situated in the north west of Africa with a population of 12.22 million women ages 15 years and older who are at risk of developing cervical cancer (Census 2014). Cervical cancer is the second female cancer in terms of incidence and mortality [12]. Morocco's age standardized cervical cancer incidence and mortality rates are 14.3 and 7.0 per 100.000 per year respectively. In 2014, the prevalence of HPV infection was estimated at 24.5% (95% CI: 22.7-26.4) [13].

Morocco is undertaking national cervical cancer screening program, based on the visual inspection with acetic acid (VIA) technique, used as a screening tool in primary health centers by trained doctors, midwives, and nurses. The eligible women are those aged between 30 and 49. Colposcopy and/or directed biopsy are performed on VIA-positive women in newly built specialized centers named reference centers for reproductive health. Treatment by loop electrosurgical excision procedure (LEEP) is offered to those with cervical intraepithelial neoplasia (CIN). A study on program perception in Meknes-Tafilalt region showed low awareness about cervical cancer (19.6 %) and a high acceptability of VIA screening (94.5 %). The majority of women (98.6 %) were satisfied with the service received at the health center [14].

HPV vaccines have been licensed in Morocco since 2008 for use among females aged between 11 and 25 years. However, there is no state-funded vaccination program and the three-dose course costing of approximately 1241 Moroccan Dirham (\$147 US) is beyond the means of most of the population, as it represents half month's average income for 40% of Moroccan families [4, 15].

A Systematic Review in Sub-Saharan Africa revealed high levels of willingness and acceptability of HPV vaccine but low levels of knowledge and awareness of cervical cancer, HPV or HPV vaccine [16]. In low and middle-income countries, Individual barriers include lack of awareness and knowledge about risk factors and prevention of cervical cancer determine the women's' willingness to utilize cervical cancer prevention services [17].

A good knowledge of HPV infection and attitude towards HPV vaccine among medical students will greatly influence the success of immunization program against cervical cancer [18]. Starting from the premise that medical students are better informed than average, although there is currently no specific training program on the cervical cancer prevention and its risk factors in the Curricula at the School of Medicine. In our knowledge, no data are available in Moroccan

medical students' knowledge on the topic. The purpose of this research is to assess attitudes and knowledge of Fez medical students on cervical cancer, HPV infection and vaccinations, and the pattern of sexual behavior among these students.

METHODS

Study area and population

Cross-sectional study carried out at the Faculty of Medicine and Pharmacy of Fez (FMPF) on 2016. Fez is the oldest, biggest medieval and second largest city in terms of population of Morocco with of 1.1 million inhabitants (2014 census). It's the capital of the Fez-Meknes's administrative region. FMPF is membership of the University Sidi Mohamed Ben Abdellah, the total medical student population at FMPF is around 2000. They are required to have high baccalaureate grades and take an entrance exam to attend limited-access.

Participation in the study was voluntary. Inclusion criteria for study were students enrolled from first to sixth while an exclusion criterion was not giving consent.

Study design and study procedures

Using random stratified sampling, stratum was year of study. Sample size was estimated at 354 students representing the six years of study.

Data were collected through self-administered questionnaire in French. It consists of 41-item divided into four sections: socio-demographic characteristics, knowledge of cervical cancer prevention, knowledge and perceptions of cervical cancer, HPV infection and vaccine. Questionnaires were administered to the students in classroom with no prior information or announcements in order to minimize response bias. They were collected back immediately after anonymous completion.

Statistical Analysis

All variables were summarized using descriptive statistics. Categorical variables were described in terms of proportions and quantitative variables in terms of average and standard deviation. Before bivariate analysis, a knowledge score was calculated with reference to a model of the literature [19]. The knowledge was assessed using 29 true-false items. The questions were asked about cervical cancer (risk factors, protective factors etc.), the role that HPV plays in the occurrence of cervical cancer, HPV infection, its transmission mode and its prevention. A score ranging from 0 to 29 was calculated by weighting each item 1 point. Then the score was dichotomized according to the threshold 14.5 (50% correct answers). A score greater than or equal to 14.5 was considered as good score, and a score below 14.5 was considered as poor score. We obtained a binary variable that has been compared to different explanatory variables by a chi-

square test. A multivariate analysis by the model of binary logistic regression was made by including in this model all variables found significant at the bivariate analysis with $p < 0.05$ and all variables found at the bivariate analysis with $p < 0.20$. The threshold of significance had been fixed at 5%. Data were entered on Excel and analyzed on Epi-info version 7 in Laboratory of Epidemiology, Clinical research and Community Health at the faculty of medicine of Fez-Morocco.

Ethical consideration

Ethical approval for this study was granted by the Ethics Review Committee of the Hospital Clinic of Barcelona, Spain (CEIC) [Reg. No. HCB/2016/0903], and Ethics Review Committees of University Hospital of Fez in 10 June 2016. The study was conducted in accordance with the Good Clinical Practice Guidelines set up by the WHO, and under the provisions of the Declaration of Helsinki, and local rules and regulations.

RESULTS

From 354 students included, 328 agreed to participate and filled correctly the questionnaires in

their totality (response rate 96.5%). The average age was 20.8 ± 2.7 years, more than two tiers (68.2%) were females and 37.5% graduated at first cycle. The large majority (94.2%) of students reported not having received training on cervical cancer prevention while 90.2% fully agreed that prevention should have a major place in the physicians' activities.

The best-known risk factor was sexually transmitted (86.4%), followed by infection family history of cervical cancer (83.9%) and having multiple sexual partners (78.7%). Genital condyloma was reported as risk facto by 60.3% of respondents. Moreover, 56.4% and 42.8% of students recognized genital herpes and late age at last pregnancy respectively as risk factors. Less than one third 32.0% and 36.6% knew that prolonged use of oral contraceptives and early age at first pregnancy increased cervical cancer risk respectively. The mean score of respondents' knowledge about cervical cancer was 14.1 ± 3.5 (29 items) out of 32. Table 1 shows students' knowledge on cervical cancer risk factors.

Table-1: Knowledge of risk factor for cervical cancer among medical students in Morocco

Items	Risk factor (%)	Predictive factor (%)	No association (%)	Do not know (%)
Early age at menarche (N=319)	37.3	3.1	32.0	27.6
High number of pregnancies (N=318)	41.8	12.9	24.5	20.8
Early age at first pregnancy (N=317)	36.6	12.9	22.4	28.1
Late age at last pregnancy (N=318)	42.8	3.1	24.8	29.2
Early menopause (N=317)	30.6	11.4	28.7	29.3
Number of induced abortion (N=318)	53.5	1.6	13.2	31.8
Obesity (N=318)	45.3	0.9	29.9	23.9
Sedentary life style (N =316)	37.7	0.9	26.6	34.8
Family history of cervical cancer (N =317)	83.9	1.3	6.6	8.2
Prolonged use of oral contraceptives (N =316)	32.0	3.5	25.3	39.2
Smoking (N=317)	72.6	2.2	12.3	12.9
Having a sexually transmitted infection (N=316)	86.4	0.3	4.1	9.2
Genital herpes (N =312)	56.1	0.6	14.4	28.8
Genital Condyloma (N =312)	60.3	1.0	4.8	34
Early age at first intercourse (N =315)	60.3	2.9	15.9	21
Multiple sexual partners (N =315)	78.7	1.9	5.1	14.3
Sex during menstruation (N =315)	43.5	0.6	12.7	43.2
Immunodeficiency State (N =314)	69.1	1.0	4.1	25.8
Stress (N =314)	47.5	1.3	20.1	31.2
Consumption of antioxidants (N =314)	21.0	15.6	12.1	51.3
Consumption of animal protein (N =312)	30.8	5.8	17.6	45.8

More than two tiers of participant's (68.8%) reported cervical cancer is a public health problem in Morocco. Around three quarter of participants recognized HPV infection as sexual transmitted disease and risk factor for cervical cancer. More than half (58.2%) knew about its association with condyloma and

genital warts and 63.8% reported its transmission by both sexes. Furthermore, more than half (56.9%) knew the availability of HPV vaccine in Morocco. The mean score of knowledge about HPV was 3.54 ± 1.1 (7 items) out of 7 as shown in table-2.

Table-2: Participants' Knowledge about HPV and HPV vaccination.

Variables	%	M±SD*
HPV is a risk factor for cervical cancer (N=276)		
Yes	74.3	
No	2.5	
Don't know	23.2	
HPV is associated with condyloma and genital warts (N =273)		
Yes	58.2	
No	7.4	
Don't know	34.4	
Do you think HPV infection is immunizing (N=271)		
Yes	18.5	
No	36.9	
Don't know	44.6	
HPV is a sexually transmitted infection (N = 274)		
Yes	74.5	
No	2.9	
Don't know	22.6	
HPV infection is transmitted by body fluids (saliva..) (N= 272)		
Yes	41.9	
No	25.0	
Don't know	33.1	
HPV infection can be transmitted by both sexes (N= 268)		
Yes	63.8	
No	6.7	
Don't know	29.5	
Use of condom provides complete protection against acquisition of HPV infection (N= 270)		
Yes	28.9	
No	37.0	
Don't no	34.1	
Do you think there is any HPV vaccine available? (N= 260)		
Yes	56.9	
No	40.0	
Don't no	3.1	
Knowledge score		3.54±1.12

The average mean of cervical cancer, HPV and vaccine score knowledge was 17.2±4.3. More than two tiers (69.4%) of participants had good score. Proportion of good score was better among females; 70.3% versus 67.0% of men (p=0.01). It was also higher among second cycle students (third year level or higher); 87.7% versus 54.0% among first cycle students (p=0.01). It was higher among student having attending training sessions; 74.4 versus 56.8% among those who did not attend training (p=0.01).

At the bivariate analysis, factors statistically associated with medical students' knowledge were age (p <0.001), educational level in favor of second medical cycle (p < 0.001) and having previously benefit from training sessions on cervical cancers prevention (p < 0.04).

Multivariate analysis by logistic regression found only the educational level as associated with the student's knowledge (OR=1.8; 95% CI: [1.3-2.3]; p <0.001) as shown in table-3.

Table-3: Determinants of good students' knowledge on cervical cancer and HPV infection.

Variables	Univariate analysis			Multivariate analysis	
	Proportion (%)	Crude OR (95%CI)	p	Adjusted OR (95%CI)	p
Sex (N=316)					
Male	67.0	Referent	NS		
Female	70.3	1,2 (0,6-1,9)			
Educational level					
Cycle 1 st	54.0	Referent	<0.001	1	<0.001
Cycle 2 nd	87.7	6.0 (3,4-10,7)		1.8 (1.3-2.3)	
Prevention must have a major place in the activity of doctor					
No	56.7	Referent	NS		
Yes	71.2	1.8 (0.8 – 4.0)			
Attending training					
No	56.8	Referent	0.03	1	NS
Yes	74.4	2.2 (1.01 – 4.91)		1.1 (0.43– 3.33)	

DISCUSSION

Our study aimed to assess the Moroccan medical students' knowledge, attitude and perception of cervical cancer, HPV infection and the existence of HPV vaccine. More than half of the respondents were aware of the risk factors for cervical cancer and the existence of HPV vaccines.

More than half (69.4%) of participants had good knowledge of cervical cancer and HPV, this proportion was significantly higher among women's 70.3% versus 67.0% in men's (p= 0.52). It was also higher among students in medical second cycle and participants who has had training sessions on cervical cancer prevention. The average of participants' knowledge score was 17.21±4.35 points (29-items) out of 29. Although this is higher than the knowledge observed in studies conducted in Kuala Lumpur, Malaysia among the female university students [20], in Greece [21] and in Nigeria among female university students of Lagos [22]; it is still not satisfactory knowledge for medical students despite the fact that majority of them (68.8%) had already heard of cervical cancer and HPV infection and its vaccination. Their knowledge is relatively lower than those reported by Adejuyigbe *et al.*, and Voidazan *et al.*, in studies conducted in Nigeria [23] and TîrguMureş in Romania [24] where respectively 67.1% and 62% a good knowledge about HPV had. The inadequate knowledge among medical students reflects a lack of emphasis by students on this issue and may compromise their awareness of personal risk of cervical cancer and HPV infection and the severity of its consequences. As future doctors, their knowledge will have a positive or negative influence on the understanding of people about cervical cancer and HPV infection if they themselves have not been sufficiently trained on the subject.

Majority of students (74.3%) reported that HPV infection is a risk factor for cervical cancer. A similar trend has been reported by several authors [22, 23]. The proportion reported in our study is significantly higher than that reported in a study conducted in Nigeria [23] where only 11.1% knew that genital HPV infection is a risk factor of cervical cancer. It is important to note that the Knowledge of the factors associated with cervical cancer is an important element in screening and prevention activities. This knowledge will make it possible to identify women and risky behaviors and thus adopt a communication and an attitude adapted to each case. So, globally the knowledge of students oscillated between fairly good average and very good concerning the factors associated with cervical cancer.

Concerning HPV transmission, the level of participants' knowledge was very appreciable; 75% of the respondents knew the correct modes of transmission. The knowledge of the modes of transmission is very important in the health education of population because it allows a better prevention of the transmission of HPV infection and thus of the occurrence of cervical cancer.

The knowledge of the students on the specific case of the existence of HPV vaccines was good. It should be noted, however that one of the limitations of this study was the failure to develop enough questions about HPV vaccines to better assess participants' levels of knowledge and acceptability of vaccines. It is also important to report that this knowledge will enable participants who will be future doctors to identify the target population, better convince women to get vaccinated, better answer patients' questions and thus to better succeed in the vaccination program set up for this purpose. Therefore, medical students should have comprehensive understanding of benefits and risks of

HPV vaccine so that they can provide adequate and evidenced-based information to reassure the public in future clinical practice. A study conducted by M. Berraho *et al.*, about Physician's Knowledge and Practice of Cervical Cancer and HPV Infection in Fez city found a knowledge level about HPV Significantly higher than in our study (56.9% versus 98.9%) [19]. Although there is a great deal of effort in the fight against cervical cancer in Morocco, also this comparison proves that targeted measures and actions must be taken to improve the knowledge of medical students about HPV and its infection. This same trend has been reported in studies conducted by the authors [22, 24, 25] in which 69.3%, 86.4% and 62% of participants had heard about HPV, respectively.

Regarding determinants of students' knowledge, some factors were statistically associated with knowledge levels. Female students had better knowledge than males, advanced age, and the students of the second medical cycle compared with the first medical cycle. This could be explained by the fact that the cervical cancer is female cancer and females may pay more attention on this issue than males. But it is also important to enhance male's HPV related education since they play an important role in the spread of the virus. Students in more senior year of study may obtain more comprehensive information from medical teaching, which is consistent to recognition that school courses were the most selected source of HPV vaccination. Similar trends have been reported by these authors [25]. Also, having training sessions on cervical cancer prevention was a determining factor in the level of student knowledge. This means that targeted training sessions play a key role in the student's knowledge development, which can have a positive impact on their role in the future.

We have noticed some limits to this study. It was in particular the participation not-effective of all students included, since on 354 students selected, 328 (92.6%) have fully completed their questionnaires. Also, questions about HPV vaccines acceptability were not sufficiently developed. But still this study is the first one in Morocco and it provided important data about knowledge attitude and perception of medical students about cervical cancer and HPV vaccines.

CONCLUSION

The results of our study show that levels of participants' knowledge about HPV and its vaccination are insufficient for medical students who in their majority had already heard about it. It will be necessary to provide regular training sessions for medical students to become aware of the real impact of their knowledge in the fight against cancer in general. Thus tailored and targeted education programs should be designed incorporating such impact from gender and medical teaching. Also it will be necessary to carry out further studies to assess their acceptability of HPV vaccines.

Acknowledgements

The research leading to these results has received funding from the PeopleProgramme (Marie Curie Actions)of the European Union's seventh Framework Programme FP7/2007 2013 under REA grant agreement n° 612216.

REFERENCES

1. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Bray F. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. *International journal of cancer*. 2015 Mar 1;136(5).
2. GLOBOCAN Cancer Fact Sheets: Cervical cancer. Available at: <http://globocan.iarc.fr/old/FactSheets/cancers/cervix-new.asp>. (Accessed: 4th November 2016)
3. Berraho M. *Epidémiologie du cancer du col au Maroc*(Doctoral dissertation, Bordeaux 2). 2012.
4. Alhamany Z, El Mzibri M, Kharbach A, Malihy A, Abouqal R, Jaddi H, Benomar A, Attaleb M, Lamalmi N, Cherradi N. Prevalence of human papillomavirus genotype among Moroccan women during a local screening program. *The Journal of Infection in Developing Countries*. 2010 Sep 14;4(11):732-9.
5. Navalpakam A, Dany M, Hussein IH. Behavioral Perceptions of Oakland University Female College Students towards Human Papillomavirus Vaccination. *PloS one*. 2016 May 20;11(5):e0155955.
6. World Health Organization. Report of the consultation on human papillomavirus vaccines: World Health Organization, Geneva, April 2005.
7. Smith JS, Lindsay L, Hoots B, Keys J, Franceschi S, Winer R, Clifford GM. Human papillomavirus type distribution in invasive cervical cancer and high-grade cervical lesions: a meta-analysis update. *International journal of cancer*. 2007 Aug 1;121(3):621-32.
8. Oliveira LH, Rosa ML, Pereira C, Vasconcelos GA, Silva RA, Barrese TZ, Carvalho MO, Abi GM, Rodrigues EM, Cavalcanti S. Human papillomavirus status and cervical abnormalities in women from public and private health care in Rio de Janeiro State, Brazil. *Revista do Instituto de Medicina Tropical de Sao Paulo*. 2006 Oct;48(5):279-85.
9. World Health Organization (WHO). GLOBOCAN, International Agency for Research on Cancer (IARC). 2014.
10. Braaten KP, Laufer MR. Human papillomavirus (HPV), HPV-related disease, and the HPV vaccine. *Reviews in obstetrics and gynecology*. 2008;1(1):2.
11. Lu B, Kumar A, Castellsagué X, Giuliano AR. Efficacy and safety of prophylactic vaccines against cervical HPV infection and diseases among women: a systematic review & meta-analysis. *BMC infectious diseases*. 2011 Dec;11(1):13.

12. Berraho M, Bendahhou K, Obtel M, Zidouh A, Benider A, Errihani H, Nejari C. Cervical cancer in Morocco: epidemiological profile from two main oncological centers. *Asian Pacific Journal of Cancer Prevention*. 2012;13(7):3153-7.
13. Selmouni F, Zidouh A, Belakhel L, Sauvaget C, Bennani M, Khazraji YC, Benider A, Wild CP, Bekkali R, Fadhil I, Sankaranarayanan R. Tackling cancer burden in low-income and middle-income countries: Morocco as an exemplar. *The Lancet Oncology*. 2018 Feb 28;19(2):e93-101.
14. Selmouni F, Zidouh A, Alvarez-Plaza C, El Rhazi K. Perception and satisfaction of cervical cancer screening by Visual Inspection with Acetic acid (VIA) at Meknes-Tafilalet Region, Morocco: a population-based cross-sectional study. *BMC women's health*. 2015 Dec;15(1):106.
15. Mouallif M, Bowyer HL, Festali S, Albert A, Filali-Zegzouti Y, Guenin S, Delvenne P, Waller J, Ennaji MM. Cervical cancer and HPV: awareness and vaccine acceptability among parents in Morocco. *Vaccine*. 2014 Jan 9;32(3):409-16.
16. Perlman S, Wamai RG, Bain PA, Welty T, Welty E, Ogembo JG. Knowledge and awareness of HPV vaccine and acceptability to vaccinate in sub-Saharan Africa: a systematic review. *PloS one*. 2014 Mar 11;9(3):e90912.
17. Chidyaonga-Maseko F, Chirwa ML, Muula AS. Underutilization of cervical cancer prevention services in low and middle income countries: a review of contributing factors. *Pan African Medical Journal*. 2015;21(1).
18. WHO HPV vaccine group. HPV infection. Cervical Cancer and HPV vaccines. http://www.gfmer.ch/Medical_education/En/PGC_SRH_2009/pdf/HPVvaccinesBroutet_Eckert_2009_- (Accessed: 13th March 2018)
19. Berraho M, El Fakir S, Abda N, Mathoulin-Pelissier S, Nejari C. Connaissances et pratiques des médecins vis-à-vis du cancer du col de l'utérus et de l'infection HPV à Fès. *Santé Publique* 2013; 25. 351–357.
20. Michail G, Smaili M, Vozikis A, Jelastopulu E, Adonakis G, Poulas K. Female students receiving post-secondary education in Greece: the results of a collaborative human papillomavirus knowledge survey. *Public health*. 2014 Dec 1;128(12):1099-105.
21. Makwe CC, Anorlu RI, Odeyemi KA. Human papillomavirus (HPV) infection and vaccines: knowledge, attitude and perception among female students at the University of Lagos, Lagos, Nigeria. *Journal of epidemiology and global health*. 2012 Dec 1;2(4):199-206.
22. Wong LP, Sam IC. Ethnically diverse female university students' knowledge and attitudes toward human papillomavirus (HPV), HPV vaccination and cervical cancer. *European Journal of Obstetrics and Gynecology and Reproductive Biology*. 2010 Jan 1;148(1):90-5.
23. Adejuyigbe FF, Balogun MR, Sekoni AO, Adegbola AA. Cervical cancer and human papilloma virus knowledge and acceptance of vaccination among medical students in Southwest Nigeria, *African Journal of Reproductive Health* 19 (1) March 2015: pp. 140-148: erratum. *African journal of reproductive health*. 2015 Jun 1;19(2):139.
24. Voidazan S, Morariu SH, Tarcea M, Moldovan H, Dobreanu M. Human Papilloma Virus (HPV) Infection and HPV Vaccination: Assessing the Level of Knowledge among Students of the University of Medicine and Pharmacy of Tirgu Mures, Romania. *Acta dermatovenerologica Croatica*. 2016 Sep 13;24(3):193-.
25. Michail G, Smaili M, Vozikis A, Jelastopulu E, Adonakis G, Poulas K. Female students receiving post-secondary education in Greece: the results of a collaborative human papillomavirus knowledge survey. *Public health*. 2014 Dec 1;128(12):1099-105.