

Knowledge, awareness and attitude towards human papilloma virus vaccine in a resource-constrained setting: a comparison between an urban and rural population in South Africa

Lwangila W Shabani^{a*}, Manivasan Moodley^b and Thinagrin Dhasarathun Naidoo^c

^aDepartment of Obstetrics and Gynaecology Registrar, Greys Hospital, University of KwaZulu Natal, Pietermaritzburg, South Africa

^bDepartment of Gynaecological Oncology, Greys Hospital, Pietermaritzburg, South Africa

^cDepartment of Obstetrics and Gynaecology, Greys Hospital, Pietermaritzburg, South Africa

*Corresponding author, email: wilcosha@gmail.com



Objectives: This study compared the knowledge, awareness and attitude towards the human papilloma virus (HPV) vaccine between urban and rural population groups.

Materials and methods: A comparative and descriptive study was undertaken of 200 women attending gynaecological services in the Pietermaritzburg Hospitals Complex. A systematic random sampling and interview-administered questionnaire was conducted. The study analysed demographic data and compared the similarities/differences in terms of awareness, knowledge, attitude and uptake of HPV vaccine between the groups.

Results: Some 29% of urban participants as compared with 27% of rural participants knew about HPV; 72% lacked knowledge and awareness of HPV (71.0% urban and 73% rural). Of the urban population, 12% knew that HPV vaccine existed and protected against HPV transmission, 54% did not know, whilst 34% wished to know more. Only 7% of the rural population knew that the HPV vaccine existed and protected against HPV transmission, 57% did not know and 36% expressed the wish to know more. Overall 25% of the participants agreed on HPV vaccine safety (urban, 28 vs. rural, 22), while among the rest of the participants 75% were unsure. In total 57% of participants were unsure as to whether the HPV vaccine could encourage sexual promiscuity (urban, 56 vs. rural, 59), 21 urban dwellers agreed that the HPV vaccine could encourage sexual promiscuity and 23 disagreed. In the rural populations, 24 agreed and 17 disagreed.

Conclusion: The knowledge and awareness of the HPV vaccine was generally poor among both the urban and rural population groups. However, both rural and urban dwellers expressed the need for more information about the HPV vaccine before they could recommend the vaccine.

Keywords: attitude, awareness, HPV vaccine, human papilloma virus, knowledge, Rural, urban

Introduction

Cervical cancer is the most common form of cancer affecting black South African women. It is the second most common form of cancer worldwide.¹ More than 85% of the global burden occurs in resource-constrained settings.² The human papilloma virus (HPV) is responsible for more than 99.7% of cervical cancer cases.³ HPV types 16 and 18 are responsible for about 70% of all cervical cancer cases worldwide.² HPV is also a major cause of anal, vaginal, vulva and oropharyngeal cancers. HPV vaccines that prevent HPV 16, 18, 6 and 11 infections are now available and have the potential to reduce the incidence of cervical and other anogenital cancers.⁴ The current vaccines are effective and can prevent up to 100% of precancerous cervical lesions.³ It is estimated that more than 70% of cervical cancer diagnoses could be prevented with the current vaccines.³ In Australia, the prevalence of HPV types 16, 18, 6 and 11 declined by 77%; for genital warts and CIN3/AIS the prevalence was reduced by 90% and 48% respectively, after the introduction of the quadrivalent HPV vaccination programme.⁵ In some countries where the vaccine has been implemented, vaccination uptake rates remain low. Barriers to HPV vaccination included access to healthcare, cultural beliefs and lack of communication and education, and the dissemination of misinformation regarding the safety and effectiveness of the HPV vaccine, and the belief that it can potentially lead to sexual promiscuity.^{3,6,7} Cervical cancer in South Africa

remains a major public health concern. It is the second most common form of cancer in women and the most frequently occurring cancer among women aged between 15 and 44 years of age.⁸ It is estimated that there are over 6 000 new cases of cervical cancer diagnosed in South African women every year, of whom over 50% will die from the disease.⁹ Of those women acquiring and dying from cervical cancer in South Africa over 80% are black women, due to the lack of access to cervical cancer prevention by means of pap smears.⁹ According to the National Cancer Registry Statistics published in 2009, 1 in 42 South African women will develop cervical cancer.¹⁰ It is estimated that cancer of the cervix kills roughly 8 women every day and this number will increase to about 12 per day in 2025.⁸ In South Africa 63.9% of invasive cervical cancers are attributed to HPV 16 or 18.¹⁰ The rate of progression of HPV infection to the development of cancer of the cervix is rapid in HIV (human immunodeficiency virus) infected women. The high prevalence of HIV infection in South Africa is a substantial public health concern as HPV infection is worsened by HIV.¹¹ Two types of HPV vaccines are licensed and available in South Africa. Bivalent (Cervarix[®]) targets the HPV types 16 and 18. Quadrivalent (Gardasil[®]) targets the HPV types 6, 11, 16 and 18. Both HPV vaccines have shown a high success rate in the prevention of cervical cancer.¹² More recently, the nonavalent vaccine against HPV genotypes was approved in the United States and other countries for the primary prevention of HPV

infections.¹³ In South Africa since 2014 the Department of Health has embarked on a school-based HPV vaccination programme targeting girls in Grade 4 between 9 and 13 years of age. Over 1.2 million girls have been vaccinated.⁹ Between December 2009 and November 2014 an estimated 50 000 women were vaccinated in the private sector in South Africa.¹⁴ The uptake was limited. The reason for the low coverage was attributed to the limited knowledge and awareness of healthcare workers and the public, as well as the absence of government endorsement.¹⁴ This study investigated and compared the knowledge, awareness and attitudes toward the HPV vaccine in our urban and rural populations, where the rates of cervical cancer are still high, causing significant morbidity and mortality.

Materials and methods

The study was conducted among 200 women attending the Pietermaritzburg (PMB) Hospitals Complex outpatient departments. The PMB Hospitals Complex is situated in KwaZulu-Natal, South Africa and comprises Northdale (District), Edendale (Regional) and Greys (Tertiary) hospitals. They act as the referral hub for many surrounding urban and rural areas. The study population involved urban and rural patients attending the PMB Hospitals Complex. Participants were randomly selected from the gynaecology outpatients departments (GOPD) and antenatal clinics (ANC); 50% of the participants were from the rural population and the remaining half comprised the urban population. We determined whether the participants were from the urban or rural community by asking them 'Which area are you from?' and the area of residence was then determined as per provincial categorisation. The principal investigator explained the aim and the objectives of the study to the participants in a language that was understandable. In some cases an interpreter was required to assist with a local language for better understanding. Informed written consent was obtained from all participants. Information from the participants was obtained in the form of face-to-face interviews, using a structured questionnaire with demographic variables to determine the knowledge, awareness and attitude toward the HPV vaccination within the two communities. Persons refusing to participate in the study were excluded.

Ethical approval

The study was approved by the Biomedical Research Ethics Committee of the University of KwaZulu-Natal, the KwaZulu-Natal Department of Health and respective institutions.

Statistical methods

This was a descriptive comparative study. The data collected were captured onto a Microsoft Excel spreadsheet (Microsoft Corp, Redmond, WA, USA) and subsequently cleared and analysed using SPSS (Statistical Package for Social Sciences) version 23 (IBM Corp, Armonk, NY, USA). Descriptive statistics such as tendencies and percentages were used to summarise categorical data. Measures of central tendency, means and median, and measures of dispersion such as standard deviation and interquartile ranges were calculated from questions relating to knowledge, awareness and attitude. The chi-square test of associations was used to test the association between knowledge, awareness and attitude of the study participants on the one hand and the area of residence on the other hand. The relationship between calculated scores and types of residence of the participants is presented in tables. The strength of the association was assessed by using odds ratio and 95% confidence intervals. The level of statistical significance was set at 5% ($p < 0.05$). To be able to find more information, cross-tabulations were performed to obtain knowledge on how the

proportions differed across the area of residence. Chi-square tests were performed to check whether there were any associations or dependencies on responses based on the area of residence. Once this was done, further tests were conducted to reaffirm the differences between the proportions obtained using two-sample tests for the difference in proportions. To further analyse our data, a logistical regression model was run.

Results

Study participants' characteristics (Table 1)

We had a sample size of 200 consisting of 100 rural and 100 urban dwellers.

Study participants' age groups were divided into three categories: 18–30 years of age (28%); 31–45 years of age (50%); and those above 45 years of age (22%). In terms of race, Africans were the majority (70%), followed by Indians (19%), mixed race (7%) and Caucasians (4%). Some 69% of the respondents had Grades 8–12 as their highest educational qualification (Table 1).

Among urban dwellers, 29% knew what HPV was, compared with 27% of rural dwellers (p -value 0.75; CI –0.10; 0.14). There was no significant evidence that the proportion of urban dwellers who knew about the HPV was different from that of rural dwellers.

However, of the 200 participants from both areas, only 56 knew about the HPV vaccine. When the participants were asked if they knew about the availability of the HPV vaccine and if they knew that it protected against HPV transmission, 12% of the urban population said 'yes', 54% said they did not know, whilst 34% said they wanted to know more. For the rural population only 7% said 'yes', 57% did not know, whilst 36% wanted to know

Table 1: Demographic characteristics

Biographical variable	Category	Urban (n = 100)	Rural (n = 100)	p-value
Age group	18–30 years	24	33	0.26
	31–45 years	50	49	
	> 45 years	26	18	
Race	African	53	88	0.00*
	Coloured	11	4	
	Indian/Asian	29	8	
	White/Caucasian	7	0	
	Others	0	0	
Marital status	Married	61	44	0.02*
	Single	39	56	
Level of education	Grades 0–7	13	32	0.00*
	Grades 8–12	72	66	
	Tertiary	15	2	
Employment status	Employed	50	42	0.32
	Unemployed	50	57	
	Self-employed	0	1	
HIV status	HIV-positive	43	45	0.78
	HIV-negative	57	54	
	Unknown	0	1	

* $p < 0.05$ significant.

more. The responses were independent of where one was from. The proportion of those who knew about the HPV vaccine was the same for urban and rural populations. The difference in knowledge and awareness between the rural and urban participants was statistically not significant (Table 2).

Regarding knowledge concerning the causes of cervical cancer, 40% of urban dwellers knew what caused cancer of the cervix, while only 25% of rural dwellers were aware of the cause. In all, 49% of urban respondents compared with 56% of rural respondents said they did not know the cause.

Of those who knew about the cause of cervical cancer, 11% of urban respondents compared with 19% of rural respondents thought it was hereditary; 40% of urban as compared with 25% of rural dwellers thought it was caused by sexual intercourse. A chi-square value of 6.06 and a corresponding *p*-value of 0.48 was obtained at a 5% level of significance, which was sufficient evidence that the two proportions are independent of each other.

When asked if they believed that the HPV vaccine was safe, 28% of urban respondents said 'yes', compared with 22% of rural respondents.

Among urban dweller respondents, 72% said they were unsure and 78% of rural dwellers were also unsure. None of the

respondents from both categories disagreed. The responses to whether the HPV vaccine was safe were independent of the area of residence (*p*-value 0.33; CI -0.06; 0.18). Therefore, there is insufficient evidence that the two proportions are unequal at a 5% level of significance.

Participants' attitudes towards the HPV vaccine

When asked if they were afraid that the HPV vaccine could encourage sexual promiscuity, 21% of urban and 24% of rural respondents said 'yes'. Those who were unsure comprised 56% of urban and 59% of rural dwellers, with 23% of urban dwellers and 17% of rural dwellers disagreeing. The number of urban participants who disagreed that the HPV vaccine could encourage sexual promiscuity was larger than that of rural participants (*p*-value 0.55; CI -0.15; 0.08). There is not enough evidence to suggest an association between the area of residence and knowledge of whether the HPV vaccine would encourage sexual promiscuity at a 5% level of significance.

When asked if the HPV vaccine could save lives, all respondents, irrespective of where they came from, agreed that the HPV vaccine could save lives, but they would need more information on the HPV vaccine before they could recommend it. However, all of the respondents said they would encourage more people to have the HPV vaccine.

Table 2: Questions related to knowledge and awareness of the HPV vaccine

Biographical variable	Category	Urban (n = 100)	Rural (n = 100)	<i>p</i> -value	Confidence interval
Do you know what HPV is?	Sexually transmitted infection	13	12	0.75	(-0.10-0.14)
	Sexually transmitted infection/ Causes cancer of the cervix	16	15		
	Don't know	71	73		
Do you know what causes cancer of the cervix?	Sexual intercourse	40	25	0.48	(0.022-0.28)
	Hereditary	11	19		
	Don't know	49	56		
I am scared that HPV vaccine can encourage sexual promiscuity	Agree	21	24	0.55	(-0.15-0.08)
	Not sure	56	59		
	Disagree	23	17		
HPV vaccine is safe	Agree	28	22	0.33	(-0.06-0.18)
	Not sure	72	78		
HPV vaccine exists and protects against HPV transmission	Yes	12	7	0.48	(-0.03-0.13)
	Don't know	54	57		
	Want to know more	34	36		
Do you know what HPV mode of transmission is?	Yes	24	22	0.33	(-0.10-0.18)
	No	76	68		
I will need more information on HPV vaccine before I can recommend it	Agree	100	100	N/A	N/A
Cervical cancer is killing many people	Agree	100	99	0.32	N/A
	Not sure	0	1		
Do you know that HPV vaccine is been given to girls at school from the age of 9 years?	Yes	26	25	0.50	(-0.01-0.14)
	No	74	75		
What is your source of information about HPV?	Healthcare worker	2	4	0.43	(-0.06-0.15)
	Family	11	14		
	Friend	14	8		
	School	25	1		
Can you advise people to take HPV vaccine?	Yes	99	100	1.00	N/A
	Not sure	1	0		

Evaluation of knowledge, awareness and attitude amongst those who know about HPV and its vaccine

Overall 56 respondents knew what HPV was, with 27% from rural areas, and the remainder of the participants from rural areas (73%) not knowing about HPV; 29% of the participants were from urban areas, with 71% of the urban participants not knowing about HPV. Of the respondents with knowledge of HPV, it was found that most had family and friends as the major source of knowledge. The figures show that 44.6% acquired their information from family and 39.3% acquired the information from friends; 11% obtained the information from health workers and 4% received the information at school. All the respondents knew the mode of transmission of HPV. Of the 56 who knew what HPV was, 19 (33.9%) knew that the HPV vaccine existed and protected against HPV transmission, whilst (1.8%) respondents never knew and 36 (64.3%) said they wanted more information. Forty-six respondents agreed that the HPV vaccine was safe, whilst 10 said it was not. Eighteen of the respondents agreed to the question: 'I am afraid that the HPV vaccine could encourage sexual promiscuity', 2 were unsure and 36 disagreed. All respondents agreed that they would encourage women to have the HPV vaccine, but would need more information on the HPV vaccine before they could recommend it.

To further analyse our data, a logistical regression analysis was performed. The dependent variable was whether one knew what HPV was and the independent variables were the age, the area of residence, race, marital status, educational level and whether one had had a pap smear or not. At the 5% level of significance, only education was significant. The odds ratio of Grades 0–7 was 0.12 (CI 0.00; 0.07) to those who had a tertiary education. Those having obtained Grades 0–7 were 1/0.12, i.e. 83 times, less likely to know what HPV was as compared with those with tertiary education, regardless of the area of residence. The odds ratio of Grades 7–12 was 0.57 (CI 0.01; 0.23) to those respondents having a tertiary education. Those having obtained Grades 7–12 were 1/0.57, i.e. approximately 17 times, less likely to know what HPV was as compared with those with tertiary education, regardless of the area of residence. The tertiary-level respondents knew about HPV compared with those having obtained Grades 0–7 and 8–12. Other variables were insignificant and thus no further interpretation was required.

Discussion

This study compared the knowledge, awareness and attitude towards the HPV vaccine among urban and rural populations occurring in a resource-constrained setting. In our study the proportion of knowledge and awareness about the HPV vaccine was the same for urban and rural populations with no statistical significance. Our findings were consistent with the results of Degarage *et al.*¹⁵ The study reported an overall lack of awareness and poor knowledge of HPV in both populations. There is an overall lack of knowledge and awareness of the HPV vaccine in both communities; urban dwellers (42%) as compared with rural populations (11%) were more likely to know the cause of cancer of the cervix but with no statistical significance this could be associated with the fact that urban populations are more educated than rural populations. Urban populations are exposed to better sources of information (radio, internet, television, newspapers) compared with rural populations. This is a clear indication that rural areas should be a priority in terms of educational programmes and implementation of the HPV

vaccine. However, according to the findings of the study, both rural and urban populations had expressed the need to know more about the HPV vaccine. The study found that the level of education was associated with higher HPV knowledge and awareness, regardless of the area of residence. Those with a higher level of education were found to have better knowledge and awareness of the HPV vaccine. This is in keeping with the findings of a study on HPV vaccine awareness, which also reported a strong association between education and knowledge of HPV.^{16,17}

More urban populations (28%) considered the HPV vaccine to be safe compared with rural populations (22%); however, there were no statistically significant differences between the two groups and their responses were independent of the area of residence. Overall, both populations, 72% of urban dwellers and 78% of rural dwellers, were unsure about the safety of the vaccine. This can possibly be attributed to the lack of knowledge and awareness. Better awareness programmes are needed in both urban and rural populations, highlighting that the vaccines are safe and well tolerated.¹⁸

When asked whether the HPV vaccine could encourage sexual promiscuity, more participants in the study (56% urban and 59% rural) were unsure, with 21 participants from the urban area and 24 participants from the rural agreeing that the HPV vaccine could encourage sexual promiscuity; only 40 (20%) of the participants disagreed. The majority of the participants were unsure as to whether the HPV vaccine could have a negative influence on sexual behaviour. This could be attributed to the lack of knowledge and information regarding HPV and its vaccine, which could be an important factor for low uptake. There is a dire need for public education, and an urgent need to increase public awareness, if we expect a change of perception and attitude towards the HPV vaccine. Public awareness, if increased, could reduce the stigma around the vaccine. Issues of lack of information need to be addressed if we are to expect a high uptake of the HPV vaccine. Studies evaluating concerns regarding the potential increase in sexual activity after the HPV vaccination did not identify any significantly elevated risk of increased sexual activity after the HPV vaccination.^{7,19} Issues such as misinformation need to be addressed if we are to expect a high uptake of the vaccine. A study that was conducted in the United Kingdom on attitudes towards HPV testing showed that all participants expressed a need for more information about HPV.²⁰

The results of our study suggest that those with a higher level of education are likely to know more about HPV compared with those with a lower level of education, regardless of the area of residence. The tertiary-level respondents knew more about HPV compared with those with a lower level of education, regardless of the area of origin. The knowledge and awareness of the HPV vaccine is associated with a high level of acceptability. The results of our study have confirmed the findings in a study that showed a strong association between education and knowledge.¹⁶ Our study found that the level of education was also associated with higher HPV knowledge and awareness, regardless of the area of residence. Participants with a higher level of education were found to have better knowledge of the HPV vaccine. Another study reported that parents' likelihood of having their children vaccinated against HPV was associated with the knowledge of HPV and its vaccine.^{18,22}

Better education will result in a positive attitude and increased acceptance of the HPV vaccine. A lower level of education is likely to impede vaccine acceptability and thus influence poor uptake.^{21,22}

Among those who knew about HPV vaccination, the participants received information from family, friends and at school. Unfortunately, the study participants did not mention media coverage and health professionals as a source of information. A study in Durban, which assessed the knowledge and awareness of the HPV vaccine among professionals, found that although health-care professionals were aware of the HPV vaccine, only a few counselled their patients and prescribed it.²³

Education surrounding the HPV vaccine is needed in our communities. A high uptake of the vaccine can save many lives. Implementing HPV awareness programmes via the media, schools, outreach programmes and involvement of religious communities should be considered. The use of opportunistic health promotion by healthcare professionals is an important source of knowledge for the general public. Healthcare professionals should make information on HPV available in their consulting rooms to fill the gaps in knowledge and assist patients to make an informed choice about the HPV vaccine. In a study in Turkey, which assessed parents' knowledge of the HPV vaccine and attitude towards vaccinating themselves and their daughters, 67% of women participants said recommendations from health workers were the major influence in their decision to have the vaccination.²⁴

Issues like advantages of the vaccination and how to get the vaccine, its availability, safety, side effects and cost should be addressed as a routine practice.

Governments in partnership with healthcare providers should work to implement an educational programme on the HPV vaccine, which will send an appropriate message to the general public.

This study had certain limitations, as the study assessed only patients attending public hospitals and did not assess women in the private sector. However, the findings provided valuable information on the knowledge and awareness of the HPV vaccine among rural and urban populations in a resource-constrained setting. Our study also provided information to fill the knowledge gaps among participants. The findings in our study can assist policy-makers, can be used when planning awareness programmes and can assist healthcare workers in patient education regarding the HPV vaccine.

Conclusion

The overall lack of knowledge and awareness of the HPV vaccine in the study participants did not differ significantly among urban and rural participants. Our findings also demonstrated that providing education about HPV infection and vaccine is an essential component to addressing the change in attitude, as this will improve the HPV vaccine uptake. The findings of this study can be used to assist in policy-making.

Acknowledgements – The authors would like to thank the management of the hospitals for permission to conduct the study.

Disclosure statement – No potential conflict of interest was reported by the authors

Funding – No funding received

References

- Denny L. Prevention of cervical cancer. *Reprod. Health Matters*. 2008;16:18–31. doi:10.1016/S0968-8080(08)32397-0
- Bradford L, Goodman A. Cervical cancer screening and prevention in low-resource settings. *Clin. Obstet. Gynaecol*. 2013 March;56(1):76–87. doi:10.1097/GRF.0b013e31828237ac
- Strohl AE, Mendoza G, Ghant MS, et al. Barriers to Prevention: Knowledge of HPV, Cervical Cancer and HPV vaccinations among African American Women. *Am J. Obstet. Gynecol*. 2015;212–65. doi:10.1016/j.ajog.2014.06.059. Epub 2014 Jun 28.
- Cancer Association of South Africa. Fact Sheet on Human Papilloma Virus Infection and Cancer, Researched and Authored by Prof. Michael C. Herbst, Approved for Distribution by Ms. Elize, March 2017,. Available from www.cansa.org.za/files/2017/04.
- Sankaranarayanan R. HPV vaccination: The most pragmatic cervical cancer strategy. *Int. J. Gynaecol. Obstet*. 2015;131:533–535. Available at <http://creativecommons.org/licenses/by-nc-nd/4.0/>. doi:10.1016/j.ijgo.2015.02.014
- Zinet GD, Roseberg Z, Fisher WA, et al. Beliefs, Behaviour and HPV vaccine: Correcting the myth and misinformation. *Prev. Med*. 2013;57:414–8. doi:10.1016/j.ypmed.2013.05.013
- Bednarczyk RA, Figueroa-Downing D, Ault K. Why is it appropriate to recommend human papillomavirus vaccination as cervical cancer prevention? *Am. J. Obstet. Gynecol*. 2016 Apr;214(4):490–493. doi:10.1016/j.ajog.2015.10.920. Epub 2015 Oct 31.
- WHO/ICO HPV information centre. Human Papillomavirus and related Ca, available from <http://apps.who.int/HPV> centre statistics (access Dec 2012).
- Denny L. HPV vaccination. *S. Afr. J. Gynaecol. Oncol*. 2017;9(1):5–6. Available at www.sasog.co.za.
- Available from www.cansa.org.za what you need to know about ca cx.
- Botha MH, Dreyer G. Guidelines for cervical cancer screening in South Africa. *So. Afr. J. Gynaecol. Oncol*. 2017;9(1):8–12.
- Botha H, Cooreman B, Dreyer G, et al. Frequently asked questions: human papilloma virus (HPV), cervix cancer and HPV vaccines. *So. Afr. J. Gynaecol. Oncol*. 2009;1(2):74. doi:10.1080/20742835.2009.11441144
- Herrero R, Gonzalez P, Markowitz LE. Present status of human papillomavirus vaccine development and implementation. *Lancet Oncol*. 2015;16:e206–e216. doi:10.1016/S1470-2045(14)70481-4
- Doche C, Bogers JJ, Verhelst R, et al. HPV vaccines to prevent cervical cancer and genital warts: an update. *Vaccine*. 2014;32:1595–1601. doi:10.1016/j.vaccine.2013.10.081
- Degarege A, Krupp K, Fennie K, et al. Urban-Rural inequities in the parental attitudes and beliefs towards human papillomavirus infection, cervical cancer, and human papillomavirus vaccine in Mysore, India. *J. Pediatr. Adolesc. Gynecol*. 2018 Oct;31(5):494–502. Epub 2018 Mar 26. doi:10.1016/j.jpog.2018.03.008
- Patel H, Pcolkina K, Strazdina K, et al. Awareness of HPV infection and attitudes toward HPV vaccination among Latvian adolescents. *Int. J. Gynaecol. Obstet*. 2017;137(2):138–144. doi:10.1002/ijgo.12117. Epub 2017 Feb 26.
- Prayudi PKA, Permatasari AAIY, Gde Sastra Winata I, et al. Impact of human papillomavirus vaccination on adolescent knowledge, perception of sexual risk and need for safer sexual behaviours in Bali, Indonesia. *J. Obstet. Gynaecol. Res*. 2016 Dec;42(12):1829–1838. doi:10.1111/jog.13123. Epub 2016 Oct 20.
- Islam JY, Khatun F, Alam A, et al. Knowledge of cervical cancer and HPV vaccine in Bangladeshi women: a population based, cross-sectional study. *BMC Women's Health*. 2018;18:15. doi:10.1186/s12905-018-0510-7
- Licht AS, Murphy JM, Hyland AJ, et al. Is use of the human papillomavirus vaccine among female college students related to human papillomavirus knowledge and risk perception? *Sex Transm Infect*. 2010;86(1):74–8. doi:10.1136/sti.2009.037705

For a full list of references visit: <http://www.sajgo.co.za/>