

# Sexual characteristics, knowledge on human papillomavirus-related diseases and its associated factors among high-risk men

Noor Syazana Che Ismail, MMed (Fam Med)<sup>1</sup>, Leelavathi Muthupalaniappen, MMed (Fam Med)<sup>2</sup>, Adawiyah Jamil, AdvMDerm<sup>3</sup>

<sup>1</sup>Greentown Health Clinic, Ministry of Health Malaysia, Ipoh, Perak, <sup>2</sup>Department of Family Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Kuala Lumpur, Malaysia, <sup>3</sup>Department of Medicine (Dermatology), Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Kuala Lumpur, Malaysia

## ABSTRACT

**Introduction:** Human papillomavirus (HPV) infection is sexually transmitted and responsible for anogenital warts and malignancies. HPV-related disease awareness among high-risk men in Malaysia remains unknown. The objective of this study was to assess sexual characteristics and HPV knowledge among high-risk men.

**Materials and Methods:** A total of 194 men between ages 18 and 45 years from the HIV and STD clinics of a tertiary hospital and six Health Clinics in Perak participated in this study. Knowledge of HPV was assessed using a self-administered questionnaire.

**Results:** Majority of participants were Malays (47.4%) and had tertiary education (54.1%). Most of them (76.5%) were homosexual and practiced the versatile sexual role (69.9%). Majority engaged in oral (72.2%) and anal sex (58.2%). Only one-third of them (30.8%) used condom consistently. Only 14.4% of the study participants had adequate knowledge of HPV. Men who practiced oral sex and had previous STD had adequate knowledge of HPV. Those who practiced oral sex were 3.9 times more likely to have adequate knowledge of HPV.

**Conclusion:** Our study shows that most participants have high-risk sexual behaviour. These men also have poor knowledge of HPV-related diseases. This may be a barrier to implement preventive strategies and reduce HPV-related disease and malignancies among them. Counselling regarding HPV, for men attending the HIV and STD clinics may improve patient's awareness and knowledge on HPV-related diseases and promote HPV vaccination uptake.

## KEYWORDS:

HPV infection, knowledge, high-risk men, sexual characteristics

## INTRODUCTION

Human papillomavirus (HPV) infection is one of the most prevalent sexually transmitted infection worldwide.<sup>1</sup> HPV subtypes 6 and 11 are responsible for anogenital and respiratory papilloma (warts) while infection with subtypes 16 and 18 are responsible for malignancies.<sup>2</sup> Although HPV infection is more popularly known to be associated with cervical cancers among women, studies looking at HPV-

related malignancies have shown an association with anal and penile cancers among men with HPV, acquired through sexual contact.<sup>3-5</sup> The high-risk subtypes 16 and 18 have been detected in 88% of anal cancers, 50% of penile cancers, and in about 26% of oropharyngeal cancers.<sup>6</sup> The risk factors for acquiring HPV infection include multiple sexual partners, early age of sexual initiation, receptive anal intercourse, unprotected sex, previous history of sexually transmitted diseases, and HIV-positive homosexual men.<sup>7,8</sup>

Studies in Puerto Rico, Italy and The United States of America (USA) have found a lack in knowledge regarding HPV, risk of acquiring HPV infection, HPV-related diseases and awareness of HPV vaccine among homosexual and bisexual men and women.<sup>1,9,10</sup> This lack of knowledge regarding HPV infection is an obstacle to preventive efforts such as safe sex advice and HPV vaccination uptake. The lack of knowledge regarding HPV-related malignancies can increase morbidity and mortality due to these conditions as people are unaware of underlying risks associated with HPV. Despite the high rates of HPV infection amongst men and rising incidences of anal and penile cancers attributed to its infection, health promotion, and preventive strategies targeting high-risk men in Malaysia and other countries like Hong Kong are still lacking.<sup>6,11</sup> However, preventive strategies against HPV-related cervical cancer for women in Malaysia are well established.

Since the women in Malaysia have well-established preventive measures against HPV-related malignancies, it is now time to shift the focus to men. Assessing men's knowledge and awareness of HPV infections will foster successful preventive strategies as some of these subtypes are vaccine preventable. The aim of this study is to assess the sexual characteristics, knowledge regarding HPV-related diseases and its associated factors among high-risk men. This information could provide substantial insight regarding the high-risk men and facilitate policy planning regarding vaccine-preventable diseases among men in Malaysia.

## MATERIALS AND METHODS

A cross-sectional study was conducted from December 2020 to April 2021 among men attending the HIV and STD clinic at Hospital Raja Permaisuri Bainun (HRPB) Ipoh and six Health Clinics in Kinta district, Perak. The sample size was calculated using the Kish Formula using the prevalence of

This article was accepted: 07 June 2022

Corresponding Author: Leelavathi Muthupalaniappen

Email: drleelaraj@gmail.com

adequate knowledge of HPV infection of 29.3%;<sup>1</sup> 95% confidence interval and 7% absolute precision. An additional 20% was added for possible incomplete response, giving a final sample size of 194. Male participants aged 18 years and above who understood English or Bahasa Malaysia were invited to participate in this study using convenience sampling when they registered for their scheduled appointment. Those who agreed to participate were briefed regarding the study and an anonymous written consent was obtained.

The main tool used in this study was a self-administered questionnaire from a previous study by Colon Lopez et al.<sup>1</sup> The original questionnaire was subjected to cultural and social adaptation to suit the local population by an expert panel consisting of the researcher, a consultant family medicine specialist, consultant dermatologist, and infectious disease physician. The questionnaire was then translated forwards and backwards by two linguists. The final bilingual questionnaire was then subjected to face validation. The Cronbach Alpha value of the 14-item scale for knowledge was 0.876.

The questionnaire consists of total 31 statements in two parts. The first part of the questionnaire contained participant's demographic data (6 questions) and sexual characteristics (11 questions). Consistent use of condom was defined as the use of condom at every sexual encounter in the last 1 year.<sup>12</sup> The second part assessed participant's knowledge regarding HPV infection using 14 statements where participants were instructed to select one of the three options, "Yes", "No", or "Don't know" for each item. One point was allotted for each correct response while the incorrect or "don't know" responses were scored zero. Hence, the minimum and maximum scores were zero (0%) and 14 (100%), respectively. Adequate knowledge was defined as having at least 10 correct responses out of the 14 (which is 70%) based on the original cut-off score of the original questionnaire.<sup>1</sup> The cut-off value of 70% was taken as good knowledge based on the expectant knowledge according to the Central Disease Control on HPV information pamphlet content as there was no local public awareness pamphlet on HPV. All participants were given this pamphlet (translated to Bahasa Malaysia) upon completing the questionnaire to create awareness regarding HPV infection among men.

A pilot study was done and there were no problems in the process of data collection. Data were then collected and analysed using "Statistical Package for Social Sciences (SPSS)" version 26 (SPSS Inc., Chicago, IL, USA). Descriptive analysis was used to describe knowledge on HPV while Chi Square and Mann-Whitney U tests, were used to describe the association between demographic and sexual characteristics and knowledge of HPV.

This research was approved by the Research and Ethics Committee of Universiti Kebangsaan Malaysia Medical Centre (FF- 2020-012) and registered with the National Medical Research Registration (NMRR-19-4086-51097).

## RESULTS

A total of 194 participants completed the questionnaire. The median age of participants was 31 years (IQR: 12) and they were mainly Malays (47.4%, n=92). Participants mostly had tertiary education (54.1%, n=105) and were from the low-income group (86.6%, n=168).

The median age of initiating sexual activities was 19 years (IQR: 3). Most (66.5%, n=129) participants had male partners (homosexual) practiced anal sex (58.2%, n=113) and assumed the versatile sexual role (69.9%, n=79). HIV (80.9%, n=157) and syphilis (29.9%, n=58) were the two commonly acquired sexually transmitted diseases. More than half (60.3%, n=117) of the participants were sexually active with about one-third of them (28.9%, n=56) had more than one sexual partner. A large majority (82.9 %, n=97) of participants who were sexually active used condom but only one-third 30.8% (n=36) of them used it consistently.

The mean score for knowledge of HPV-related diseases was 3.4 (SD  $\pm$  4.35). Only 14.4% (n=28) men had adequate knowledge (knowledge score >70%) regarding HPV. The best score for knowledge was for the statement HPV can spread through sex while the lowest was the statement "Some HPV type can disappear without treatment". The knowledge score was almost similar across all domains (Table I).

There was no association between participant's demographic characteristics and adequate HPV knowledge (Table II).

Testing the association between adequate knowledge of HPV and sexual characteristics, showed that participants who practiced oral sex and those with a previous history of sexually transmitted diseases have association with knowledge regarding HPV (Table III).

Independent variables with *p* value <0.25 were further selected for multivariate logistic regression analysis adjusted for employment status, oral sex practise, previous history gonorrhoea, and syphilis. The regression model reasonably fit well. There were no multicollinearity and interaction between the independent variables tested. It was found that participants who practiced oral sex were found to be 3.90 times more likely to have adequate knowledge regarding HPV (adjusted Odds Ratio, aOR 3.90; 95% Confidence Intervals, 95%CI: 1.06, 14.28). The Nagelkerke R square value for this model is 0.199 (Table IV).

## DISCUSSION

Most of our study participants received higher education (54.1%); however, the majority were from the lower-income group (86.6%) and were not married (80.9%). Similar study done amongst HIV/STD male clinic attendees in China also showed that most study participants were single (64.5%) and from the lower and middle-income categories (83.9%).<sup>13</sup> Low socio-economic status and unmarried status have been linked with risky sexual behaviour, HPV infection and other STDs.<sup>14,15</sup> Those from low-economic levels tend to have increased social risk factors such as drug abuse and high-risk sexual behaviours, while those who are unmarried possibly engage in multiple sexual partnerships both of which

**Table I: Knowledge on HPV and related diseases**

Items	Frequency (n)	Correct response (%)
Nature of HPV infection		
There are many types of HPV	39	20.1
Some HPV type can disappear without treatment	24	12.4
Risk factors for HPV infection		
The more sexual partner I have, the higher my risk of getting HPV	71	36.6
Using condom can fully protect from HPV infection	46	23.7
Transmission of HPV infection		
HPV can spread through sex	73	37.6
I can infect my partner with HPV even though I am asymptomatic	56	28.9
Genital HPV can spread by skin-to-skin contact	30	15.5
HPV-related benign diseases		
HPV can cause genital warts in the anus	58	29.9
HPV can cause genital warts in the penis	57	29.4
Genital warts are caused by HPV	54	27.8
HPV-related malignancies		
HPV can cause cervical cancer	52	26.8
HPV can cause cancer of anus	51	26.3
HPV can cause cancer of penis	40	20.6
HPV can cause cancer of the mouth	34	17.5

**Table II: Association between sociodemographic characteristics and adequate HPV knowledge**

Variables	Frequency % (n)	Adequate HPV knowledge (N=194)		
		No % (n)	Yes % (n)	p-value
Ethnicity				0.909
Malay	47.4 (92)	47.6 (79)	46.4 (13)	
Non-Malay	52.6 (102)	52.4 (87)	53.6 (15)	
Education Level				0.151
School (primary and secondary)	45.9 (89)	48.2 (80)	32.1 (9)	
Tertiary	54.1 (105)	51.8 (86)	67.9 (19)	
Employment status				*0.179
Employed	83.5 (162)	81.9 (136)	92.9 (26)	
Unemployed	16.5 (32)	18.1 (30)	7.1 (2)	
Monthly income				*0.662
Low	86.6 (168)	85.5 (142)	92.9 (26)	
Middle	12.4 (24)	13.3 (22)	7.1 (2)	
High	1.0 (2)	1.2 (2)	0.0 (0)	
Marital status				*0.262
Unmarried	84.5 (164)	83.1 (138)	92.9 (26)	
Married	15.5 (30)	16.9 (28)	7.1 (2)	

\*Fisher Exact Test was used. p-value < 0.05 is significant.

increase the risk of acquiring STDs.

Our study found that the median age of initiating sexual activity was fairly young (19 years; IQR: 3) and is similar to other studies done among high-risk men.<sup>16,17</sup> Early initiation of sexual activities at the stage where there is a lack of maturity and judgement predisposes to risky sexual behaviour such as unprotected sex, substance abuse, and multiple sexual partners eventually leading to higher incidences of HPV infection and other STDs.<sup>18</sup>

This study found a high rate of men who have sex with men (MSM) (76.5 %) and HIV infection (80.9%). Currently, MSM practice among the HIV population in Malaysia is about 21.6%.<sup>19</sup> This is a major concern, as concomitant HIV and HPV infection are responsible for retention of HPV in the body in contrast to people with normal immune system who have a chance for spontaneous elimination of HPV. Retention of HPV among people with HIV predisposes them to a higher risk of developing HPV-related malignancies due to persistent infection with HPV.<sup>8</sup>

More than half of our study participants practised anal sex

with a large majority (87%) of them practicing anal receptive role. This is consistent with previous studies in China which reported that receptive anal sex practice was prevalent amongst MSM attending HIV and STD clinics (52%–66.7%).<sup>13,17</sup> Oral sex was also widely practised by the majority of our participants (72.2%) as also found by an earlier study.<sup>20</sup> This is of concern as both receptive anal intercourse and oral sex predisposes to anal cancer and oropharyngeal cancers, respectively. The incidences of both malignancies are on the rise, especially among MSM and male HIV population, attributed to their sexual practices.<sup>6</sup>

Almost one-third participants (28.9%, n=56) in our study had multiple sexual partners. This is less, compared to earlier data from Malaysia, Thailand, and Ireland where the percentages were more than 60%.<sup>21-23</sup> The apparent low figure in our study could be attributed to the Covid-19 pandemic as data were collected during the government's implementation of Movement Control Order (MCO) where social gatherings were restricted in effort to curb the pandemic. Additionally, our study also found that consistent use of condoms among sexually active participants were low (30.3%). Other parts of

Table III: Association between sexual characteristics and adequate HPV knowledge

Variables	Frequency % (n)	Adequate HPV Knowledge (N=194)		
		No % (n)	Yes % (n)	p-value
Sexual orientation				0.303
MSM	66.5 (129)	65.1 (108)	75.0 (21)	
Non-MSM	33.5 (65)	34.9 (58)	25.0 (7)	
Number of sexual partners (last 12 months)				0.128
None	39.7 (77)	42.2 (70)	25.0 (7)	
One partner	31.4 (61)	28.9 (48)	46.4 (13)	
Multiple partners	28.9 (56)	28.9 (48)	28.6 (8)	
Condom use (last 12 months) (n=117)				*0.522
No	17.1 (20)	18.8 (18)	9.5 (2)	
Yes	82.9 (97)	81.3 (78)	90.5 (19)	
<b>Sexual practice</b>				
Oral sex				0.038
Yes	72.2 (140)	69.3 (115)	89.3 (25)	
No	27.8 (54)	30.7 (51)	10.7 (3)	
Anal Sex				0.539
Yes	58.2 (113)	57.2 (95)	64.3 (18)	
No	41.8 (81)	42.8 (71)	35.7 (10)	
Role of anal sex				*0.463
Receptive	87.6 (99)	86.3 (82)	94.4 (17)	
Non-Receptive	12.4 (14)	13.7 (13)	5.6 (1)	
<b>History of sexually transmitted diseases</b>				
HIV				*0.646
Yes	80.9 (157)	81.3 (135)	78.6 (22)	
No	16.5 (32)	15.7 (26)	21.4 (6)	
Unsure	2.6 (5)	3.0 (5)	0.0 (0)	
Syphilis				0.028
Yes	29.9 (58)	31.3 (52)	21.4 (6)	
No	49.0 (95)	45.2 (75)	71.4 (20)	
Unsure	21.1 (41)	23.5 (39)	7.1 (2)	
Genital Warts				*0.005
Yes	13.9 (27)	12.0 (20)	25.0 (7)	
No	56.7 (110)	54.8 (91)	19 (67.0)	
Unsure	29.4 (57)	33.1 (55)	7.1 (2)	
Gonorrhoea				*0.001
Yes	7.7 (15)	6.0 (10)	17.9 (5)	
No	60.8 (118)	58.4 (97)	75.0 (21)	
Unsure	31.4 (61)	35.5 (59)	7.1 (2)	
Chlamydia				*0.003
Yes	2.6 (5)	2.4 (4)	3.6 (1)	
No	64.4 (125)	60.2 (100)	89.3 (25)	
Unsure	33.0 (62)	37.3 (62)	7.1 (2)	
Herpes				*0.003
Yes	2.1 (4)	1.8 (3)	3.6 (1)	
No	66.0 (128)	62.0 (103)	89.3 (25)	
Unsure	32.0 (62)	36.1 (60)	7.1 (2)	

\*Fisher Exact Test was used. p-value <0.05 is significant

the world such as China and Thailand show a wide range of poor compliance to condom use among a similar population (13.3-57.3%).<sup>13,22</sup> An earlier study done among sexually active Malaysians revealed that inconsistent condom use was attributed to low awareness and negative perception of condom use.<sup>24</sup> Having multiple sexual partners and unprotected sex are common risk factors for sexually transmitted diseases, including HPV.

Our study also found that only 14.4% of participants had adequate knowledge regarding HPV infection. This is much lower compared to an earlier study done on a similar population in Puerto Rico (29.3%).<sup>1</sup> Although public campaigns on cervical cancer and its prevention have been promoted in Malaysia over many years, only about 25% of participants knew about this condition, reflecting a lack of awareness among men. An earlier local study discovered that only 36.5% of men had knowledge of HPV-related

cervical cancer in women.<sup>25,26</sup> This shows that Malaysian men in general have a lack of awareness HPV-related diseases. They may be under the assumption that HPV infection affects woman as the current practice is to promote HPV screening and vaccination for women. Additionally, less than one-third of the participants knew that genital warts are caused by HPV, even though it is a commonly treated condition in STD clinic with high rates of recurrence.<sup>22</sup> The mean scores for knowledge items on the HPV-related malignancies in men were also poor. Perhaps, the absence of policy on HPV vaccination for men in Malaysia and the relative rarity of HPV-related cancers amongst them, may have further contributed to the scarcity of public information on HPV among men.

Previous studies have shown variable relationships between previous exposure to STD and knowledge of HPV where some showed positive or no associations. Studies from Puerto Rico

Table IV: Multivariate regression analysis for factors associated with adequate HPV knowledge

Variable	Crude OR (95%CI)	p-value	Adjusted OR (95%CI)	p-value
Oral sex				
Yes	3.67 (1.07; 12.80)	0.04	3.90 (1.06; 14.28)	0.04*
No	(1)		(1)	
Gonorrhoea				
Yes	2.31 (0.72; 7.46)	0.16	2.75 (0.74; 19.27)	0.13
Unsure	0.16 (0.04; 0.69)	0.01	0.21 (0.02; 2.22)	0.20
No	(1)		(1)	
Syphilis				
Yes	0.43 (0.16; 1.15)	0.09	0.40 (0.13; 1.19)	0.10
Unsure	0.19 (0.04; 0.87)	0.03	0.70 (0.06; 7.81)	0.77
No	(1)		(1)	
Employ				
Yes	2.87 (0.65; 12.74)	0.17	3.44 (0.73; 16.25)	0.12
No	(1)		(1)	

Reference group. p-value <0.05 is significant, .\* multiple binary logistic regression (MLogR), OR, Odds Ratio, 95%CI, 95% Confidence Intervals

and China did not find any significant association between HIV status and knowledge of HPV while one study amongst MSM in Florida found a positive association between HIV and better knowledge of HPV.<sup>1,7,27</sup> The possible explanation for better HPV knowledge among those with HIV or previous STD is that once diagnosed with an STD, these high-risk individuals would have received counselling regarding other STDs which include HPV as part of management to prevent future STDs. However, the participants with HIV in our study did show better knowledge of HPV. Hence, information regarding HPV and other STD should be offered during counselling upon diagnosis of HIV and STDs to increase awareness and as an effort to prevent future STDs.

Although genital wart is caused by HPV, having genital warts was not associated with adequate knowledge of HPV in our study. Meanwhile, a similar study by Colon-Lopez et al., showed an association between knowledge of HPV and diagnosis of herpes, while the history of genital warts only showed a marginal association. These findings suggest a possible lack of HPV-related counselling for HIV/STD-infected men during treatment for STD by their healthcare providers.

The current study found that men who engage in oral sex are almost four times more likely to have adequate knowledge of HPV. An earlier study in Bahamas also showed better awareness of HPV infection among youth who practised oral sex.<sup>28</sup> This is probably because those who engaged in oral sex would probably have a higher self-perceived risk of HPV hence better knowledge of HPV. Association between oral sex with higher self-perceived risk and awareness of HIV was also seen amongst heterosexual men in China.<sup>29</sup> It was also demonstrated that knowledge on oral sex and HPV-related oropharyngeal cancer amongst youth was associated with decreased willingness to engage in oral sex.<sup>30</sup>

Almost 66% of our study participants were MSM; however, we did not find any association between their sexual practice and knowledge of HPV although studies from other countries demonstrated better knowledge and awareness of HPV amongst this group.<sup>1,9</sup> MSM community in Malaysia has grown larger over the years and would benefit greatly from the targeted HPV vaccination in men.<sup>20</sup> This community

benefits least from the herd immunity created through female HPV vaccination.<sup>31</sup> Imparting knowledge regarding HPV-related disease, appropriate preventive strategies such as safe sex practice advice and information regarding HPV vaccination could provide great health benefits for these high-risk men. These strategies could be an added advantage if initiated at the STD and HIV clinics. In fact, targeted HPV vaccination for MSM population has proven to be more cost-effective and confers greater public health impact as compared to universal HPV vaccination for men.<sup>32</sup>

Some of the limitations of our study are that it was done among a selective group of men using convenience sampling; hence the findings may not represent the general population. However, it provides valuable information for potential preventive measures and public health campaigns on HPV infection among high-risk men. The survey questions were self-administered hence recall and socially desirable bias could not be excluded.

## CONCLUSION

Despite more than a decade of HPV-related infections, our study demonstrates high-risk sexual behaviours and poor knowledge of HPV infection among high-risk men. Engagement in oral sex practice was noted to be almost four times more likely to have adequate knowledge of HPV. Information on HPV infection, its related diseases, and preventive aspects should be made available during STD clinic encounters. It is hoped that the findings of this study can be used as a guide for strategies on HPV education for better awareness and subsequent advocacy for HPV vaccination. This could improve the quality of life for MSM population and HIV-infected men.

## ACKNOWLEDGEMENT

We would like to thank the Director General Health Malaysia for his permission to publish this article. The authors would also like to thank Dr Ker Hong Bee and Clinical Research Centre (CRC) Hospital Raja Permaisuri Bainun, Ipoh, for feedback on the questionnaire and facilitating data analysis respectively.

## REFERENCES

1. Colon-Lopez V, Ortiz AP, Del Toro-Mejias LM, Hermes García, Michael C Clatts, Joel Palefsky. Awareness and knowledge of human papillomavirus (HPV) infection among high-risk men of Hispanic origin attending a sexually transmitted infection (STI) clinic. *BMC Infect Dis* 2012; 12: 346.
2. Juckett G, Hartman-Adams H. Human papillomavirus: Clinical manifestations and prevention. *Am Fam Phys* 2010; 82(10): 1209-13.
3. Yap LF, Lai SL, Rhodes A, Sathasivam HP, Abdullah MA, Pua KC, et al. Clinico-pathological features of oropharyngeal squamous cell carcinomas in Malaysia with reference to HPV infection. *Infect Agent Cancer* 2018; 13: 21.
4. Douglawi A, Masterson TA. Updates on the epidemiology and risk factors for penile cancer. *Transl Androl Urol* 2017; 6(5): 785-90.
5. Giuliano AR, Tortolero-Luna G, Ferrer E, Bruchell AN, Silvia de Sanjasoe, Kjaer SK, et al. Epidemiology of human papillomavirus infection in men, cancers other than cervical and benign conditions. *Vaccine* 2008; 26 Suppl 10(0 10): K17-K28.
6. Bruni L, Albero G, Serrano B, Mena M, Collado JJ, Gómez D, et al. ICO/IARC. Information Centre on HPV and Cancer (HPV Information Centre). Human Papillomavirus and Related Diseases in Malaysia, 2019. Available at: <https://hvpcentre.net/statistics/reports/MYS.pdf>. Accessed March 10, 2021.
7. Rodríguez-Álvarez MI, Gómez-Urquiza JL, Husein-El Ahmed H, Albendín-García L, Gómez-Salgado J, Cañadas-De la Fuente GA. Prevalence and risk factors of human papillomavirus in male patients: a systematic review and meta-analysis. *Int J Environ. Res. Public Health* 2018; 15(10): 2210.
8. Hernandez AL, Efirid JT, Holly EA, Berry J, Jay N, Palefsky JM. Incidence of and risk factors for type-specific anal human papillomavirus infection among HIV-positive MSM. *AIDS* 2014; 28(9): 1341-9.
9. Pelullo CP, Di Giuseppe G, Angelillo IF. Human papillomavirus infection: knowledge, attitudes, and behaviors among lesbian, gay men, and bisexual in Italy. *PLoS One* 2012; 7(8): e42856.
10. Radecki Breitkopf C, Finney Rutten LJ, Findley V, Jacobson DJ, Wilson PM, Albertie M, et al. Awareness and knowledge of Human Papillomavirus (HPV), HPV-related cancers, and HPV vaccines in an uninsured adult clinic population. *Cancer Med* 2016; 5(11): 3346-52.
11. Siu JY, Fung TKF, Leung LH. Barriers to receiving HPV vaccination among men in a Chinese community: a qualitative study in Hong Kong. *Am J Mens Health* 2019; 13(1): 1557988319831912.
12. Tesfaye B, Seifu Y, Tekleselassie B, Ejeso A. The magnitude and associated factors of consistent condom utilization among ART users in Hawassa City, Sidama, Ethiopia. *HIV/ AIDS (Auckl)* 2020; 12: 909-22.
13. Zou H, Meng X, Jia T, Zhu C, Chen X, Li X, et al. Awareness and acceptance of human papillomavirus (HPV) vaccination among males attending a major sexual health clinic in Wuxi, China: A cross-sectional study. *Hum Vaccin Immunother* 2016; 12(6): 1551-9.
14. Harling G, Subramanian S, Barnighausen T, Kawachi I. Socioeconomic disparities in sexually transmitted infections among young adults in the United States: examining the interaction between income and race/ethnicity. *Sex Transm Dis* 2013; 40(7): 575-81.
15. Maonga B, Gondwe TS, Machira K. Determinants of risky sexual behavior among the youth in Malawi, 2018. Available at: [https://pdf.usaid.gov/pdf\\_docs/PA00TC2D.pdf](https://pdf.usaid.gov/pdf_docs/PA00TC2D.pdf). Accessed March 20, 2021.
16. Xin HN, Li HJ, Li Z, Li XW, Li MF, Zhang HR, et al. Genital HPV infection among heterosexual and homosexual male attendees of sexually transmitted diseases clinic in Beijing, China. *Epidemiol Infect* 2017; 145(13): 2838-47.
17. Tian T, Wang D, Papamichael C, Yan Z, Guoyao S, Zhanlin Z, et al. HPV vaccination acceptability among men who have sex with men in Urumqi, China. *Hum Vaccin Immunother* 2018; 15(4): 1005-12.
18. Ryscavage P, Anderson EJ, Sutton SH, Reddy S, Taiwo B. Clinical outcomes of adolescents and young adults in adult HIV care. *J Acquir Immune Defic Syndr* 2011; 58(2): 193-7.
19. Global AIDS Monitoring Report 2020, Malaysia. Available at: [www.moh.gov.my/moh/resources/Penerbitan/Laporan/Umum/Laporan\\_Global\\_AIDS\\_Monitoring\\_2020\\_new.pdf](http://www.moh.gov.my/moh/resources/Penerbitan/Laporan/Umum/Laporan_Global_AIDS_Monitoring_2020_new.pdf). Accessed March 20, 2021.
20. Yeoh CA, Chan CL, Chin CC, Tan WC. Prevalence and risk factors of genitourinary Chlamydia trachomatis infection among patients attending sexually transmitted disease clinics in northern Malaysia. *Med J Malaysia* 2020; 75(2): 103-9.
21. Sadlier C, Lynam A, O'Dea S, Delamere S, Quinlan M, Clarke S et al. HPV vaccine acceptability in HIV-infected and HIV negative men who have sex with men (MSM) in Ireland. *Hum Vaccin Immunother* 2016; 12(6): 1536-41.
22. Jiamton S, Leeyaphan C, Maneprasopchoke P, Omcharoen V. Prevalence and clinical manifestation of male patients with anogenital warts attending a sexually transmitted disease clinic prior HPV recommendation. *Southeast Asian J Trop Med Public Health* 2014; 45(6): 1337-43.
23. Koh KC, Kanagalingam K, Tai FT, Kamarulzaman A.. Sexual practices and HIV prevalence amongst men who have sex with men at a community-based voluntary counseling and testing centre in Malaysia. *International Schol Res Notice* 2013; 2013: 247545.
24. Mutalip H, Mishkin K, Paiwai F, Sulaiman J, Yoep N. Factors associated with sexual intercourse, condom-use, and perceived peer behaviors among adolescents in Malaysia: a school-based cross-sectional study. *Malaysian Journal of Social Science and Humanities (MJSSH)* 2019; 4(2): 8-18.
25. Muhamad NA, Buang SN, Jaafar S, Jais R, Tan PS, Mustapha N, et al. Achieving high uptake of human papillomavirus vaccination in Malaysia through school-based vaccination programme. *BMC Public Health*. 2018; 18(1): 1402.
26. Widjaja VN. Awareness, knowledge and attitudes of human papillomavirus (HPV) among Private University Students-Malaysia Perspective. *Asian Pac J Cancer Prev* 2019; 20(7): 2045-50.
27. Fenkl EA, Schochet E, Jones SG, da Costa Br. Evaluation of an HPV/anal cancer screening awareness program for HIV-infected men who have sex with men. *J Assoc Nurses AIDS Care*. 2015; 26(4): 492-7.
28. George C, Roberts R, Brennen D, Deveaux L, Read SE. Knowledge and awareness of Human Papillomavirus (HPV) and HPV vaccines among Caribbean youth: the case of the Bahamas. *Hum Vaccin Immunother* 2020; 16(3): 573-80.
29. Ma Q, Pan X, Cai G, Yan J, Xu Y, Ono-Kihara M, et al. The characteristics of heterosexual STD clinic attendees who practice oral sex in Zhejiang Province, China. *PLoS One* 2013; 8(6): e67092.
30. Stock ML, Peterson LM, Houlihan AE, Walsh LA. Influence of oral sex and oral cancer information on young adults' oral sexual-risk cognitions and likelihood of HPV vaccination. *J Sex Res* 2013; 50(1): 95-102.
31. Lin A, Ong KJ, Hobbelen P, King E, Meshel D, Edmunds WJ, et al. Impact and cost-effectiveness of selective human papillomavirus vaccination of men who have sex with men. *Clin Infect Dis* 2017; 64(5): 580-8.
32. Brisson M, Benard E, Drolet M, Bogaards JA, Baussano I, Vänskä S, et al. Population-level impact, herd immunity, and elimination after human papillomavirus vaccination: a systematic review and meta-analysis of predictions from transmission-dynamic models. *Lancet Public health* 2016; 1(1): e8-e17.