

ACCEPTINGFACTORS OF HPV VACCINATION

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Abstract: Human papillomavirus is a condition which caused due to human papillomavirus (HPV) from papillomaviridae DNA virus family. HPV vaccines helps to eradicate most types of HPV condition. Vaccines gives minimal benefit to women who are infected already with HPV types 16 and 18 .Due to this, the vaccine is recommended initially for women who have not been vulnerable with HPV during sexual intercourse. WHO stated that HPV vaccination clearly outlines rightful, cost-effective techniques on using HPV vaccine in public health programs. There are various factors that influence the acceptance of HPV vaccination. There is a need for empirically validated, theoretically driven behavior changes interventions to increase HPV vaccination among young adult women. Various interventions done suggest that education and message framing may increase the acceptability and intention to receive the

vaccination. Thus, there is a need for dynamic interventions that are specifically focused on psychosocial and behavioral constructs that produce behavior change. This study would give insights about the various modifiable and non-modifiable factors of HPV vaccination among people around the globe.

Key Words: *Human Papilloma Virus, Accepting Factors, Vaccination*

Introduction:

Human papillomavirus is a condition which caused due to human papillomavirus (HPV) from papillomaviridae DNA virus family. [1] 90% of HPV condition does not have symptoms and it resides within two years [2]. In some rare cases HPV condition becomes warts, based on the affected site it elevates cancer risk in throat, penis, cervix, vagina, mouth vulva, vagina, penis, anus or mouth [3]. Major number of cervical cancer is caused because of Human Papilloma Virus; HPV16 strain and HPV18 strain comprises of 70 percent of cases. Among 60 and 90 percent of the other cancers are also related with HPV. [4] Strain HPV6 and strain HPV11 results in genital warts in laryngeal and genital papillomatosis [2] HPV vaccines helps to eradicate most types of HPV condition. [5] .Vaccines gives minimal benefit to women who are infected already with HPV types 16 and 18 [6]. Due to this, the vaccine is recommended initially for women who have not been vulnerable with HPV during sexual intercourse. WHO stated that HPV vaccination clearly outlines rightful, cost-effective techniques on using HPV vaccine in public health programs [7]. There are various factors that influence the acceptance of HPV vaccination. This study would give insights about the various modifiable and non-modifiable factors of HPV vaccination among people around the globe.

1. Personal factors:

a. Age:

A study among women attending a well women clinic in Central London shows that there were significant but generally small associations with demographic characteristics (personal factors) such as age. Awareness of HPV was higher in older (47%) than younger women (25%) [8]. Other study supported the higher vaccination rates were seen among older girls [9]. A Malaysian study showed, age ($p < 0.001$) significantly influenced the practice of HPV vaccine among secondary school girls. This is due to the government now offering a free vaccine for secondary school girls aged 13 years. Bynum reported that age is significantly associated with HPV vaccine uptake [10]. A similar study among general Malaysian population showed that age significantly influenced the practice of HPV vaccine [11]. In Australia, the national HPV vaccination registry (which collects data on all vaccinations provided free to girls and women aged between 11 and 26) has shown that vaccination rates are higher for younger teenage girls than for older teenage girls (completion rate for girls aged 11–12, 73% compared with 66% for 16–17-year-old girls). Completion rates for older teenage girls and women in community/GP settings were significantly lower (17–19 38%, 20–26 30%), reflecting both the effect of increasing age, but also the higher uptake associated with school-based vaccination programs [12].

b. Ethnicity:

Acceptance of HPV vaccine varies across racial and ethnic groups. Several studies have indicated the role of race and its influence on the knowledge and awareness of HPV vaccine thus impacting the acceptability of it. Al-Naggar found that the race significantly ($p < 0.001$) influenced the uptake of HPV vaccine among the schoolgirls [13]. Noteworthy disparities were observed in completion of HPV vaccination by race/ethnicity after adjusting for other variables known to be associated with vaccination, suggesting that populations at greatest risk for cervical cancer remain potentially under protected. These findings are consistent with other studies. Neubrand and colleagues showed that Hispanics were 60% less likely than whites to complete vaccination [14]. Widdice and colleagues showed that blacks and freely insured patients were 50% and 24% less likely than whites and paid insured patients, respectively, to complete vaccination [15]. Cook showed that blacks were 44% less likely than whites to complete vaccination [16]. For both HPV vaccine initiation and completion there was shown a clear indication that having an ethnic background of Caucasian was associated with higher rates of vaccination. There are considerable racial and ethnic disparities in terms of burden of HPV infection and cervical cancer incidence in the United States with women from Hispanic background experiencing a higher burden of disease compared to women of Caucasian origin [17]. Similarly, in the United States, girls without health insurance were less likely to initiate or complete the vaccination program. Cervical cancer and HPV incidence rates are much higher among women living in poorer and less educated countries than among women living in wealthier areas [18].

c. Marital status:

It was shown that Marital status is considerably associated ($p < 0.001$) with increased awareness of HPV [19]. Another study suggested that marital status significantly influence the practice of HPV vaccine among Malaysian women from the general population ($p = 0.001$) [20].

d. Course of study:

A study by Medeiros and Ramada, on male and female university students found a significant association between being a female health sciences student and having heard of HPV ($p < 0.001$) and being a non-health sciences student and having heard of HPV ($p < 0.049$) [21]. A study done by Moreira shows that women with some high school education knew more about the association between HPV and cervical cancer than those with less than high school education. They also suggested that knowledge of HPV transmission, presenting symptoms and signs, and HPV association with greater risk of cervical cancer were all linked to the number of school years attended. Women with higher educational attainment were more likely to have received information on these matters. However, the lack of knowledge on HPV diagnosis and treatment was prevalent in women, regardless of their education, suggesting that the amount of information they may receive at high school is still insufficient or limited [22].

e. Year of study:

A study done by Makwe and colleagues among female students at university of Lagos, has mentioned that student level in university had a significant association with the awareness of HPV vaccine and its uptake [23]. Another study done by Wong in Malaysia on ethnically diverse female university students stated that intention to receive HPV vaccine was significantly associated with the year of study of the students ($p < 0.001$). Higher the year of study the students belonged to

greater was their knowledge score on HPV infection and vaccination and more likely were they to take up the vaccination[24].

2.Family factors

a. ParentsLevel of education:

Parents' education is an important factor among the schoolgirls and general population towards HPV vaccine. A study by Wong states that parents with less than high school education are significantly more likely to vaccinate their daughter than parents who are high school graduates [25]. Several studies have reported that parents with lower levels of education were more likely to accept HPV vaccination for their daughters [26]. These are encouraging findings because increased poverty and lower education level have been associated with greater incidence of cervical cancer. A study done on mothers reported that mothers who had less than a high school degree were more likely to prefer their daughters being vaccinated [27]. Unvaccinated children were more likely from families where the mother is college educated and a high household income family, which indicated that the acceptability rate of the vaccine is lower in more educated category [28]. This is supported by another study, which showed that higher uptake levels were associated with lower parental education levels (college vs. high school: OR 0.6, 95% CI = 0.5–0.8; postgraduate degree vs. high school: OR 0.6 95% CI = 0.4–0.9) [12]. In contrast another study found higher vaccine uptake in girls of parents with a college education compared to a high school education (adjusted OR =1.69,95% CI = 1.04–2.73) [29].

b. Family history of cervical cancer:

A study done by Al-Naggar among secondary school girls in Melaka showed that family history of cervical cancer did not have any significant association with HPV vaccination uptake($p>0.001$) [13].

3.Awareness of HPV infection and HPV vaccination:

It is important that general population and the adolescents understand why they are being offered the HPV vaccine to ensure uptake remains high; research into HPV-related information provision and communication would help assess whether more effective communication prior to, and at the point at which the vaccine is offered is necessary.

Although the majority of the population are unlikely to recognize that acquisition of a specific STI is a risk factor for cancer, a much larger proportion do recognize ‘some kind of’ sexual aetiology to cervical cancer. This finding was evidenced in a UK survey of both men and women, which revealed that 67% of women and 51% of men recognized having several sexual partners (as opposed to practising monogamy) as a risk factor for cervical cancer [30]. A study done on 368 female students at the University of Lagos in Nigeria shows that out of the 64 (17.7%) of students who were aware of HPV infection, only 6.25% agreed (somewhat/strongly) that they could be at risk of acquiring the infection. Out of the 52 participants who had heard about the HPV vaccine, 22 (42.3%) agreed it should be given to girls before their first sexual intercourse and 30 (57.7%) agreed it should be given to all sexually active females. More than half of the students who had heard about HPV vaccine stated their willingness to be vaccinated and most (92.3%) of them indicated that they would seek the opinion of their health care providers before receiving the vaccine. Student level in the University showed a significant association with the awareness of HPV infection and HPV vaccine (p-value< 0.001) [23].

4.Sources of information of HPV & its vaccine:

An often-overlooked problem in cancer communication is health literacy. Differential access to health information is one potential explanation for persistent disparities experienced among social groups[31]. Indeed, African American women are less likely to have heard of HPV than White women [32]. Access to this information is important because increased awareness is the first stage of many that people adopting health behaviors pass through [33]. Narrowing the gap between the “information rich” and the “information poor” by raising awareness and increasing education about HPV and the HPV vaccine may help to decrease disparities in cervical cancer mortality.[34]

The internet is a popular medium of choice for the people who are seeking health information. It has been observed that the individuals with higher level of education are more likely to have increased chance of learning about the vaccine through the internet, this can be attributed to the accessibility of internet is linked to higher income and education [35].

Several studies showed that vaccine uptake was positively associated with having heard about the vaccine from a healthcare provider. Higher uptake was also found if the information source was a newspaper, family, friends or a brochure, with the uptake also higher, compared to other information sources [36]. Parental satisfaction with the amount and quality of information was significantly associated with vaccine uptake, and vaccine refusal linked to dissatisfaction with information [37].

5.Knowledge:

Knowledge and awareness are one of the key factors influencing the acceptance of the HPV vaccine. The literature uncovers three main areas where there are deficits in knowledge and awareness regarding HPV: awareness of HPV as a disease, knowledge of HPV (its modes of transmission and disease profile) and its aetiological role in cervical cancer. Marshall et al. found a lack of knowledge regarding the association between HPV and cervical cancer in a representative study of 2002 men and women from the population of South Australia. A higher level of HPV awareness

and knowledge was reported by Pitts et al. in a representative study of 1100 women aged 18–61 years in Victoria, Australia. The authors found that approximately half the women interviewed reported they were aware of HPV, and of those who had heard of the virus, over half correctly identified an association with cervical cancer[38]. Two studies showed girls who had been vaccinated had a significant higher knowledge about HPV, HPV vaccine and cervical cancer compared to non-vaccinated girls in a study [39]. Caskey indicated that many adolescents and young women lack fundamental knowledge about this widespread sexually transmitted infection. Because health beliefs are known to influence health behaviors, lack of knowledge regarding HPV infection may hinder efforts to prevent HPV infection. However, despite limited knowledge about HPV infection and the vaccine, few respondents believed that the HPV vaccine provided protective benefits beyond the true impact of the vaccine[40]. Makwe reported about 60% of the students who were aware of the HPV vaccines expressed their desire to get vaccinated. A similar study in Italy showed that 81.7% of respondents were willing to have HPV vaccine, the higher rate was attributed to the education programs in Italy[41]. A study in Brazil showed that respondents with higher educational attainment were more likely to have better knowledge of HPV infection. It has been reported that among women aged 18-30 years, majority of them had heard of HPV infection (88.9%) and knew that it was acquired sexually (86.7%). Overall a large proportion of women identified failure to use condoms as a risk factor for getting HPV (71.1%). [22]

6. Perception

Perception and belief in one's ability to be vaccinated within the next year, elements that are expected to predict actual vaccination, were not as high as might be anticipated given that women may have been exposed to HPV vaccine marketing campaigns or may have heard about HPV vaccines from their clinicians. A substantial proportion of young women who are eligible for HPV vaccination do not perceive to receive the vaccine or do not feel confident that they can receive it

and that vaccine affordability and insurance coverage may play a significant role in shaping these attitudes[42]. Brewer suggested that those who perceived HPV infection to be more likely were more accepting of HPV vaccination, but perceived severity was largely unrelated to acceptability. Perceived risk of cervical cancer has been reported in only one published study of HPV vaccine acceptability. Perceived effectiveness of vaccines in preventing HPV infection was a key predictor of vaccine acceptability. Additional research is needed on the role of perceived effectiveness of the vaccine against genital warts or cervical cancer given the importance of this construct. Perceived barriers to HPV vaccination may present challenges, such as the belief among a small minority of parents that an HPV vaccine may implicitly condone, and thus increase, adolescent sexual behaviour. Two qualitative studies concluded that parents were concerned that HPV vaccines would promote sexual behaviour among their children, but this may be an artefact of qualitative data synthesis that can highlight distinct themes or beliefs that may not be widespread [43].

7. Other factors

a. Cost of HPV vaccination:

HPV vaccine cost and access are other important predictors of vaccine intentions. A study done by Liao showed that increasing cost is inversely related to intention to receive the vaccination. Income plays a significant role in the practice of HPV vaccination among secondary school girls [44]. A Malaysian study showed that monthly family income has a significant influence on the practice of HPV vaccine among Malaysians [20]. Another study reported that most young women would accept HPV vaccine if it is free of charge [45]. Wong & Daley also reported that the cost of the HPV vaccine is a major obstacle to uptake the HPV vaccine [46]. The recommended 3-dose course of HPV vaccination costs approximately US\$360 (Malaysian Ringgit 1200) in the private sector in Malaysia. This is unaffordable by the lower socioeconomic status women. To ensure wide coverage, the vaccine may need to be incorporated into the vaccination program in Malaysia [20].

Another study reported that girls in the lowest income quintile were the least likely to complete the recommended three-dose regimen, suggesting that program delivery should be modified to improve series completion in vulnerable populations. It is worth mentioning that cost issues are more complex than simple coverage for cost of vaccine provided [47].

b. Communication:

The key scientific facts supporting HPV vaccines will apply cross-culturally, messages will need to be carefully crafted and adapted to local needs and values. The task ahead may be particularly daunting, given the insufficient level of funding that is typically allocated to vaccine communication research activities[48]. Communicators need an in-depth understanding of target audiences to develop effective and appropriate strategies [49]. This is true whether the intended audience is the public, policymakers, or healthcare providers. Such data can be obtained informally and at relatively low cost in resource-poor settings. Qualitative research such as focus groups, interviews, and meetings with community leaders is often the most useful approach for exploring audiences' knowledge, attitudes, beliefs, behaviors, and communication needs and preferences. Qualitative research should also assess target audiences' perceived benefits, costs, and barriers to HPV vaccination; the settings in which they may be most receptive to and able to act upon vaccine messages; trusted and acceptable channels for vaccine messages; and how the vaccine fits within the audience's social and cultural values and understandings of health, illness, prevention, and immunization. Quantitative (survey) data may be useful in profiling audiences and informing these qualitative research questions and for rigorous evaluation of education and training programs[48].

c. Health behavior factors influencing Vaccination.

Several health behaviors were found in literature to be associated with intention and completion of HPV vaccination. One of them is sexual behavior. Caron and his colleagues in the year 2008 found

that sexual behaviors is significantly related to the intention to receive HPV vaccination. They suggested that risky behaviors like multiple sexual partners, minimal usage of condom by male partners were significantly contributing to the concern of acquiring HPV infection, thus influencing the HPV vaccine acceptance.[50]

Conclusion:

There is a need for empirically validated, theoretically driven behavior changes interventions to increase HPV vaccination among young adult women. Various interventions done suggest that education and message framing may increase the acceptability and intention to receive the vaccination. Thus, there is a need for dynamic interventions that are specifically focused on psychosocial and behavioral constructs that produce behavior change. Building and evaluating such an intervention is an important next step in enhancing compliance with vaccination recommendations and reducing the health risk of HPV. This study would pave a better way to provide better insight to stop HPV spread among population.

Funding:

No funding was received for carrying out the present study.

Conflicts of Interest:

The authors declare no conflict of interest.

References:

1. Milner DA. Diagnostic Pathology: Infectious Diseases ... 297: "Cancer". Archived from the original on 2014-02-13. February 2014
2. Garland, S.M., Kjaer, S.K., Muñoz, N., Block, S.L., Brown, D.R., DiNubile, M.J., Lindsay, B.R., Kuter, B.J., Perez, G., Dominiak-Felden, G. and Saah, A.J., 2016. Impact and effectiveness of the

- quadrivalent human papillomavirus vaccine: a systematic review of 10 years of real-world experience. *Reviews of Infectious Diseases*, 63(4), pp.519-527.
3. Ljubojevic, S. and Skerlev, M., 2014. HPV-associated diseases. *Clinics in dermatology*, 32(2), pp.227-234.
 4. Gottlieb, S.D., 2018. *Not Quite a Cancer Vaccine: Selling HPV and Cervical Cancer*. Rutgers University Press.
 5. Pourmohsen, M., Simbar, M., Nahidi, F., Fakor, F. and Majd, H.A., 2018. HPV Risk Factors and Prevention Behaviours: A Review. *Journal of Clinical & Diagnostic Research*, 12(12).
 6. Priest, H.M. and Knowlden, A.P., 2015. Systematic review of primary prevention human papillomavirus interventions targeting college students. *International Journal of Sexual Health*, 27(2), pp.125-144.
 7. World Health Organization, 2009. Human papillomavirus vaccines: WHO position paper. *Weekly Epidemiological Record= Relevéépidémiologiquehebdomadaire*, 84(15), pp.118-131.
 8. Becker-Dreps, S., Otieno, W.A., Brewer, N.T., Agot, K. and Smith, J.S., 2010. HPV vaccine acceptability among Kenyan women. *Vaccine*, 28(31), pp.4864-4867
 9. Gerend, M.A., Weibley, E. and Bland, H., 2009. Parental response to human papillomavirus vaccine availability: uptake and intentions. *Journal of Adolescent Health*, 45(5), pp.528-531.
 10. Bynum, S.A., Brandt, H.M., Sharpe, P.A., Williams, M.S. and Kerr, J.C., 2011. Working to close the gap: identifying predictors of HPV vaccine uptake among young African American women. *Journal of Health Care for the Poor and Underserved*, 22(2), pp.549-561.
 11. Al-Naggar, R.A. and Bobryshev, Y.V., 2011. Practice towards human papillomavirus vaccine among Malaysian women: a survey of the general population. *Asian Pac J Cancer Prev*, 12(8), pp.2045-2049.

12. Kessels, S.J., Marshall, H.S., Watson, M., Braunack-Mayer, A.J., Reuzel, R. and Tooher, R.L., 2012. Factors associated with HPV vaccine uptake in teenage girls: a systematic review. *Vaccine*, 30(24), pp.3546-3556.
13. Al-Naggar, R.A., Bobryshev, Y.V., Al-Jashamy, K. and Al-Musli, M., 2012. Practice of HPV vaccine and associated factors among school girls in Melaka, Malaysia. *Asian Pacific Journal of Cancer Prevention*, 13(8), pp.3835-3840.
14. Neubrand, T.P., Radecki Breitkopf, C., Rupp, R., Breitkopf, D. and Rosenthal, S.L., 2009. Factors associated with completion of the human papillomavirus vaccine series. *Clinical pediatrics*, 48(9), pp.966-969.
15. Widdice, L.E., Bernstein, D.I., Leonard, A.C., Marsolo, K.A. and Kahn, J.A., 2011. Adherence to the HPV vaccine dosing intervals and factors associated with completion of 3 doses. *Pediatrics*, 127(1), pp.77-84.
16. Cook, R.L., Zhang, J., Mullins, J., Kauf, T., Brumback, B., Steingraber, H. and Mallison, C., 2010. Factors associated with initiation and completion of human papillomavirus vaccine series among young women enrolled in Medicaid. *Journal of Adolescent Health*, 47(6), pp.596-599.
17. Koulova, A., Tsui, J., Irwin, K., Van Damme, P., Biellik, R. and Aguado, M.T., 2008. Country recommendations on the inclusion of HPV vaccines in national immunization programmes among high-income countries, June 2006–January 2008. *Vaccine*, 26(51), pp.6529-6541.
18. Kahn, J.A., Rosenthal, S.L., Hamann, T. and Bernstein, D.I., 2003. Attitudes about human papillomavirus vaccine in young women. *International journal of STD & AIDS*, 14(5), pp.300-306.
19. Al-Dubai, S.A., Alshagga, M.A., Al-Naggar, R.A., Al-Jashamy, K., Baobaid, M.F., Tuang, C.P. and Ab Kadir, S.Y., 2010. Knowledge, attitudes and barriers for human papilloma virus (HPV) vaccines among Malaysian women. *Asian Pac J Cancer Prev*, 11(4), pp.887-892.

20. Al-Naggar, R.A. and Bobryshev, Y.V., 2011. Practice towards human papillomavirus vaccine among Malaysian women: a survey of the general population. *Asian Pac J Cancer Prev*, 12(8), pp.2045-2049.
21. Medeiros, R. and Ramada, D., 2010. Knowledge differences between male and female university students about human papillomavirus (HPV) and cervical cancer: Implications for health strategies and vaccination. *Vaccine*, 29(2), pp.153-160.
22. Moreira, E.D., Oliveira, B.G.D., Ferraz, F.M., Costa, S., Costa Filho, J.O. and Karic, G., 2006. Knowledge and attitudes about human papillomavirus, Pap smears, and cervical cancer among young women in Brazil: implications for health education and prevention. *International Journal of Gynecologic Cancer*, 16(2).
23. Makwe, C.C., Anorlu, R.I. and Odeyemi, K.A., 2012. 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*, 2(4), pp.199-206.
24. Wong, L.P. and Sam, I.C., 2010. Ethnically diverse female university students' knowledge and attitudes toward human papillomavirus (HPV), HPV vaccination and cervical cancer. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 148(1), pp.90-95.
25. Wong, L.P., 2010. Role of men in promoting the uptake of HPV vaccinations: focus groups' finding from a developing country. *International Journal of Public Health*, 55(1), pp.35-42.
26. Brewer, N.T. and Fazekas, K.I., 2007. Predictors of HPV vaccine acceptability: a theory-informed, systematic review. *Preventive medicine*, 45(2-3), pp.107-114.
27. Rosenthal, S.L., Rupp, R., Zimet, G.D., Meza, H.M., Loza, M.L., Short, M.B. and Succop, P.A., 2008. Uptake of HPV vaccine: demographics, sexual history and values, parenting style, and vaccine attitudes. *Journal of Adolescent Health*, 43(3), pp.239-245.

28. Smith, E.M., Ritchie, J.M., Yankowitz, J., Wang, D., Turek, L.P. and Haugen, T.H., 2004. HPV prevalence and concordance in the cervix and oral cavity of pregnant women. *Infectious diseases in obstetrics and gynecology*, 12.
29. Brewer, N.T., Gottlieb, S.L., Reiter, P.L., McRee, A.L., Liddon, N., Markowitz, L. and Smith, J.S., 2011. Longitudinal predictors of HPV vaccine initiation among adolescent girls in a high-risk geographic area. *Sexually transmitted diseases*, 38(3), p.197.
30. Cuschieri, K.S., Horne, A.W., Szarewski, A. and Cubie, H.A., 2006. Public awareness of human papillomavirus. *Journal of Medical Screening*, 13(4), pp.201-207.
31. Viswanath K, Breen N, Meissner H, Moser RP, Hesse B, Steele WR, Rakowski W (2006) Cancer knowledge and disparities in the information age. *J Health Commun* 11(Suppl 1): 1 – 17
32. Cates, J.R., Brewer, N.T., Fazekas, K.I., Mitchell, C.E. and Smith, J.S., 2009. Racial differences in HPV knowledge, HPV vaccine acceptability, and related beliefs among rural, southern women. *The Journal of Rural Health*, 25(1), pp.93-97.
33. Weinstein, N. D. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology*, 39(5), 806–820. doi:10.1037/0022-3514.39.5.806
34. Kontos, E.Z., Emmons, K.M., Puleo, E. and Viswanath, K., 2012. Contribution of communication inequalities to disparities in human papillomavirus vaccine awareness and knowledge. *American journal of public health*, 102(10), pp.1911-1920.
35. Xi, L.F., Hughes, J.P., Edelstein, Z.R., Kiviat, N.B., Koutsky, L.A., Mao, C., Ho, J. and Schiffman, M., 2009. Human papillomavirus (HPV) type 16 and type 18 DNA loads at baseline and persistence of type-specific infection during a 2-year follow-up. *The Journal of infectious diseases*, 200(11), pp.1789-1797.

36. Reiter, P.L., Cates, J.R., McRee, A.L., Gottlieb, S.L., Shafer, A., Smith, J.S. and Brewer, N.T., 2010. Statewide HPV vaccine initiation among adolescent females in North Carolina. *Sexually transmitted diseases*, 37(9), p.549.
37. Stretch, R., Roberts, S.A., McCann, R., Baxter, D., Chambers, G., Kitchener, H. and Brabin, L., 2008. Parental attitudes and information needs in an adolescent HPV vaccination programme. *British Journal of Cancer*, 99(11), pp.1908-1911.
38. Pitts, M.K., Dyson, S.J., Rosenthal, D.A. and Garland, S.M., 2007. Knowledge and awareness of human papillomavirus (HPV): attitudes towards HPV vaccination among a representative sample of women in Victoria, Australia. *Sexual Health*, 4(3), pp.177-180.
39. Agius, P.A., Pitts, M.K., Smith, A.M. and Mitchell, A., 2010. Human papillomavirus and cervical cancer: Gardasil® vaccination status and knowledge amongst a nationally representative sample of Australian secondary school students. *Vaccine*, 28(27), pp.4416-4422.
40. Caskey, R., Lindau, S.T. and Alexander, G.C., 2009. Knowledge and early adoption of the HPV vaccine among girls and young women: results of a national survey. *Journal of Adolescent Health*, 45(5), pp.453-462.
41. Di Giuseppe, G., Abbate, R., Liguori, G., Albano, L. and Angelillo, I.F., 2008. Human papillomavirus and vaccination: knowledge, attitudes, and behavioural intention in adolescents and young women in Italy. *British journal of cancer*, 99(2), pp.225-229.
42. Hussain, S., Nasare, V., Kumari, M., Sharma, S., Khan, M.A., Das, B.C. and Bharadwaj, M., 2014. Perception of human papillomavirus infection, cervical cancer and HPV vaccination in North Indian population. *PLoS One*, 9(11), p.e112861.
43. Ziarnowski, K.L., Brewer, N.T. and Weber, B., 2009. Present choices, future outcomes: anticipated regret and HPV vaccination. *Preventive medicine*, 48(5), pp.411-414.

44. Liao, A., Stupiansky, N.W., Rosenthal, S.L. and Zimet, G.D., 2012. Health beliefs and vaccine costs regarding human papillomavirus (HPV) vaccination among a US national sample of adult women. *Preventive medicine*, 54(3-4), pp.277-279.
45. Duvat, B., Gilca, V., Boulianne, N., Pielak, K., Halperin, B., Simpson, M.A., Baxendale, D., Sauvageau, C., Lavoie, F. and Dube, E., 2007. Do Nurses Support Hpv Vaccination? Opinions And Knowledge About Primary And Secondary Cervical Cancer Prevention. In *Abstract Book of the 24th International Papillomavirus Conference and Clinical Workshop*.
46. Wu, T., Qu, S., Fang, Y., Ip, M. and Wang, Z., 2019. Behavioral intention to perform risk compensation behaviors after receiving HPV vaccination among men who have sex with men in China. *Human vaccines & immunotherapeutics*, 15(7-8), pp.1737-1744.
47. Kreimer, A.R., Villa, A., Nyitray, A.G., Abrahamsen, M., Papenfuss, M., Smith, D., Hildesheim, A., Villa, L.L., Lazcano-Ponce, E. and Giuliano, A.R., 2011. The epidemiology of oral HPV infection among a multinational sample of healthy men. *Cancer Epidemiology and Prevention Biomarkers*, 20(1), pp.172-182.
48. Sherris, J., Friedman, A., Wittet, S., Davies, P., Steben, M. and Saraiya, M., 2006. Education, training, and communication for HPV vaccines. *Vaccine*, 24, pp.S210-S218.
49. Kotler, P., Roberto, N., & Lee, N. (2002). *Social marketing: Improving the quality of life* (2nd ed.). Thousand Oaks, CA: Sage
50. Caron, R.M., Kispert, E. and McGrath, R.J., 2008. Human papillomavirus (HPV) vaccine: Attitudes, behaviors, and beliefs of at-risk women. *The Internet Journal of Health*.

