



Systematic Review: Does a positive human papillomavirus vaccination status increase the risk of unsafe sexual health practice?

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Introduction

Immunisation programs are one of the most economically efficient means of decreasing morbidity and mortality [ref]. In 2007, Australia was the first country to implement a government-funded national human papillomavirus (HPV) vaccination program². Since its induction, the HPV program remains one of the most successful public health initiative, covering 71% of all Australian females aged 15 years and over and reducing HPV infections by 77%³.

Interestingly, whilst rates of HPV infection have declined, other sexually transmitted infections (STI) have escalated to a 20 year high⁴. At the core of this problem is the declining rate of safe sexual health practice and health awareness. 61% of young people do not use condoms regularly and 13% having never used one at all⁵. Furthermore, although rates of HPV vaccination have remained constant since its introduction, rates of Pap tests have been declining⁵.

What constitutes safe sexual health practice is subjective but nevertheless involves adequate preventative measures against STI transmission and unplanned pregnancies. A number of studies have attempted to analyse factors that have influenced these trends. Therefore we aim to unify these studies and provide an Australian perspective to determine whether a positive HPV vaccination status increases the risk of engaging in unsafe sexual health practice.

Methodology

Search strategy:
A systematic literature search was conducted in MEDLINE, Scopus, Embase, Discovery and Google Scholar, from the 1st of January 2007 to the 1st of March 2015. The search terms used were *papillomavirus infections, human papillomavirus or HPV AND vaccination, Gardasil or Cervarix AND behaviour, Pap smear, early detection of cancer, safe sex OR health knowledge, attitudes, practice AND Australia*. Reference lists of all included papers were examined for any additional studies not identified from the main search

Inclusion and exclusion criteria:
We included peer-reviewed articles that reported Australian data on HPV vaccination in females of all ages. We excluded conference abstracts, case series, case studies, editorials and opinion pieces. Furthermore studies had to be reported in the English language and published from January 2007 onwards.

Data extraction and analysis:
For each study, pertinent data and all relevant outcomes were transcribed into a pre-specified form .This was conducted by three researchers. No meta-analysis was conducted. All data was tabulated and narratively synthesised.

Critical appraisal:
All included studies were critically appraised by three independent researchers to identify bias or factors that may have limited the validity, reliability and accuracy of results. Each study was critically appraised by three researchers in accordance with internationally accepted criteria (STROBE, CONSORT, PRISMA)⁶⁻⁸.

Results

Table 1) Main findings of the four included studies	
Author(s) and study population	Main findings
Shand <i>et al</i> (2010)⁹ 18 – 26 year old Australian women (<i>n</i> =274)	<ul style="list-style-type: none">No significant association between cervical cancer screening and sexual activity or past experience with abnormal Pap test and cervical cancer.No significant differences on overall knowledge of HPV, cervical cancer or Pap testing between participants who followed the recommended screening schedule and those who did not.
Brotherton & Mullins (2010)¹⁰ 18 –28 year old Victorian women (<i>n</i> =234).	<ul style="list-style-type: none">Awareness of HPV vaccine was high, though 19% assumed, “<i>the vaccine can prevent all cervical cancers if given early enough</i>”.95.5% thought Pap tests were still needed after vaccinationUnvaccinated women more likely to believe that HPV vaccine could be used as treatment for cervical cancer.17% of unvaccinated women suggested “<i>knowing the vaccine is available makes me less likely to have a Pap test in the future</i>”
Mather <i>et al</i> (2012)¹¹ 18 – 30 year old psychology students (<i>n</i> =193) at University of Sydney.	<ul style="list-style-type: none">Vaccination is not a significant predictor of perceived vulnerability to cervical cancer (p=0.601), intention to participate in HPV screening (p=0.521) or uptake of cervical screening (p=0.181)HPV vaccination was not a significant predictor of safer sexual behaviour (p=0.515) or consistent condom use (p=0.876).HPV vaccination was a significant predictor of positive attitudes towards maintaining sexual health (p<0.001), with vaccinated participants scoring on average 5.6 points out of 40 higher on questionnaire compared to unvaccinated participants.U Vaccination was not associated with scores in a knowledge test, and responses from both groups were poor overall especially on cervical screening knowledge. 48% incorrectly responded when quizzed on when cervical screening should be commenced.
Budd <i>et al.</i> (2014)¹² 20-29 year old Victorian women(<i>n</i> not recorded)	<ul style="list-style-type: none">Two- and three-year participation in cervical screening was significantly lower, by between 10.1% and 21.7%, in vaccinated women compared to unvaccinated womenWomen aged 30-34 (who by definition had received the vaccination electively) showed even lower cervical screening participation in vaccinated compared to unvaccinated women, of between 33.8 and 55.7% difference.

Discussion

Comparison to existing knowledge:
To our knowledge, this systematic review is the first to explore the association between HPV vaccination amongst women and sexual behaviour in Australia. Shand et al and Mather et al did not identify a significant association between HPV vaccination and sexual behaviour^{9,11}, which are similar to that of the UK-based systematic review¹³. A recent survey of Nordic women found that HPV vaccination did not result in earlier sexual debut or greater risk taking behaviour¹⁴. Furthermore, a large cross-sectional and longitudinal study of 1053 girls in the UK found that uptake of the vaccine did not affect condom use or number of sexual partners¹⁵. From our review, overall knowledge on HPV, STIs, HPV vaccine and cervical cancer screening was poor with a high degree of misconceptions, consistent with findings by Coles et al¹³. Shand et al found that knowledge did not change with vaccination status⁹. In comparison, several studies indicate vaccinated individuals had higher levels of knowledge compared to the unvaccinated cohort. Studies in the UK, Germany and the US have also demonstrated positive associations between HPV vaccination and awareness and likelihood of attending regular cervical cancer screening¹⁶⁻¹⁸.

Limitations of this review:
Search was limited to English language papers produced after 2007. Furthermore, the four identified papers only measured women’s intention to continue participating in cervical cancer screening according to the current national guidelines. No studies looked at the numerical rates of screening participation, even though 7 years have elapsed since the implementation of the national HPV vaccination program.

Limitations of included studies:
All studies were cross-sectional design and do not provide information on temporality. Various biases exist within each of these studies (see Table 2)

Table 2) Types of bias from the four included studies				
	Shand <i>et al</i> (2010) ⁹	Brotherton and Mullins (2010) ¹⁰	Mather <i>et al</i> (2012) ¹¹	Budd <i>et al</i> (2014) ¹²
Sampling	Snowball sampling (acquaintances of the investigators) which therefore lacks random selection. High chance of homogeneity between participants	Study precluded women without a phone or with communication difficulties (e.g. hearing impaired, foreign language).	Exclusively sampled students in a psychology course at the University of Sydney (more highly educated than the general public).	Minimised by using population-based data sourced from the Victorian Cervical Cytology Registry and the National HPV Vaccination Program Register.
Self-selection	Women who have an interest in sexual health may have been more likely to participate.	Women with interest in sexual health more likely to participate	Participants received partial course credit for their participation.	N/A
Attrition	76/350 surveys were not analysed due to keys measures not being completed	Not reported	19/212 students did not complete the survey	N/A
Interpretation	Minimised by performing psychometric analysis of the scale and removing poor correlation items	Minimised by using trained interviewers with standard scripts and pilot testing	Reliability analyses indicated that all purpose-designed scales had acceptable internal reliability, except for the vulnerability scale.	N/A
Reporting	Minimised by using an online questionnaire.	Minimised by using only specifically trained female interviewers	Minimised by online survey conducted at a time and place of the participants’ choosing.	N/A
Confounding	Participant responses were stratified according to relevant variables Disparity of group sizes between those who had received the HPV vaccination and those who had not, prevented more detailed examination of the barriers thought to be associated with vaccine uptake in the non-vaccination group.	The presence of potential confounding variables was not addressed in the statistical analysis.	Demographic data about ethnicity was captured, however the country of long-term residence was not	No adjustment for socioeconomic status was made

Conclusion

The results have proven inconclusive, as there is insufficient evidence to support or refute that HPV vaccination increases the risk of unsafe sexual behaviours. We identified a number of misconceptions regarding HPV, vaccination programs and cervical cancer screening. As such these issues must be addressed in through education and public health policy

References

