

Full Length Research Paper

HPV and Papanicolaou (Pap) smear: Compliance, knowledge and barriers for young women in Bathurst

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Introduction: Cervical cancer is the third most commonly diagnosed cancer worldwide. Pap smears and HPV vaccinations allow for prevention, diagnosis and improved treatment for cervical cancer. Concerns have been raised about decreased Pap smear compliance due to misconceptions about the role of HPV vaccinations. This study aimed to assess the compliance of, the knowledge about and the barriers to receiving HPV vaccinations and Pap smears amongst the 18-30 year old females in Bathurst. **Study Design:** This descriptive study was conducted using an anonymous questionnaire that was distributed at various locations in the Bathurst region. **Results:** 166 participants completed the survey. Of the 92% (153) who were sexually active, 59% had received ≥ 1 HPV vaccination and 58% were compliant with the Pap smear recommendations. No relationship was established between vaccination status and Pap smear compliance ($p=0.22$). Unemployment was the only factor negatively associated with HPV vaccination status. Greater knowledge scores were noted in the HPV vaccinated group compared with the non-vaccinated group ($p<0.001$). The most common barriers for Pap smears were patient discomfort and embarrassment (40%). **Conclusion:** This study demonstrated that women in the Bathurst region have a poor HPV vaccination rate. Although good Pap smear compliance was noted, identified barriers to Pap smears need to be addressed to further increase compliance. Further research needs to be conducted amongst HPV vaccinated females to continue to evaluate Pap smear compliance.

Key words: Cervix, cancer, cervical cancer, HPV, pap smear, women's health.

INTRODUCTION

Cervical cancer is the third most commonly diagnosed and fourth most common cause of cancer mortality in women worldwide (American Cancer Society, 2011). The majority of these cases have been reported in developing countries (American Cancer Society, 2011). In Australia, cervical cancer is the twelfth most common cancer – accounting for 1.5% of newly diagnosed cancers and 1.3% of cancer deaths (Australian Institute of Health and Welfare [AIHW], AIHW, 2012(a); AIHW, 2013(b)). This lower

rate of incidence and mortality compared to other nations is largely attributed to the National Cervical Screening (AIHW, 2013). Regular screening allows for early detection of low-grade abnormalities and treatment before progression to higher stage cervical cancer (AIHW 2013).

The primary cause for cervical cancer is infection with high-risk strains of HPV, namely HPV 16 and 18 (Rositch et al., 2012). HPV 16 and 18 cause 56% and 10-15% of all cervical squamous cancers respectively (Rositch et al., 2012). HPV 18 is also responsible for 35% of cervical adenocarcinomas (Balanchandra, 2012). Other strains of HPV, including HPV 6 and 11, are not implicated in cancer development but commonly cause genital warts

(Hawkins et al., 2013). The usual path for cervical carcinogenesis involves infection with HPV, persistence of the virus, promotion and progression of a clone of the HPV infected cell to a precancerous stage (cervical intraepithelial neoplasia (CIN) grade 3), and then invasion (Balanchandra, 2012).

There are multiple risk factors for the development of cervical cancer, including age at first intercourse, smoking, multiparity, sexually transmitted infections (STI), nutritional factors and long-term oral contraceptive use (Balanchandra, 2012; Schiffman and Castle.,2003).Age in particular is important, as the greatest incidence of HPV infection is amongst 20-24 year old females, with progressively declining rates after 30 years of age (Balanchandra, 2012).

In an attempt to reduce HPV infection rates and subsequent cervical cancer, the Australian Government has funded the National HPV Vaccination Program since 2007(Cancer Council Victoria, 2014). However, not all HPV strains are covered by vaccination, and hence regular Pap smears remain vital for women who are sexually active(Elit et al. 2009; Australian Government DHA, 2012).

Recent studies have shown that in women with no history of cervical cancer, knowledge about the relationship between HPV and cervical cancer is poor Charakorn et al. 2011; Wong, 2010; Pitts et al., 2010).Predictors that positively influence the knowledge about HPV and Pap smears include media awareness, access to primary healthcare, female sex, Remote and rural geographical settings were found to negatively influence the knowledge about HPV and Pap smears (Wojciech et al., 2013; Assoumou et al., 2015; Montgomery et al., 2015; Hyacinth et al., 2012).

The current literature suggests that the most common barriers to Pap smears include a lack of understanding and confidence in the cervical cancer screening, embarrassment, anxiety about the potential diagnosis, inability to find time to make appointments, negligence, cost involved, and past negative experiences(Assoumou et al., 2015; Montgomery et al., 2015). Assoumou et al.'s study (2015) showed that Gabonese women had a very low level of knowledge regarding HPV, cervical cancer and Pap smears. Montgomery et al. (2015) reported a low level of knowledge regarding cervical screening and HPV vaccination amongst women in Karnataka (India). Alnagger et al.'s study (2010) demonstrated that age, marital status, income and ethnicity affected knowledge about cervical cancer screening. Jia et al.(2013), noted that women were more likely to undergo cervical cancer screening if they had more knowledge about cervical cancer, if they have a positive family history of cervical cancer or if their education was at secondary school level or higher. The recommendations made by studies that assessed knowledge for cervical cancer screening and HPV suggest more public health awareness, increasing access to outreach programs, increasing access to culturally appropriate practitioners, increasing Government funding,

improving access to healthcare providers and introducing reproductive health lessons in schools (Assoumou et al., 2015; Alnagger et al., 2015; Montgomery et al., 2015).

Bathurst is a regional area 200km west of Sydney with a population of 38,519(Bathurst Council, 2013; Australian Bureau of Statistics, 2011).Females account for approximately 50% of the total population(Australian Bureau of Statistics, 2011). The median age in Bathurst is 36 years compared with the national median age of 37(Australian Bureau of Statistics, 2011).The lack of data on compliance, barriers and knowledge specific to females in the Bathurst region regarding HPV vaccination and Pap smears highlights the need for this study. This study aims to assess the compliance, knowledge and barriers regarding HPV vaccinations and Pap smears amongst women in the Bathurst region. The results of this study will potentially guide and enable development of future health promotion and prevention strategies for cervical cancer in Bathurst.

Aims

This study aims to:

- i) Document compliance rates of the HPV vaccination and Pap smears in the Bathurst region
- ii) Identify any association between HPV vaccination and Pap smear compliance
- iii) Compare knowledge about HPV and Pap smears between HPV vaccinated and unvaccinated females
- iv) Identify barriers to Pap smear compliance in the Bathurst region

METHODS

This descriptive study will investigate the compliance, knowledge and barriers associated with Pap smears and the HPV vaccination amongst females aged 18-30 years old in the Bathurst region.

i) Literature Review

A literature search was conducted using PubMed, Embase and Google Scholar search engines (Appendix A). Publications were limited to those that were free, had full text availability, were published in the last 5 years (2008-201), were related to the human species, and were written in English. Papers were excluded if they did not relate to the research topic, or if male participants were involved. A further literature search was conducted prior to submission of the manuscript.

PubMed

Key search terms were identified and searched individually using MeSH Terms and the Boolean operator 'OR' (Appendix A1). Following the primary search (Appendix A2), another search was performed using different

combinations of the search themes (Appendix A3). In total, 3 significant papers were identified.

Embase

Four papers (Appendix A4) were identified that supported the research topic. These papers had not previously been identified through the PubMed search.

Google Scholar

Due to the large number of search results, relevant titles were noted and abstracts were read in full. Two articles from the Google Scholar search (Appendix A5), which were not previously identified through the PubMed and Embase searches, were included.

ii) Participants and Surveys

GP practices within Bathurst, Charles Sturt University and Bathurst Netball Association were contacted by email and telephone to obtain approval for survey administration at these locations. A structured survey of 27 questions was used to collect information about demographics, HPV vaccination and Pap smear compliance, knowledge about the HPV vaccination and Pap smears and barriers towards receiving Pap smears (Appendix B). Participation was voluntary and anonymous.

The survey was developed following a literature review, and piloted on 5 women aged 18-30 years to assess appropriateness. Following feedback, the survey was modified and administered between the 5th August 2013 and 11th October 2013. Exclusion criteria included male gender, females not within the predetermined age range (18-30 years) and females outside the Bathurst region. Women aged 18-30 years who were living, working or studying in Bathurst at the time of the survey were eligible for inclusion in the study.

Surveys were made available at five GP practices for eligible women to complete. Medical students undertaking this project and GP receptionists facilitated survey administration. Further participants were recruited at the Charles Sturt University (Bathurst Campus) and at local games held by the Bathurst Netball Association.

A participant information sheet (Appendix C) was provided and return of a completed survey was taken as consent to participate. A drop box and sealable envelopes were provided to maintain privacy. An information pamphlet was offered upon survey completion (Appendix D) which included information about HPV, the HPV vaccine, Pap smears and advice to talk to their GP should they have any further questions.

iii) Data Analysis

The research questions below are based on the aims of the study. Data was entered into an Excel spreadsheet.

Tables and graphs were constructed to answer each question and the Chi-square test was used to assess differences between relevant groups. Significance was determined at $p < 0.05$.

1. What proportion of sexually active females aged 18-30 years are vaccinated with the HPV vaccination?
2. What proportion of sexually active females aged 18-30 years are compliant with the recommended 2-yearly Pap smear guidelines?
3. Is there an association between HPV vaccination and Pap smear compliance amongst sexually active females?
4. Does age, education level or employment affect:
 - a. HPV vaccination compliance?
 - b. Pap smear compliance?
 - c. Knowledge about HPV and Pap smears?
5. How do vaccinated and unvaccinated groups compare in their knowledge about HPV, HPV vaccination and Pap smears?
6. Where do most females in Bathurst receive their information regarding HPV vaccination and Pap smears?
7. What are the barriers preventing women from receiving regular Pap smears?

The Table Builder²⁶ tool from the Australian Bureau of Statistics (ABS) website was used to compile relevant demographic information on women aged 18-30 living in the Bathurst Urban Centre Locality (UCL112001). This was then compared to the surveyed population to determine whether it was representative of the Bathurst population.

To assess compliance rates, women were divided into compliant and non-compliant categories for both HPV vaccination status and Pap smears. Partial vaccination was defined as having had one or two doses of the vaccine and full vaccination as having received all three doses. In accordance with the Australian Department of Health and Aging's National Cervical Screening Program recommendations, Pap smear compliance was defined as having had a Pap smear every two years for women who had ever been sexually active. Women who had never been sexually active before were excluded.

On the occasion that participants left a question unanswered, their answers were inferred only if there was sufficient information using either their comments or other survey questions answered.

Knowledge was measured by totalling the number of correct answers to the knowledge questions in the survey, giving an overall 'knowledge score'. Participants were divided into groups that answered < 5 or ≥ 5 of the 10 questions correctly. The knowledge scores of the different participant groups were then compared.

Barriers to having a Pap smear were assessed by calculating the proportion of women reporting each barrier.

Ethics approval for the study was obtained from the UWS Ethics Committee on 31st May 2013 (Ethics Approval Number: H9067).

RESULTS

A total of 166 participants aged between 18-30 years completed the survey (Table 1). Of this population, 50% were fully HPV vaccinated. From the total sample (166), 92% (153) of females were sexually active and 58% of these females were compliant with Pap smear requirements. This study group consisted of a significantly higher proportion of 18-25 year old women ($p < 0.001$), a lower proportion of people who completed tertiary education ($p < 0.001$), a higher representation of students ($p < 0.001$) and lower rate of marriage in the study population ($p < 0.001$) when compared to the general Bathurst population (Table 1). This difference is consistent with recruitment of participants from Charles Sturt University.

HPV Vaccination Compliance

Of the 166 participants in the survey, 92% (153) were ever sexually active. Of these, 59% (90) had received at least one dose of the HPV vaccination (13 partially vaccinated, 77 fully vaccinated), 28% (42) had never been vaccinated, and 13% (20) were uncertain of their vaccination status; one did not answer.

Pap smear compliance

Of the 153 sexually active participants, 58% (89) were compliant with current recommended Pap smear guidelines, 41% (62) were non-compliant, and 1% (2) did not respond. The non-compliant group consisted of 48 women who had never had a Pap smear and 14 who had received Pap smears less frequently than recommended guidelines.

Association between HPV vaccination and Pap smear compliance

Of the 153 sexually active females, 21 did not respond to questions regarding both vaccination status and Pap compliance. Therefore, were excluded from this analysis. There was no statistically significant difference found in Pap smear compliance between the different vaccination groups (never vaccinated 57%, partially vaccinated 69% and fully vaccinated 57%; $p = 0.22$).

Effect of age, education level and employment status on HPV vaccination compliance

There were not any statistically significant difference in vaccination rates between age groups ($p = 0.66$) or education

level ($p = 0.68$). This study showed that unemployed were less likely to be vaccinated (partially or fully) than students or those employed ($p = 0.02$) (Table 2).

Effect of age, education level and employment status on Pap smear compliance

Of the 153 sexually active participants, no significant difference was found in the rate of Pap smear compliance on the basis of education or employment status. Age was a factor that affected Pap Smear compliance. This study showed that the 26-30 age group had a higher rate of Pap smear compliance (81%) than the 18-25 age group (53%) ($p < 0.01$) (Table 3).

Effect of age, education level and employment status on knowledge

Knowledge scores regarding HPV vaccination and Pap Smears were obtained based on age, education level and employment status (Table 4). This study showed nil statistically significant difference in knowledge scores between the groups in terms of age ($p = 0.44$), education ($p = 0.18$) and employment ($p = 0.63$).

Knowledge comparison between vaccination groups

There was a significant difference in knowledge scores between the vaccination groups, with more participants who had ever been vaccinated answering ≥ 5 questions correctly compared with the unvaccinated group ($p < 0.001$) (Table 5).

Knowledge differed between the three groups in four of the questions. The fully vaccinated group answered more questions correctly regarding vaccine coverage of HPV strains ($p < 0.001$) and the role of the vaccine in the prevention of cervical cancer ($p < 0.05$) than the partially or never vaccinated groups. The partially vaccinated group answered more questions correctly regarding the prevalence of HPV ($p < 0.01$) and Pap smear requirements following HPV vaccination ($p < 0.001$) (Appendix E).

Information sources regarding HPV vaccination and Pap smears for women in Bathurst

The most common sources of information about Pap smears were family or friends (69%), and doctors (65%). For HPV vaccination, the most common sources of information were school (60%) and doctors (38%). Other important sources of information were television and magazines (Figure 1).

Sources for HPV information varied with age. Significantly more of the older age group (26-30 years) reported using the Internet ($p < 0.001$), magazines ($p < 0.001$), and newspapers ($p < 0.01$) for information compared to the younger group (18-25 years) that obtained

Table 1. Demographics of sample and Bathurst population, women aged 18-30 years.

Characteristics	Study population (n=166)	Bathurst Population* (n=3156)	P-values
Age			<0.001
18-25	83% (138)	69% (2174)	
26-30	17 % (28)	31% (982)	
Average age	22.1	23.3	
Aboriginality			0.39
Aboriginal or Torres Strait Islander descent	4% (6)	5% (161)	
Highest level of education completed			<0.001
Did not finish secondary school	9% (15)	14% (440)	
Year 12 or equivalent	64% (106)	38% (1193)	
Tertiary degree	27% (45)	41% (1279)	
Primary employment status**			<0.001
Student	60% (99)	42% (1310)	
Not employed	7% (12)	16% (502)	
Employed	33% (55)	37% (1155)	
Marital Status			<0.001
Never married (including de facto)	90% (149)	82% (2578)	
Married	7% (12)	16% (500)	
Separated/Divorced	2% (4)	2% (78)	
Widowed	0.6% (1)	0% (0)	

*Bathurst Urban Centre Locality, ABS 2011²⁶

**Those working whilst studying are considered as 'students' for the purpose of this data.

Table 2. Comparison of HPV vaccination compliance between age groups, education level and employment status.

	Total	Never vaccinated (n=46)	Partially vaccinated (n=14)	Fully vaccinated (n=83)	P-values
Age					0.66
18-25	121	31% (38)	9% (11)	60% (72)	
26-30	22	36% (8)	14% (3)	50% (11)	
Highest level of education completed					0.68
Did not finish secondary school	11	45% (5)	0% (0)	55% (6)	
Year 12 or equivalent	92	33% (30)	10% (9)	58% (53)	
Tertiary degree	40	28% (11)	13% (5)	60% (24)	
Primary employment status					<0.05
Student	88	30% (26)	9% (8)	61% (54)	
Not employed	5	100% (5)	0% (0)	0% (0)	
Employed	50	30% (15)	12% (6)	58% (29)	

HPV information from school ($p < 0.001$). Sources for Pap smear information were similar for the different age groups (Figure 1).

Barriers preventing women from receiving regular Pap smears

This study demonstrated that forty-five percent of the total

Table 3. Comparison of Pap smear compliance by age, education level and employment status.

	Total	Pap smear compliant	Pap smear non-compliant	p-value
Age				
18-25	126	53% (67)	47% (59)	<0.01
26-30	27	81% (22)	19% (5)	
Highest level of education completed				
Did not finish secondary school	15	47% (7)	53% (8)	0.33
Year 12 or equivalent	96	56% (54)	44% (42)	
Tertiary degree	42	67% (28)	33% (14)	
Primary employment status				
Student	88	51% (45)	49% (43)	0.10
Not employed	12	75% (9)	25% (3)	
Employed	53	66% (35)	34% (18)	

Table 4. Knowledge scores compared by age, education level and employment status.

Characteristics				P-value
Age	18-25(n=138)	26-30(n=28)		0.44
<5 knowledge score	40% (55)	32% (9)		
≥5 knowledge score	60% (83)	68% (19)		
Highest level of education completed	Did not finish secondary school (n=15)	Year 12 or equivalent (n=106)	Tertiary degree(n=45)	0.18
<5knowledge score	60% (9)	38% (40)	33% (15)	
≥5knowledge score	40% (6)	62% (66)	67% (30)	
Primary employment status	Student(n=99)	Not employed (n=12)	Employed (n=55)	0.63
<5knowledge score	36% (36)	50% (6)	40% (22)	
≥5knowledge score	64% (63)	50% (6)	60% (33)	

Table 5. Knowledge score between vaccination groups.

Knowledge score	Never vaccinated (n=46)	Partially vaccinated (n=14)	Fully vaccinated(n=83)	P-value
<5	57% (26)	21% (3)	25% (21)	<0.001
≥5	43% (20)	79% (11)	75% (62)	

cohort (74 participants) reported one or more barriers to receiving pap smears (Figure 2). The most commonly reported barrier was discomfort and embarrassment (40%). The entire study population (166) felt that Pap Smears were necessary. All the participants (166)

indicated that inability to get an appointment or cultural reasons were not barriers to receiving Pap smears. In addition to the barriers shown in Figure 2, 'Other' barriers mentioned included fear due to previous abnormal results, 'feeling lazy' and 'forgetting'.

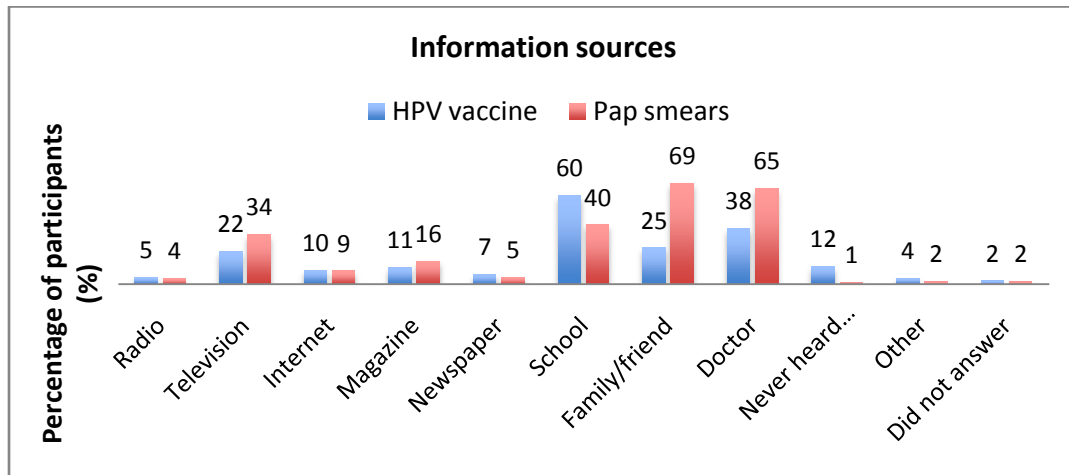


Figure 1. Sources of information about HPV vaccination and Pap smears.

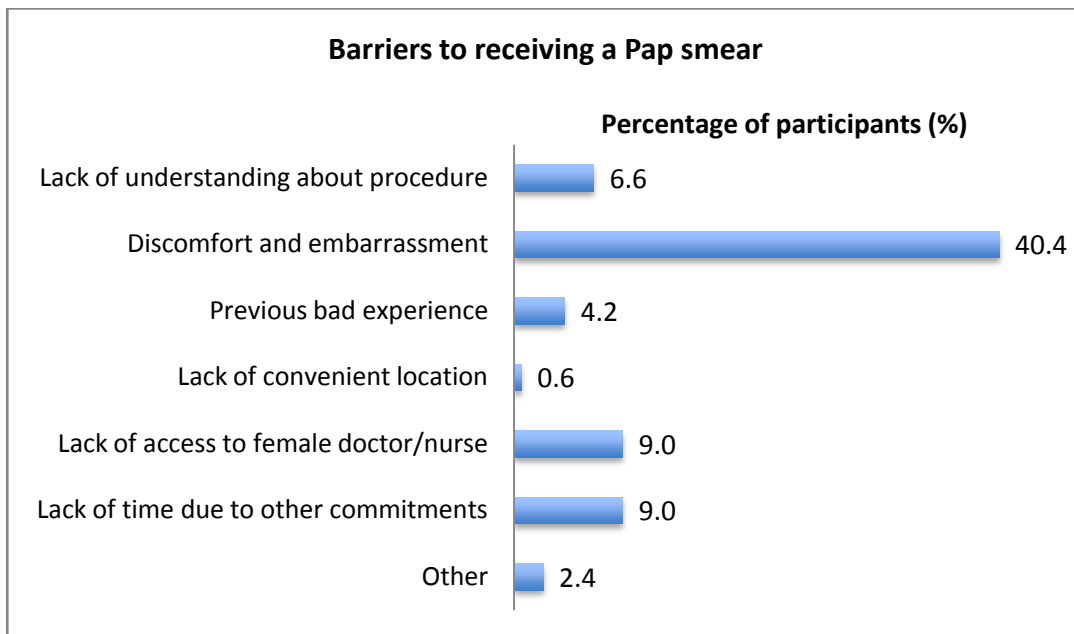


Figure 2. Barriers to receiving a Pap smear.

DISCUSSION

It is important that women continue to receive regular Pap smears following the HPV vaccination, (Elit et al., 2009; Australian Government DHA, 2012) and that they understand the significance of this for their future health. This study was the first to be conducted in Bathurst that investigated Pap smear and HPV vaccination compliance, participant knowledge and the barriers preventing Pap smears amongst young women. It also

assessed whether factors such as age, education, employment and HPV or Pap smear knowledge have any impact on compliance. Such information may provide valuable insights for local health professionals and may direct health education campaigns.

HPV vaccination compliance

The compliance with HPV vaccination in the Bathurst region was significantly lower than both the National and

State (New South Wales) average (Australian DHA, 2013). Only 50% of the participants in this study were fully vaccinated against HPV compared to the national average compliance rate of 71% and the NSW compliance rate of 73% (Australian DHA, 2013). HPV vaccination rates and compliance within the literature vary greatly. Kate et al. (2013) reported in a cohort of Malawian mothers, even though the knowledge and compliance level for cervical cancer and HPV was low, the desire for uptake of this vaccination was high. The limiting factors noted for HPV compliance in this study were access to healthcare services and unemployment (Kate et al. 2013). This study (Kate et al. 2013) supports our finding that unemployment affects HPV vaccination compliance. Perhaps, the cost of HPV vaccination has affected the uptake of HPV vaccination in the unemployed group for this study. This study supports the need for more health education and government subsidy for HPV vaccinations to help reduce the number of unvaccinated females who are unemployed in the Bathurst region. Paul et al. (2012) limited their data to mother-daughter pairs in which 87% of girls were fully vaccinated (3 doses). Eighty-two percent of these girls were 11 years old while only 2% were 12 years or older. Thus, illustrating that younger girls were more likely to be vaccinated than older girls. This result agrees with the current study as younger females were fully vaccinated than their older counterparts in this study. However, this disparity may be reflective of more participants recruited at Charles Sturt University.

Factors influencing HPV vaccination compliance

In order to explain the difference in vaccination rates, age, education level and employment status were assessed for their relationship with vaccination compliance. Employment status was the only factor found to have any significant association, with none of the unemployed group vaccinated against HPV. While employment status had a statistically significant association with vaccination compliance, the unemployed group comprised of only 5 participants (4% study population vs 16% unemployed Bathurst ABS data). Hence, this finding may not accurately reflect the greater Bathurst population. However, it does suggest that cost may be a barrier to vaccination compliance. For participants not covered by the school-based vaccination program, a full course of the vaccine currently costs \$450.3

Studies indicated that factors affecting HPV vaccination compliance were age, unemployment and education (Assomou et al. 2015; Montgomery et al., 2015; Kate et al., 2013; Thanappapasr et al., 2010). However, Thanappapasr et al., (2010) reported that vaccinations were administered as a free school-based program to school-aged girls; this may negate the effect of age, education level and employment influencing their

vaccination compliance. Another study reported lack of knowledge about the HPV vaccine and perceived lack of need for the vaccine as factors affecting uptake of the HPV vaccine (Paul- Ebhohimhen et al., 2010). Once again, health promotion programs for cervical screening programs need to continue to educate targeted female groups (for example, unemployed) to improve cervical screening knowledge and participation in screening programs.

Pap smear compliance

The overall Pap smear compliance rate of our sample population was 58%, comparing closely to the 2009 national average rate of 59%. (AIHW, 2011) It is difficult to make compliance comparisons with the literature due to differences in recommendations between countries as to how frequently women should have Pap smears. Thanappapasr et al., (2010) reported a 37% compliance rate, although compliance was defined as women having annual Pap smears. In the Australian based study, 60% of participants were compliant with Australian Pap smear guidelines (Shand et al. 2010). Gau and Dahlui (2013) reported that less than 50% of the rural Malaysian cohort survey were compliant with Pap smears. This was partly reflected by the low level of knowledge regarding cervical cancer screening program in rural Malaysia (Gau and Dahlui 2013). Paul- Ebhohimhen et al., (2010) reported a lack of knowledge about cervical screening, embarrassment, discomfort, age and lack of HPV vaccination as factors affecting decision to attend regular Pap smears. In developing countries improving knowledge regarding Pap smears either by introduction of reproductive health subjects at schools, healthcare provider encouragement, opportunistic screening in rural areas and ongoing public health promotion about cervical cancer screening may help improve Pap smear compliance rates.

Factors influencing Pap smear compliance

Participants education level and employment status were not associated with Pap smear compliance. However, increased age was associated with higher compliance, with 82% compliance amongst the 26-30 year old group compared with only 53% in the 18-25 year old group ($p < 0.01$). This result is supported by Gau and Dahlui (2013). Interestingly, both age groups in this study appeared to have comparable knowledge about Pap smears and their knowledge sources were similar. Multiple studies report higher education, visiting the doctor or having a Pap smear in the past year, having a history of an abnormal Pap smear and having a positive HPV test as factors positively associated with intentions to have a Pap smear in the next three years (Alnagger et al., 2015; Jia et al., 2013; Anhang Price et al. 2011).

Hyacinth et al., (2012) and Jia et al. (2013) agreed that higher education level, higher social economic status and knowledge about cervical cancer increased compliance and utilization of Pap Smears. Gau and Dahlui (2031) agreed with the above studies in that age, ethnicity and marital status are positively associated with uptake of Pap smears.

The study did not determine whether women had been sexually active for less than 2 years and thus, in accordance with the guidelines, would not yet have been required to commence Pap smear screening. This may have contributed to an artificially lower percentage of compliance.

Relationship between HPV vaccination and Pap smear compliance

Pap smears remain a vital screening tool after HPV vaccination because the vaccine does not protect from all HPV strains that cause cervical cancer (Elit et al., 2009; Australian Government of DHA, 2012). There is concern that poor knowledge about vaccinations and the need for regular Pap smears may cause a fall in Pap smear compliance following the vaccination. In our study population there were no statistically significant difference in Pap smear compliance between the HPV vaccinated and unvaccinated groups.

In comparison, Anhang Price et al.,(2011) showed that 96% of respondents knew they needed to continue Pap smear screening post vaccination. This awareness was greater in those who had received a Pap smear in the past 3 years or have had a history of HPV infection ($p<0.01$). Vaccinated women were more likely to have intentions to receive a Pap smear in the next three years than unvaccinated women ($p<0.001$) (Paul-Ebhohimhen et al., 2010). Paul-Ebhohimhen et al.,(2010) were able to conclude that both younger and older women (late adopters) participating in the vaccination program had a focus upon preventative health and were more likely to continue with Pap smear screening. Their study was, however, limited in that it could not comment on the intentions of women who had not yet initiated screening. These findings were supported by other studies in which unvaccinated girls were less likely to report planning to receive Pap smears when older (Assomou et al., 2015; Port et al., 2013; Paul-Ebhoimhen et al., 2010).

Knowledge & vaccination status

Comparison between the vaccination groups showed significant difference in knowledge scores ($p<0.001$). No association were found in this study between knowledge levels and age, education level or employment status. In a group of Gabonese women factors such as age, marital status and income positively influenced knowledge

scores regarding HPV vaccination (Assoumou et al., 2015). It can be postulated that the higher knowledge scores of the vaccinated group in this study could be due to education received during the vaccination process by the administering healthcare professional, or may be associated with prior knowledge that led participants to seek vaccination. Other studies identified that poor knowledge about HPV and cervical cancer can contribute to poor vaccination compliance. (Montgomery et al., 2015; Assoumou et al., 2015; Paul et al., 2012) Paul et al., (2012) showed that girls who had completed the full HPV vaccination course had a significantly higher mean knowledge score than those partially vaccinated ($p<0.001$). Another study found no association with overall knowledge and vaccination status (Shand et al., 2010). However, Shand et al.'s (2010) study was not carried out in a rural location suggesting access to healthcare and health promotion would be more pronounced in urban areas than rural areas. In such settings, assuming the level of education is high, people may be making a conscious choice not to vaccinate. As Assoumou et al., (2015) suggests, in rural settings, given the limited health promotion and knowledge about cervical screening, encouragement by healthcare providers and opportunistic screen may positively impact cervical screening rates. Lack of standardisation in methodology between studies makes it difficult to draw conclusions. Studies in Gabon and Malawi suggest that the knowledge regarding risk factors for cervical cancer is suboptimal, hence, more effort directed towards educating these females about risk factors for cervical cancer and cervical cancer screening in general will potentially improve knowledge, compliance and tackle barriers for HPV vaccinations and Pap smear compliance.

Barriers for women receiving Pap smears

The key barriers to Pap smear compliance identified in the study population were discomfort and embarrassment (40%), lack of access (9%), lack of time (9%) and lack of understanding about the procedure (7%). Similarly, three other studies found that the main barriers in their populations were embarrassment, discomfort, cost, lack of access to facilities, lack of female doctors and lack of knowledge (Montgomery et al., 2015, Shand et al., 2010; Paul-Ebhohimhen et al., 2010). Further barriers found in other studies include anxiety surrounding the potential diagnosis, feeling asymptomatic, past negative experience, inability to find time or make appointments and some participants perceiving no need for the procedure (Assoumou et al., 2015; Port et al. 2013; Hyacinth et al., 2012; Jia et al., 2013; Blomberg et al., 2008; Waller et al., 2009; Khanna and Phillips., 2001; Shand et al., 2010; Paul-Ebhohimhen et al., 2010; Jia et al., 2013). These are important factors to recognise, espe-

cially in the general practice setting, when attempting to address compliance issues. In the general practice setting especially in rural areas, it may be crucial to address the above factors by building a trusting relationship with the female patient, providing information about cervical cancer screening, educating females about what a Pap smear involves and possibly allaying fears regarding results by making a prompt follow up appointment once results are available. This follow up of Pap smear results in the general practice setting may encourage continuity of patient care, allow recognition of patients that need further investigations/referral and will encourage regular cervical screening. Other factors that may reduce barriers to receiving Pap smears may include outreach health programs to remote communities and more health promotion programs for rural and remote areas.

Study limitations

The main limitation of this study is the small sample size. Although there were 166 study participants, small numbers in some subgroups potentially lead to lack of statistical significance even though a small real difference may have existed.

Selection bias may have occurred due to convenience sampling and locations used to recruit participants. For example, participants from the general practice setting may have higher preventative healthcare behaviours and similarly, those from the university may exhibit different knowledge and health-seeking behaviours than the general Bathurst population.

It is difficult to compare the results of this study to the current literature given disparity in study design, data collection and recommendations for cervical screening in different countries. Majority of the studies used for this article were set outside of Australia (Paul et al., 2012; Thanappapasr et al., 2010; Anhang et al., 2011; Paul-Ebhohimhen et al. 2010; Alnagger et al., 2010; Assoumou et al., 2014), and had different sample sizes, education standards and employment categorisation when compared to this study. The age ranges also varied, for example, one used young school-aged girls (Paul-Ebhohimhen et al. 2010) while another included women up to 74 years of age (Anhang Prince et al., 2011). Moreover, some studies had different recommendations for Pap smear frequency compared to the current Australian recommendations. (Paul et al., 2012; Anhang Prince et al., 2011) It was difficult to compare knowledge levels of this sample to other populations in the literature, as there is no standardised scoring system available. Despite these limitations the findings of this study may be of great value to the Bathurst region in creating awareness and guiding local healthcare providers in developing future preventative strategies targeting HPV vaccination and Pap smears.

Future directions

Future research needs to be directed towards reporting the trends in Pap smear compliance post HPV vaccination and identifying barriers associated with low vaccination rates in the Bathurst region, in order to improve the future health of the community.

CONCLUSION

In conclusion, the results from this study show that young women in Bathurst have poor HPV vaccination rates and comparable Pap smear compliance compared to the national averages. Employment status was the only factor found to be negatively associated with vaccination uptake. Local government health awareness strategies need to be implemented to increase HPV vaccination uptake. No association between vaccination status and compliance with Pap smears was found. Pap smear compliance varied between the age groups, being lower in those under 26 years. Once again, health awareness strategies need to be designed to target the under 26 year old females to promote Pap smear compliance. On average, higher knowledge scores were found in participants who had received at least one dose of the HPV vaccine. Sources of information were similar across different demographic groups, with the most common being doctors, family/friends and school. In the Bathurst region, ongoing healthcare provider encouragement and opportunistic screen will continue to increase knowledge regarding the cervical cancer screening program. Discomfort and embarrassment were the most commonly reported barriers to women receiving Pap smears. Local healthcare providers perhaps need to be more culturally appropriate and improve their communication skills with female patients undergoing Pap smears. Future large scale trials need to be undertaken to further assess Pap smear compliance post HPV vaccination in the Bathurst region.

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