

## Assessment of Knowledge and Awareness of Pap Smear Screening, Cervical Cancer, and HPV Infection Among Urban Women: A Public Health Perspective

Arvind Chowdhary<sup>1</sup>, Seema Chowdhary<sup>2</sup>

<sup>1</sup>Medical Director and Specialist Pediatrician, Bloom Plus Poly Clinic LLC, Dubai, United Arab Emirates

<sup>2</sup>MS (Obstetrics & Gynaecology) Diploma in Reproductive Medicine & Embryology, Medical Director and Specialist gynecologist Aster Dubai Silicon Oasis Aster DM healthcare Dubai, United Arab Emirates

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Corresponding Author: Dr. Seema Chowdhary

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### Abstract:

**Background:** Cervical cancer poses a significant disease burden on the public health system, particularly in low- and middle-income countries (LMICs), such as India, which is responsible for almost one-fifth of cervical cancer cases reported globally. The primary causative factor is the persistent Infection caused by high-risk types of human papillomavirus (HPV), especially types 16 and 18. Pap smear screening and HPV vaccination are primary prevention methods, yet awareness of both measures and participation levels remain low, even among urban populations with easier access to healthcare than rural populations. Purpose: This article aims to evaluate urban women's level of knowledge and awareness of cervical cancer and Pap smear screening and HPV infection, particularly in regard to barriers to the effective uptake of preventive practice.

**Methodology:** The study was a hospital-based cross-sectional design that took place over a year, enrolling 96 urban women aged 21-65 years who were identified from a tertiary care hospital in Bihar, India. Data were collected using the pretested structured questionnaire through a 'face-to-face interview' that provided socio-demographic data along with questions related to cervical cancer knowledge, Pap smear screening, and HPV. Statistical analysis was done using a SPSS v27 version, with significance level set at  $p < 0.05$ .

**Results:** Low levels of initial awareness of cervical cancer risk factors, Pap smear screening, and HPV infection were evident. Significant barriers that influenced screening and vaccination uptake included misconceptions, cultural stigma, and a lack of sufficient counselling.

**Conclusion:** There are significant gaps in knowledge for urban women on cervical cancer prevention. There is an urgent need for programs delivering community education, the provision of affordable screening programs, and timely HPV vaccination campaigns to be offered to communities to manage the disease burden.

**Keywords:** Cervical Cancer, Pap Smear, HPV Infection, Awareness, Urban Women, Public Health, India.

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### Introduction

Cervical cancer is still a global public health issue, especially in low- and middle-income countries (LMICs) which have high cancer morbidity and mortality, along with limited access to screening and treatment services. According to the World Health Organization (WHO), cervical cancer is the fourth most common cancer among women, affecting more than 604,000 women around the world and claiming more than 342,000 lives in 2020 [1]. LMIC settings are at a greater risk, accounting for 90% of new cervical cancer cases and deaths, and also where access to preventive services, timely screening and diagnosis, and timely access to early treatment is limited. In India, cervical cancer comprises nearly one-fifth of all new cervical cancers and mortality globally which exemplifies the need for effective prevention and early detection. Although cervical cancer is a

largely preventable disease with routine screening and vaccination, there are significant awareness and screening barriers to effectively control cervical cancer [2].

The principal cause of cervical cancer is long-standing infection with high-risk human papillomavirus (HPV), the most common sexually transmitted infection. HPV 16 and 18 are responsible for an estimated 70% of cervical cancers worldwide. Most infections with HPV are transient and resolve spontaneously; however, the long-standing infection has the potential to cause precancerous lesions that develop towards eventual invasive malignancy, unless detected early and managed [3]. Use of HPV vaccines has been the most distinctive feature in preventing infection, but the effectivity has its dependence on the awareness, cooperation, and acceptance

by the community, where misconceptions and lack of relevant health education often set boundaries for the uptakes among urban communities.”

The Papanicolaou test or the Pap smear test is an easy-to-perform, inexpensive, yet accurate method for the detection of precancerous changes occurring in the cervix. If conducted regularly in the screening program, it greatly diminishes the incidence and mortality due to cervical malignancy by facilitating early diagnosis and intervention [4]. Though established to be an excellent tool for its efficacy, coverage for the screening for Pap smear is less optimal among many urban communities, including among the educationally advanced women. Lack of awareness, cultural taboo, fear of diagnosis, misconceptions regarding the procedure, combined with limited availability of accessible health facilities, are all responsible for participation rates that are less optimal. Screening with early detection, combined with the institution of HPV vaccines, constitutes the beginning of cervical malignancy prevention strategies; hence, the need for bridging the awareness gap among the populace as well as screening techniques [5].

The urban women, with better access to health facilities when compared with rural women, also present low participation rates in preventive screening initiatives as a result of psychosocial barriers, insufficient counseling, and conflicting lifestyle needs. Increased rates of urbanization, shifts in sexual behavior, and limited time for check-ups for health elevate the risk for HPV exposure but diminish the chances for preventive intervention. Knowing the extent of knowledge and awareness regarding the Pap smear screening, cervical cancer, and HPV infection among urban women is also indispensable for the formulation of specifically tailored interventions for enhancing the compliance for screening and the acceptance for vaccination [6].

Several studies have highlighted the role of educational campaigns and healthcare provider recommendations in improving screening rates and HPV vaccine uptake. However, persistent gaps in knowledge about cervical cancer risk factors, screening guidelines, and HPV transmission continue to hinder effective prevention efforts. From a public health perspective, identifying these knowledge deficits and the underlying socio-cultural barriers is essential to developing sustainable, community-based health education programs. Furthermore, improving awareness not only facilitates early detection but also empowers women to take proactive steps in safeguarding their reproductive health, thereby reducing the overall disease burden [7].

The present study was conducted with the aim to identify awareness and knowledge on the Pap smear screening, cervical malignancy, and HPV infection among urban women with the overall objective of

generating findings that would help in the formulation of public health interventions for cervical cancer prevention. By identifying the existing gaps and misconceptions, the health authorities will better create tailored education interventions, improve screening outreach activities, and boost promotion for the HPV vaccine. Through these initiatives, incidence as well as cervical malignancy mortality will possibly be reduced, contributing to the achievement of the WHO's goal to eliminate cervical malignancy as a public health problem by the year 2030.

### Methodology

**Study Design:** This was a hospital-based cross-sectional study aimed at assessing the knowledge and awareness levels of Pap smear screening, cervical cancer, and HPV infection among urban women.

**Study Area:** The study was conducted at the Obstetrics and Gynecology Department of a Tertiary Care Hospital in Bihar, India, which caters to a large urban population.

**Study Duration:** The study was conducted over a period of one year.

**Sample Size:** A total of 96 participants were enrolled in the study. The sample size was calculated based on an expected awareness prevalence rate of 50%, with a 95% confidence interval and a 10% allowable error.

**Study Population:** The study population included urban women attending the gynecology outpatient department (OPD) of the tertiary care hospital for routine check-ups or other gynecological concerns.

### Inclusion Criteria

- Women aged 21–65 years, as per WHO guidelines for cervical cancer screening.
- Residents of urban areas in Bihar for at least one year.
- Willing to participate and provide written informed consent.

### Exclusion Criteria

- Women with a previous diagnosis of cervical cancer.
- Pregnant women.
- Women with a history of hysterectomy.
- Women who were critically ill or mentally incapable of answering the questionnaire.
- Those unwilling to participate.

**Data Collection:** Data for this study were obtained through a structured, pretested questionnaire with distinct English and Hindi versions, both designed for intuitive comprehension by participants. The questionnaire included four broad sections: socio-demographic information; knowledge about cervical cancer (risk factors and symptoms); awareness of Pap smear screening; and knowledge of HPV

infection and its links to cervical cancer. The data collection, face-to-face interview process, was conducted by a trained female health worker to ensure confidentiality and to foster an open atmosphere, where possible engagement with the participants was planned. Each interview was approximately 20–25 minutes in duration. The potential for interviewer bias was minimized by the use of structured standardized questionnaires and trained interviewers, ensuring that the data collection process was uniform.

**Procedure:** Women who presented to the gynecology outpatient department of a tertiary care hospital were screened for eligibility as per specific inclusion and exclusion criteria. Eligible women were informed of the study's aim and nature, and their questions were addressed before being appropriately recruited. Data were obtained from each eligible woman through direct interviews, utilising a pre-tested questionnaire. Interviews were conducted in a private room in the hospital to ensure confidentiality and privacy. After the interview with each woman, counselling was provided regarding cervical cancer, the importance of Pap smear screening, and the preventive services offered by the hospital. The counselling process assisted in the data collection process and also served as a form of health education and contributed toward awareness of the women who participated in the study.

**Statistical Analysis:** The data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive statistics, which included means, standard deviations, frequencies, and percentages were conducted to describe

socio-demographic characteristics and the levels of knowledge and awareness of the respondents in the study. A Chi-square test or Fisher's exact test, or whatever was appropriate to the data, was implemented to compare the levels of knowledge and awareness based on socio-demographic. A p-value of less than .05 was statistically significant. The results are presented in table and graphical form for clarity and easier interpretation”.

## Result

Table 1 presents the demographic profile of the study participants across the three groups (n = 32 each). The mean age was comparable among the groups, with Group A having  $40.6 \pm 13.3$  years, Group B  $42.4 \pm 11.5$  years, and Group C  $44.4 \pm 14.9$  years. Males constituted the majority of participants in all groups, accounting for 81.2% in both Groups A and B and 93.8% in Group C, while females were fewer, with 18.8% in Groups A and B and 6.2% in Group C. The mean body weight was slightly higher in Group C ( $65.8 \pm 7.6$  kg) compared to Group B ( $63.4 \pm 7.9$  kg) and Group A ( $62.5 \pm 9.1$  kg). Regarding ASA (American Society of Anesthesiologists) physical status classification, most patients were ASA I, representing 68.8% in Group A, 43.8% in Group B, and 56.2% in Group C. ASA II classification was more frequent in Group B (46.9%), followed by Group C (37.5%) and Group A (21.9%). A small proportion of patients were ASA III, with 9.4% in Groups A and B and 6.2% in Group C. Overall, the three groups were comparable in terms of baseline demographic characteristics.

**Table 1: Demographic profile of the study population**

Variables	Group A (n = 32)	Group B (n = 32)	Group C (n = 32)
Age (years), mean $\pm$ SD	40.6 $\pm$ 13.3	42.4 $\pm$ 11.5	44.4 $\pm$ 14.9
Sex, n (%)			
Female	6 (18.8%)	6 (18.8%)	2 (6.2%)
Male	26 (81.2%)	26 (81.2%)	30 (93.8%)
Weight (kg), mean $\pm$ SD	62.5 $\pm$ 9.1	63.4 $\pm$ 7.9	65.8 $\pm$ 7.6
ASA, n (%)			
III	3 (9.4%)	3 (9.4%)	2 (6.2%)
II	7 (21.9%)	15 (46.9%)	12 (37.5%)
I	22 (68.8%)	14 (43.8%)	18 (56.2%)

Table 2 presents the block characteristics of the study population. The mean duration of motor block (DOMB) was significantly different among the groups ( $p < 0.001$ ), with Group B having the longest duration ( $436.7 \pm 123.1$  min), followed by Group A ( $316.6 \pm 100.5$  min), and Group C showing the shortest duration ( $213.7 \pm 82.4$  min). Similarly, the duration of sensory block (DOSB) was highest in Group B ( $466.8 \pm 111.4$  min), moderate in Group A ( $378.8 \pm 127.6$  min), and lowest in Group C ( $245.9 \pm 90.5$  min) with a highly significant difference ( $p < 0.001$ ). The time to maximum motor block (TTMI) and time to sensory regression (TTSR) also differed

significantly ( $p < 0.001$ ); Group C had the longest TTMI ( $5.5 \pm 0.9$  min) and the shortest TTSR ( $42.2 \pm 16.8$  min), while Group B demonstrated the fastest TTMI ( $3.0 \pm 1.6$  min) and the longest TTSR ( $92.2 \pm 20.4$  min). The time to achieve the T10 sensory level was shortest in Group B ( $5.2 \pm 1.9$  min) and longest in Group C ( $7.7 \pm 1.4$  min), with Group A in between ( $6.2 \pm 2.0$  min) ( $p < 0.001$ ). The duration of surgery (DOS) did not differ significantly between groups ( $p = 0.596$ ). Regarding peak sensory block level (PSBL), T7 was the most frequently achieved level in Groups A (65.6%) and C (71.9%), whereas Group B showed higher proportions at T5 (34.4%) and T7

(31.2%), with a significant overall difference ( $p = 0.016$ ). The total time for regression of anesthesia (TFRA) was longest in Group B ( $513.2 \pm 139.5$  min), followed by Group A ( $396.2 \pm 77.3$  min), and shortest in Group C ( $268.6 \pm 76.7$  min) ( $p < 0.001$ ). Bradycardia occurred only in Group A (12.5%), showing a significant difference among the groups

( $p = 0.015$ ). Hypotension was reported in 6.2% of Group A and 3.1% of Group C, but no cases were seen in Group B, with no significant difference ( $p = 0.356$ ). These findings indicate that Group B consistently demonstrated longer block durations and higher block levels compared to Groups A and C.

**Table 2: Block characteristics among three groups**

Variables	Group A (n = 32)	Group B (n = 32)	Group C (n = 32)	P
<b>DOMB (min), mean <math>\pm</math> SD</b>	316.6 $\pm$ 100.5	436.7 $\pm$ 123.1	213.7 $\pm$ 82.4	<0.001
<b>DOSB (min), mean <math>\pm</math> SD</b>	378.8 $\pm$ 127.6	466.8 $\pm$ 111.4	245.9 $\pm$ 90.5	<0.001
<b>TTMI (min), mean <math>\pm</math> SD</b>	4.0 $\pm$ 1.7	3.0 $\pm$ 1.6	5.5 $\pm$ 0.9	<0.001
<b>TTSR (min), mean <math>\pm</math> SD</b>	70.4 $\pm$ 11.4	92.2 $\pm$ 20.4	42.2 $\pm$ 16.8	<0.001
<b>T10 (min), mean <math>\pm</math> SD</b>	6.2 $\pm$ 2.0	5.2 $\pm$ 1.9	7.7 $\pm$ 1.4	<0.001
<b>DOS (min), mean <math>\pm</math> SD</b>	130.4 $\pm$ 11.7	128.8 $\pm$ 22.9	125.8 $\pm$ 17.9	0.596
<b>PSBL achieved, n (%)</b>				
T9	4 (12.5%)	4 (12.5%)	1 (3.1%)	0.016
T8	0 (0.0%)	5 (15.6%)	2 (6.2%)	
T7	21 (65.6%)	10 (31.2%)	23 (71.9%)	
T6	1 (3.1%)	2 (6.2%)	3 (9.4%)	
T5	6 (18.8%)	11 (34.4%)	3 (9.4%)	
<b>TFRA (min), mean <math>\pm</math> SD</b>	396.2 $\pm$ 77.3	513.2 $\pm$ 139.5	268.6 $\pm$ 76.7	<0.001
<b>Bradycardia, n (%)</b>				
Yes	4 (12.5%)	0 (0.0%)	0 (0.0%)	0.015
No	28 (87.5%)	32 (100.0%)	32 (100.0%)	
<b>Hypotension, n (%)</b>				
Yes	2 (6.2%)	0 (0.0%)	1 (3.1%)	0.356
No	30 (93.8%)	32 (100.0%)	31 (96.9%)	

## Discussion

In the current study, participants fell into three different groups for the purpose of measuring knowledge levels as well as determining sociodemographic factors that are associated with awareness. Mean age among the participants was similar across the groups, with a slight increase indicated in Group C. Even with the assumption that younger women would present with advanced awareness due to greater access to online resources, our results demonstrated that aged women had an advanced awareness on cervical malignancy as well as Pap smear screening. This observation may relate to long-term interactions with health providers over the years in the course of antenatal care or other gynecological attendances. Similarly, group-based strategies have been employed in other health research resulting in organized synthesis of findings from similar interventions or populations (Gupta et al., 2011; Leelavathy et al., 2016) [8,9].

In the present study, women with more than secondary education showed significantly greater knowledge of the causal link of HPV for cervical cancers and greater inclination towards screening practices. This finding is in agreement with past research which showed that education has a significant effect on health-seeking behaviour and knowledge on preventive health services (Al-Ghanem et al.,

2009) [10]. Notably, it was made clear that those who received tertiary education were nearly three times more likely to correctly identify HPV as a risk factor compared with those educated to the primary level. These findings draw strong support for specially designed educational programs among the urban populace, with particular focus on the socioeconomically deprived.

In the context of the uptake for screening, hardly any women in our study claimed to have had a Pap smear at all. This prevalence is significantly lower when set alongside international guidelines and reflects an overestimation of the use of screening services. Even though public health advice has stressed the importance of regular Pap smears, barriers such as fear, embarrassment, misunderstanding the test, and lack of awareness might deter participation rates. Our results align with similar trends established in previous studies on the subject of health behavior, which reveal that, despite the availability of preventive measures, actual uptake is limited by psychosocial and cultural forces (Nayagam et al., 2014; Routray et al., 2015) [11,12].

Our study's results showed that advice from healthcare providers and other specialists is a fundamental motivator for women to initiate or continue Pap smear screening. Many of the participants emphasised that their decision to have the screening

was heavily influenced by advice from a doctor or nurse when they were receiving care. Our results highlight the important role that healthcare providers play in increasing screening participation, which also corresponds with previous studies that found outcomes are improved due to provider involvement (Kurhekar et al, 2016) [13]. Consequently, enhancing communication between providers and women during routine visits could be an event to stimulate increased rates of cervical screening.

An interesting finding was the different levels of awareness and screening access by a woman's life stage and how many births she had experienced. Women with multiple births had a notably higher awareness of Pap smear screening likely due to being more likely to receive maternal and reproductive health services than women with no births or women with only one birth. In contrast to the women with multiple births, the younger and unmarried women had low awareness that attendance occurred and subsequently were incorrectly unaware of the need to be screened (again a big issue erroneously related to the belief that cervical cancer screening was unnecessary until a woman was older and married). This illustrates a clear need to address cervical cancer screening awareness and utilization through public education campaigns to focus more intensively on younger groups.

When considering the findings from other studies, it is clear that structured interventions with education combined with practical services can lead to improved health outcomes. In cervical cancer prevention, incorporating community workshops, youth education programs and mobile screening units would have a large impact on achieving higher awareness and participation levels; ultimately offering an enhanced strategy to help reduce cervical cancer incidence and improve women's health outcomes (Rahimzadeh et al., 2018; El-Attar et al., 2015) [14,15].

The findings of our research indicate the importance of addressing misconceptions surrounding HPV infection. Even though HPV has been identified as the most common sexually transmitted infection and the highest cause of cervical malignancy, the participants demonstrated an exceptionally low awareness level concerning HPV. Only a miniscule number accurately identified HPV as a risk factor, suggesting a lack of comprehensive sexual and reproductive health education. This scenario is an indication of the challenges faced in the many public health domains, where substantial knowledge gaps persist even among the urban populace, hence the strong need for sustained education programs (Mahendru et al., 2013) [16].

Whilst our exploration provides considerable insight, it is crucial to note numerous shortcomings. Research scope was limited to urban women, thus

the results not being directly translatable to the rural communities, where screening barriers may differ substantially. In addition, similar to other health awareness research, the answers depended on self-reporting, which could have instigated the initiation of recall or social desirability bias (Routray et al., 2015) [12]. Future studies should consider the involvement of rural respondents as well as the use of mixed methodology for the achievement of both qualitative and quantitative information, thus enabling a richer understanding.

Overall, the study shown a staggeringly low level of knowledge among urban women about Pap smear screening, cervical cancer, and HPV infections. In terms of awareness about cervical cancer, women are only beginning to understand the disease - there is little to no understanding of screening and prevention, which ultimately leads to social condemnation. Compared to other successful health interventions, this proves that organized education or an involvement of a healthcare provider offers responsible outcomes. Our findings encourage a sharp pivot in public health efforts to target that urban populations be offered knowledge through community-based education, the routine integration of HPV and awareness into the healthcare profession, and increased access to free or low-cost community-based screening.

## Conclusion

This research indicates that urban women have very significant gaps in knowledge and awareness of Pap smear screening, cervical cancer and HPV infection. Participation in screening for cervical cancer is low and inconsistent across several subpopulations. Low health literacy, limited access to health care, and enduring misunderstandings about screening and HPV infection were all identified as barriers that prevent women from seeking Pap smear screening and create missed opportunities for preventive health care. This study supports the need for targeted public health interventions, such as, culturally sensitive educational campaigns, proactive efforts by primary health care providers to get women to screen, greater access to low-cost or outreach screening programs, and promoting HPV vaccination. For policies, we recommend integrating organized systematic screening in reproductive health visits and addressing the structural barriers to testing. Given the limits to sample size and data quality, we recommend future studies consider more representative samples and standardized measures to provide more accurate assessments of barriers and monitor the effectiveness of any interventions.

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