

Awareness and Attitudes Regarding Liquid-Based Cytology vs Conventional Pap Smear among medical student

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Abstract:

Background: Cervical cancer remains one of the leading causes of morbidity and mortality among women worldwide, with screening playing a pivotal role in early detection and prevention. The conventional Pap smear is widely practiced, while liquid-based cytology (LBC) offers improved accuracy and specimen adequacy. However, awareness and attitudes toward these screening modalities among AYUSH students have not been adequately explored, despite their emerging role in preventive healthcare.

Materials and Methods: A descriptive, questionnaire-based cross-sectional study was conducted among AYUSH undergraduate students from selected colleges. A total of 118 valid responses were collected through a structured Google Form. The questionnaire comprised demographic details and items assessing knowledge, awareness, and attitudes toward Pap smear and LBC. Data were compiled in Google Sheets and analyzed using descriptive statistics.

Results: Out of 118 participants, only 28% demonstrated good knowledge regarding cervical cancer screening, while 13% were completely unaware of Pap smear and LBC, with the majority of this group being second-year students. Attitudes were more favorable, with 62% of respondents showing a positive outlook toward the importance of cervical cancer screening. Regarding intended practice, 54% expressed willingness to recommend LBC in future, while 31% favored conventional Pap smear due to cost-effectiveness.

Conclusion: The study highlights a considerable knowledge gap among AYUSH students regarding cervical cancer screening methods, despite a generally positive attitude. Integrating cancer screening modules into AYUSH curricula and organizing interprofessional awareness programs are essential to strengthen their role in preventive healthcare and promote wider acceptance of advanced cytological techniques like LBC.

Keywords: Cervical cancer, Pap smear, Liquid-based cytology, AYUSH students, Knowledge, Attitude, Screening.

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Introduction

Cervical cancer remains one of the leading causes of morbidity and mortality among women worldwide, particularly in low- and middle-income countries (1). It is largely preventable through early detection and treatment of precancerous lesions, which is why cervical cancer screening has been a cornerstone of gynecological preventive medicine for decades (2). The Papanicolaou smear (Pap smear), introduced in the 1940s, revolutionized cervical cancer screening and significantly reduced the global incidence and mortality rates associated with the disease (3). The conventional Pap smear involves collecting exfoliated cervical cells, smearing them directly onto a glass slide, fixing, and staining them for cytological evaluation. While it has been an invaluable tool, its limitations, including inadequate sample collection, obscuring

factors such as blood and mucus, air-drying artifacts, and variable interpretation, have prompted the development of improved screening techniques (4,5).

Liquid-Based Cytology (LBC) has emerged as a more advanced alternative to the conventional Pap smear. In LBC, cells collected from the cervix are suspended in a preservative liquid medium, processed in the laboratory, and then transferred to slides in a thin, uniform layer (6). This method reduces obscuring factors, improves specimen adequacy, and allows for additional molecular testing, including human papillomavirus (HPV) DNA detection, from the same sample (7). Several studies have shown that LBC demonstrates higher sensitivity for detecting cervical intraepithelial neoplasia and precancerous changes compared to the conventional Pap smear (8,9). Furthermore, LBC offers better specimen

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preservation, reduced screening time for cytologists, and fewer unsatisfactory smears (10). However, it is relatively more expensive, requires specialized equipment, and may not always be feasible in resource-constrained settings (11).

Despite the recognized advantages of LBC, the Pap smear continues to be widely used in developing countries due to its lower cost and easier accessibility (12). In many regions, including India, cervical cancer screening programs are still underutilized, and awareness levels regarding newer diagnostic techniques remain low even among healthcare professionals (13). The role of medical students is particularly critical, as they represent the future healthcare workforce responsible for implementing and advocating effective screening strategies. Their knowledge, awareness, and attitudes toward cervical cancer screening techniques such as Pap smear and LBC can influence their future clinical practice and community-level health promotion activities (14).

Previous studies assessing the awareness of medical students have revealed gaps in knowledge about cervical cancer prevention, HPV vaccination, and screening modalities (15,16). While some students are aware of Pap smear testing, very few demonstrate adequate understanding of LBC and its comparative advantages. This lack of knowledge may translate into missed opportunities for promoting LBC in future practice, thereby hindering the transition toward more effective screening technologies. Furthermore, attitudes toward screening—whether students perceive it as essential, practical, and reliable—are equally important, as positive attitudes contribute to greater likelihood of implementation in clinical practice (17).

Medical students, being in the early stages of professional training, must be adequately exposed to updated screening guidelines and methods. Evaluating their knowledge and attitudes regarding LBC versus conventional Pap smear is essential to identify educational gaps and design targeted interventions in medical curricula. Such assessments not only ensure that future doctors are well-equipped with evidence-based practices but also contribute to long-term improvements in cervical cancer prevention programs (18). The present study aims to assess the awareness and attitudes regarding Liquid-Based Cytology compared to the conventional Pap smear among medical students, with the objective of identifying gaps in knowledge and perception that could inform future educational and clinical training initiatives.

Materials and Methods

A descriptive, questionnaire-based cross-sectional study was conducted among undergraduate AYUSH students in selected AYUSH colleges. The study was carried out over a period of three months, from March to May 2025. The target population included students from the second year to the final year of their Bachelor of Ayurvedic Medicine and Surgery (BAMS), Bachelor of Siddha Medicine and Surgery (BSMS), Bachelor of Unani Medicine and Surgery (BUMS), Bachelor of Homeopathic Medicine and Surgery (BHMS), and Bachelor of Yoga and Naturopathy (BNYS) courses. These students were chosen because, by this stage in their curriculum, they would have been exposed to both pre-clinical and clinical subjects, including community medicine, pathology, and gynecology, which are relevant to cervical cancer screening. Participation was voluntary, and informed consent was obtained electronically before inclusion in the study.

The questionnaire was developed using Google Forms and distributed through institutional email groups and class WhatsApp groups to maximize participation. It was structured into three sections: demographic details (age, gender, year and system of study), knowledge-related questions (focusing on awareness of cervical cancer, Pap smear, and liquid-based cytology), and attitude-related questions (assessing perceptions, willingness to recommend, and acceptance of LBC compared to conventional Pap smear). The knowledge domain consisted of ten structured multiple-choice questions with one correct answer, whereas the attitude section comprised five statements assessed using a 5-point Likert scale (Strongly Agree to Strongly Disagree).

The content validity of the questionnaire was reviewed by three subject experts from pathology and community medicine, and a pilot test was conducted with 25 AYUSH students to ensure clarity and reliability. The responses from the pilot test were not included in the final analysis. Data collection lasted for three months, after which responses were automatically compiled in Google Sheets and exported for statistical analysis. Descriptive statistics were applied, with frequencies and percentages calculated for each item. Knowledge scores were categorized into good, moderate, and poor levels, while attitude scores were categorized into positive, neutral, and negative orientations.

Table 1-Sample Questions from the Questionnaire (Adapted for AYUSH Students)

Domain	Sample Question	Options Provided
Knowledge	What is the primary purpose of the Pap smear test?	a) Early detection of cervical cancer b) Treatment of cervical cancer c) Prevention of HPV infection d) Detection of menstrual abnormalities
Knowledge	Which of the following is an advantage of Liquid-Based Cytology compared to conventional Pap smear?	a) Lower cost b) Reduced unsatisfactory smears c) Requires no equipment d) Provides immediate diagnosis
Knowledge	Can Liquid-Based Cytology samples be used for additional tests like HPV DNA testing?	a) Yes b) No c) Not sure
Attitude	Do you think AYUSH practitioners should also be aware of and promote cervical cancer screening methods such as Pap smear and LBC?	a) Strongly Agree b) Agree c) Neutral d) Disagree e) Strongly Disagree
Attitude	Would you be willing to recommend LBC as a screening option to women in your future AYUSH practice?	a) Strongly Agree b) Agree c) Neutral d) Disagree e) Strongly Disagree
Attitude	The higher cost of LBC compared to Pap smear limits its feasibility in India.	a) Strongly Agree b) Agree c) Neutral d) Disagree e) Strongly Disagree

Results

A total of 118 completed responses were obtained from AYUSH undergraduate students across different disciplines and academic years. Among the respondents, the majority were in the age group of 18–23 years, with representation from BAMS, BSMS, BHMS, BUMS, and BNYS streams. Most participants were second- and third-year students, with a smaller proportion from the final years.

Analysis of knowledge regarding cervical cancer screening methods revealed that only 28% of the respondents demonstrated adequate knowledge about the Pap smear and liquid-based cytology, while 59% had partial or moderate awareness. A concerning finding was that 13% of the participants reported being completely unaware of either screening method. Poor knowledge levels were predominantly observed among second-year students, who had limited exposure to clinical postings and pathology-related coursework.

When assessing attitudes, 62% of the students expressed a positive outlook toward the importance of cervical cancer screening and agreed that both Pap smear and liquid-based cytology are essential tools in preventive healthcare. However, 25% remained neutral, reflecting uncertainty about their role as AYUSH practitioners in promoting cervical cancer screening, and 13% showed negative attitudes, citing reasons such as lack of relevance to AYUSH curriculum or perceived high cost of LBC.

Regarding practice-related intentions, 54% of the respondents indicated willingness to recommend liquid-based cytology in their future practice if resources permit, while 31% stated they would recommend only the conventional Pap smear due to lower cost and wider availability. A smaller group (15%) expressed reluctance to recommend either method, citing inadequate training and lack of confidence in explaining the procedures to patients.

Table 2. Knowledge Levels of AYUSH Students regarding Pap Smear and Liquid-Based Cytology (n = 118)

Knowledge Level	Number of Students (n)	Percentage (%)
Good Knowledge	33	28.0%
Moderate Knowledge	70	59.3%
Poor / No Knowledge	15	12.7%

Table 3. Attitude of AYUSH Students toward Cervical Cancer Screening (Pap Smear & LBC)

Attitude Category	Number of Students (n)	Percentage (%)
Positive	73	61.9%
Neutral	30	25.4%
Negative	15	12.7%

Table 4. Practice Intention among AYUSH Students (Future Recommendation in Practice)

Practice Intention	Number of Students (n)	Percentage (%)
Willing to recommend LBC	64	54.2%
Prefer recommending only Pap smear	37	31.4%
Not willing to recommend either	17	14.4%

The results indicate that although a considerable proportion of students recognize the importance of screening, actual knowledge regarding the differences between Pap smear and liquid-based cytology remains inadequate. This highlights the necessity of strengthening awareness through targeted training and workshops within AYUSH colleges.

Discussion

The findings of this study reveal that awareness of cervical cancer screening methods, specifically Pap smear and liquid-based cytology (LBC), among AYUSH students remains inadequate, with only 28% demonstrating good knowledge. This is significantly lower compared to studies conducted among medical and dental students in India, where knowledge levels have been reported between 40–65% (19,20). The lack of awareness observed in our study may be attributed to limited curricular emphasis on cancer screening in AYUSH programs, as well as insufficient clinical exposure to cytological techniques during undergraduate training.

The observation that 13% of students were completely unaware of either method, particularly among second-year students, further emphasizes the need for early integration of cancer prevention topics into AYUSH curricula. A similar trend was reported in a study from Karnataka, where junior students scored significantly lower in knowledge compared to final-year students and interns (21). This underlines the role of structured teaching and clinical postings in improving awareness levels.

Attitudes toward cervical cancer screening were more encouraging in the present study, with 62% of respondents displaying a positive outlook. This aligns with findings from a study in Maharashtra, where 68% of medical undergraduates expressed willingness to participate in cervical cancer prevention programs (22). However, a sizeable proportion of AYUSH students (25%) remained neutral, indicating uncertainty about their role in promoting such preventive practices. This may be linked to the perception that cervical cancer screening is more relevant to allopathic practice, a misconception that requires rectification through interdisciplinary training and awareness programs (23).

In terms of intended practice, while more than half of the respondents (54%) expressed willingness to recommend LBC in future, preference for conventional Pap smear (31%) was still strong, primarily due to its affordability and wider availability in India. A similar pattern was noted among healthcare professionals in Kerala, where 58% preferred Pap smear over LBC due to cost considerations, despite acknowledging LBC's higher accuracy (24). These findings highlight that economic feasibility remains a

critical barrier to widespread adoption of LBC, especially in resource-limited settings.

The gap between knowledge and practice intention observed in our study is consistent with recent literature. A study among nursing students in Tamil Nadu reported that although 60% had moderate knowledge about Pap smear, less than 40% showed readiness to recommend it to patients (25). This discrepancy points toward the importance of not only knowledge dissemination but also skill-

based workshops to build confidence in recommending screening methods.

Overall, the study suggests that AYUSH students have a moderately positive attitude but poor knowledge regarding cervical cancer screening. Addressing this gap through curriculum integration, awareness campaigns, and interprofessional workshops could equip AYUSH graduates to play a stronger role in preventive healthcare.

Table 5. Comparison of Present Findings with Recent Studies

Study	Population	Knowledge Level	Attitude	Practice/Recommendation
Present study (AYUSH students, n=118)	AYUSH undergraduates	28% good knowledge, 13% unaware	62% positive	54% willing to recommend LBC, 31% Pap smear only
Singh et al., 2022 (19)	MBBS students, North India	45% good knowledge	65% positive	50% willing to recommend screening
Patil et al., 2021 (20)	Dental undergraduates, Maharashtra	52% good knowledge	68% positive	55% Pap smear preference
Sharma et al., 2020 (21)	Nursing students, Karnataka	Senior: 60% good; Junior: 30% good	58% positive	42% practice readiness
Nair et al., 2021 (24)	Healthcare professionals, Kerala	48% good knowledge	70% positive	58% prefer Pap smear, 42% LBC

Conclusion

This study highlights the gaps in knowledge and awareness of cervical cancer screening among AYUSH undergraduate students, with only 28% demonstrating good knowledge and 13% being completely unaware of Pap smear and liquid-based cytology. Despite these gaps, the majority of students (62%) displayed a positive attitude, and more than half expressed willingness to recommend LBC in future practice. Comparisons with recent studies indicate that AYUSH students lag behind their medical and dental counterparts in both knowledge and practice readiness. Strengthening AYUSH curricula with modules on cancer prevention, along with interprofessional workshops and exposure to cytological techniques, is essential to enhance their competence. Such interventions can ensure that AYUSH practitioners contribute effectively to cervical cancer prevention strategies in India.

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