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FACTORS ASSOCIATED WITH ADHERENCE TO CERVICAL CANCER SCREENING AND EARLY DETECTION IN TASHKENT, UZBEKISTAN

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Running title: Adherence to Cervical Screening in Tashkent

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Abstract

This study evaluated factors associated with adherence to cervical cancer screening and its relationship with early detection among women attending consultation clinics in Tashkent, Uzbekistan. A retrospective cross-sectional review of medical records from January 2023 to December 2025 included 214 women aged 18–49 years. Screening within the recommended interval was documented in 160 women (74.8%), while 54 (25.2%) were non-adherent. Adherence was lowest among women aged 18–29 years (40.7%) and higher among those aged 30–39 years (87.1%) and 40–49 years (88.7%). Screening participation was significantly associated with marital status (OR 20.97; 95% CI 9.2–47.8), secondary or higher education (OR 10.0; 95% CI 4.9–20.5), employment (OR 5.89; 95% CI 2.9–11.9), and receipt of preventive counseling (OR 19.83; 95% CI 8.8–44.5) ($p<0.001$). Parity showed no significant association ($p=0.49$). Among screened women, abnormal cytology was identified in 34.4%, biopsy-confirmed cervical intraepithelial neoplasia in 25.6%, and early-stage lesions in 32.5%. Stage I invasive cancer was detected in 1.9% of screened participants. These findings highlight variations in screening adherence and early detection within the studied outpatient setting.

INTRODUCTION

Cervical cancer continues to represent a significant public health challenge worldwide. According to recent global estimates, it remains among the most common malignancies affecting women, with a disproportionate burden observed in low- and middle-income countries (IARC, 2022). Despite the availability of effective preventive strategies, including cytological and HPV-based screening, substantial inequalities in coverage persist across regions. Recognizing this disparity, the World Health Organization has prioritized cervical cancer elimination, emphasizing the critical role of early detection through organized and high-coverage screening programs (WHO, n.d.). Achieving these targets requires not only infrastructure but also sustained participation of eligible women.

The effectiveness of cervical cancer prevention programs depends largely on adherence to recommended screening intervals. Timely participation allows identification of precancerous lesions and early-stage disease, substantially improving treatment outcomes and reducing mortality. Nevertheless, international data indicate that screening attendance remains inconsistent, even in settings where services are available (Zhang et al., 2022). Evidence from an umbrella review focusing on African countries demonstrates that uptake of cervical cancer screening is frequently suboptimal and influenced by multiple interacting determinants (Emagneneh et al., 2025). These findings highlight that availability of services alone does not guarantee utilization.

A growing body of research has examined factors influencing women's engagement in cervical cancer screening. Behavioral models, including the Health Belief Model, suggest that perceived susceptibility, perceived benefits, and perceived barriers significantly shape preventive behaviors (Al-Ani et al., 2024). Empirical studies conducted in diverse sociocultural contexts have reported consistent associations between screening participation and demographic as well as socioeconomic characteristics. Age, educational level, marital status, and income have been identified as important predictors in populations from Japan (Cui et al., 2022), Serbia (Djordjevic et al., 2024), Kenya (Gebreegziabher et al., 2024), Tanzania (Hhera et al., 2025), Hungary (Pataki et al., 2024), and Lao People's Democratic Republic (Phaiphichit et al., 2022). Beyond structural determinants, qualitative investigations reveal that fear of diagnosis, embarrassment, limited awareness, and cultural norms may further limit participation (Shariati-Sarcheshme et al., 2024). A recent systematic review confirmed that both structural and psychosocial barriers continue to hinder regular screening attendance, particularly among younger women (Shpendi et al., 2025).

While international literature provides substantial evidence regarding determinants of screening behavior, information from Central Asian countries remains scarce. In Uzbekistan, women's consultation clinics constitute the primary institutional setting for preventive gynecological services, including cervical cancer screening. However, systematic analyses examining adherence patterns and their clinical implications are limited. In particular, the relationship between screening adherence and early detection outcomes within this healthcare context has not been sufficiently explored. Understanding these associations is essential for strengthening preventive strategies and aligning national efforts with global elimination objectives.

The present study aimed to identify factors associated with adherence to cervical cancer screening and to evaluate its relationship with early detection among reproductive-age women in Tashkent, Uzbekistan.

MATERIAL AND METHOD

A retrospective cross-sectional analytical study was conducted based on the review of medical records from women's consultation clinics in Tashkent, Uzbekistan. These clinics provide primary outpatient gynecological and preventive services, including implementation of cervical cancer screening in accordance with national clinical guidelines. The study covered the period from January 2023 to December 2025. Screening adherence was evaluated according to the recommended screening interval defined by the national protocol.

The study population consisted of women of reproductive age (18–49 years) who were registered and received care in selected women's consultation clinics during the study period. Inclusion criteria:

Age between 18 and 49 years; Availability of complete medical records including documented screening history; At least one recorded clinic visit during the study period. Exclusion criteria: Diagnosis of invasive cervical cancer prior to January 2023; History of total hysterectomy; Incomplete medical records lacking key variables required for analysis.

All eligible medical records available during the study period were reviewed. A total of 214 women met the inclusion criteria and were included in the final analysis. Systematic record selection was applied within participating clinics to ensure representativeness. Clinic registries were screened sequentially, and records meeting eligibility criteria were included consecutively until all available cases for the study period were exhausted.

Data were extracted using a structured data abstraction form specifically designed for this study. The form included sociodemographic, clinical, and health service–related variables. Sociodemographic variables: Age (categorized as 18–29, 30–39, and 40–49 years); Marital status (married / unmarried or other); Educational level (secondary or higher / lower than secondary); Employment status (employed / unemployed). Reproductive and clinical variables: Parity (nulliparous / multiparous); Documented history of gynecological diseases; Frequency of clinic visits during the study period. Health service–related variables: Receipt of preventive counseling (yes / no); History of previous cervical cancer screening.

Operational definitions. Screening adherence was defined as undergoing cervical cancer screening (cytology and/or HPV testing) within the recommended three-year interval in accordance with national screening guidelines for women aged 21–49 years. Participants were classified as: Adherent — documented screening within the recommended interval; Non-adherent — no recorded screening or screening performed outside the recommended interval.

Early detection was defined as identification of LSIL, HSIL, or any grade of cervical intraepithelial neoplasia (CIN I–III) detected during routine screening. Stage I cervical cancer identified during screening was recorded separately as early-stage invasive disease. Cytological abnormalities were confirmed through histological examination where biopsy was performed.

Data quality assurance. Data abstraction was carried out by trained medical personnel. A pilot review of 10% of randomly selected records was conducted to ensure consistency and accuracy of data extraction. Double data entry and cross-checking were performed to minimize transcription errors. Records with missing key variables were excluded from multivariable analysis but retained in descriptive analysis where appropriate.

Statistical analyses were performed using SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Continuous variables were assessed for normality using the Shapiro–Wilk test. Normally distributed variables were summarized as mean ± standard deviation (SD), whereas non-normally distributed variables were presented as median and interquartile range (IQR). Categorical variables were expressed as frequencies and percentages. Associations between categorical variables and screening adherence were evaluated using the Pearson chi-square test or Fisher's exact test when expected cell counts were small. Crude odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to assess the strength of associations. Variables with $p < 0.20$ in univariate analysis and those considered clinically relevant were entered into a multivariable logistic regression model to identify independent predictors of screening adherence. Adjusted odds ratios (AORs)

with corresponding 95% CIs were reported. Multicollinearity among independent variables was assessed using variance inflation factors (VIF). Model calibration was evaluated using the Hosmer–Lemeshow goodness-of-fit test. A two-sided p-value < 0.05 was considered statistically significant.

Bias control. Selection bias was minimized by including all eligible records within the defined study period. Information bias was reduced through standardized data abstraction procedures and cross-verification. Potential confounding was addressed using multivariable regression analysis.

All participants had previously provided written informed consent for the use of their anonymized clinical data for research purposes. Personal identifiers were removed prior to analysis to ensure confidentiality. The study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

A total of 214 women were included in the analysis. The age distribution was relatively balanced across the reproductive age spectrum: 59 participants (27.6%) were aged 18–29 years, 93 (43.5%) were aged 30–39 years, and 62 (29.0%) were aged 40–49 years. The majority of women were married (168; 78.5%). Secondary or higher education was reported by 142 participants (66.4%), and 156 women (72.9%) were employed. Nulliparous women accounted for 67 cases (31.3%), while 148 participants (69.2%) had documented preventive counseling during clinic visits (Figure 1).

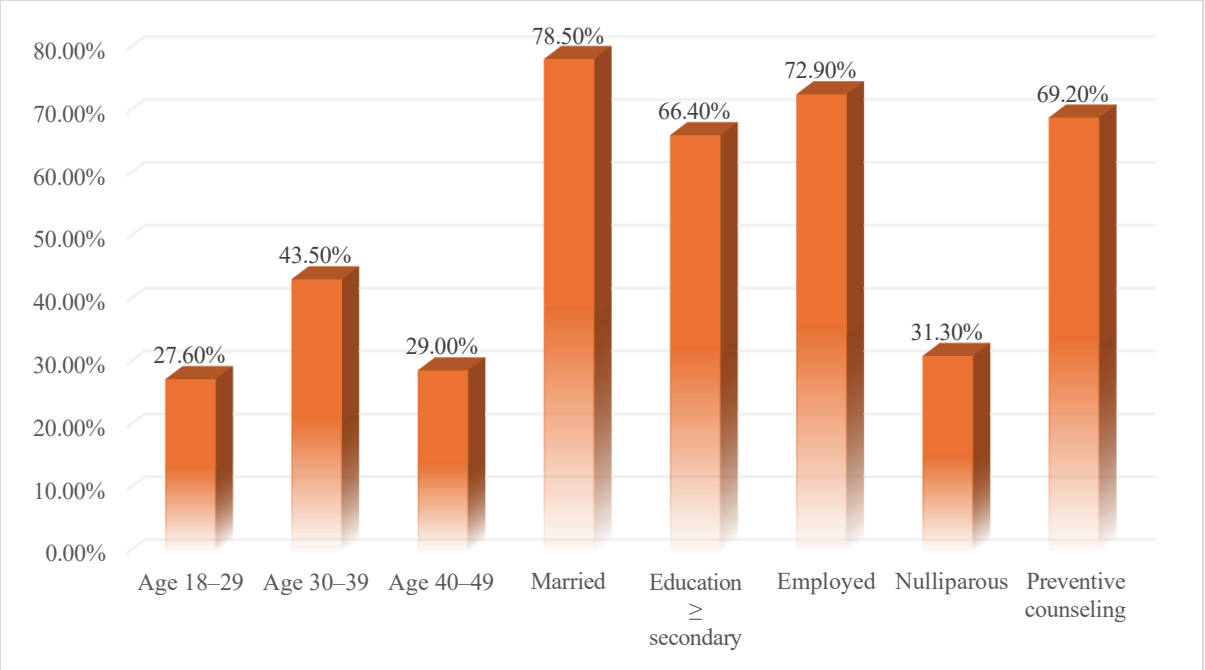

Fig.1 Sociodemographic characteristics (N = 214)

Overall, 160 women (74.8%) were adherent to cervical cancer screening within the recommended interval, whereas 54 (25.2%) were classified as non-adherent.

Screening adherence differed substantially by age. Among women aged 18–29 years, 24 of 59 (40.7%) were adherent. In contrast, adherence was considerably higher among women aged 30–39 years (81 of 93; 87.1%) and 40–49 years (55 of 62; 88.7%). Compared with women aged 18–29 years, the odds of adherence were significantly higher in women aged 30–39 years (OR =

9.84; 95% CI: 4.44–21.8; p < 0.001) and 40–49 years (OR = 11.46; 95% CI: 4.33–30.3; p < 0.001).

Marital status was strongly associated with screening participation. Among married women, 148 of 168 (88.1%) were adherent, compared with 12 of 46 unmarried women (26.1%). Married women had substantially higher odds of adherence (OR = 20.97; 95% CI: 9.2–47.8; p < 0.001).

Educational level demonstrated a similar pattern. Women with secondary or higher education showed higher adherence (127 of 142; 89.4%) than those with lower education (33 of 72; 45.8%). Higher education was associated with increased odds of screening adherence (OR = 10.0; 95% CI: 4.9–20.5; p < 0.001).

Employment status was also related to screening behavior. Among employed women, 132 of 156 (84.6%) adhered to screening recommendations, compared with 28 of 58 unemployed women (48.3%). Employment was associated with higher screening participation (OR = 5.89; 95% CI: 2.9–11.9; p < 0.001).

Parity did not show a statistically significant association with screening adherence. Among nulliparous women, 48 of 67 (71.6%) were adherent, compared with 112 of 147 multiparous women (76.2%) (OR = 0.79; 95% CI: 0.42–1.49; p = 0.49).

Preventive counseling demonstrated the strongest association with screening participation. Among women who received counseling, 136 of 148 (91.9%) adhered to screening recommendations, compared with 24 of 66 women (36.4%) who did not receive counseling. Receipt of preventive counseling was associated with markedly higher odds of adherence (OR = 19.83; 95% CI: 8.8–44.5; p < 0.001). Detailed comparisons are presented in Table 1.

Table 1.

Screening adherence by characteristics (N = 214)

Variable	OR	95% CI	χ^2	p
Age 30–39 vs 18–29	9.84	4.44–21.8	54.7	<0.001
Age 40–49 vs 18–29	11.46	4.33–30.3	49.8	<0.001
Married	20.97	9.2–47.8	88.5	<0.001
Education ≥ secondary	10.0	4.9–20.5	57.6	<0.001
Employed	5.89	2.9–11.9	25.8	<0.001
Nulliparous	0.79	0.42–1.49	0.48	0.49
Preventive counseling	19.83	8.8–44.5	86.2	<0.001

Among the 160 women who underwent screening, normal cytology was recorded in 105 cases (65.6%), while abnormal cytology was identified in 55 women (34.4%). Cytological abnormalities included low-grade squamous intraepithelial lesions (LSIL) in 6 cases (3.8%) and high-grade squamous intraepithelial lesions (HSIL) in 5 cases (3.1%).

Histological assessment of women with abnormal cytology confirmed cervical intraepithelial neoplasia (CIN) in 41 cases (25.6% of screened women). Specifically, CIN I was diagnosed in 9 women (5.6%), CIN II in 17 (10.6%), and CIN III in 15 (9.4%). In addition, stage I cervical cancer was detected in 3 women (1.9% of screened participants).

Early detection, defined as identification of LSIL, HSIL, or any CIN lesion, was achieved in 52 women, corresponding to 32.5% of screened participants. No advanced-stage cervical cancer was

identified during routine screening. Screening outcomes are summarized in Table 2.

Table 2.

Screening outcomes among adherent women (n = 160)

Outcome	**n**	**%**
Normal cytology	105	65.6
Abnormal cytology	55	34.4
LSIL	6	3.8
HSIL	5	3.1
CIN I	9	5.6
CIN II	17	10.6
CIN III	15	9.4
Stage I cancer	3	1.9
Early detection (LSIL+HSIL+CIN)	52	32.5

DISCUSSION

This study assessed factors associated with adherence to cervical cancer screening and examined screening outcomes among women attending women's consultation clinics in Tashkent. Overall adherence within the recommended interval reached 74.8%, yet substantial variation was observed across demographic and health service–related subgroups. Age, marital status, educational level, employment, and receipt of preventive counseling were significantly associated with screening participation, whereas parity was not. Routine screening identified a considerable proportion of cytological abnormalities and histologically confirmed precancerous lesions, underscoring the clinical relevance of sustained screening coverage.

A pronounced age gradient in screening adherence was observed. Women aged 30–49 years were significantly more likely to adhere to screening recommendations than those aged 18–29 years. Similar age-related patterns have been described in multiple settings, where younger women demonstrate lower screening uptake compared with older reproductive-age groups (Al-Ani et al., 2024; Zhang et al., 2022). Behavioral frameworks such as the Health Belief Model suggest that screening behavior is influenced by perceived susceptibility and perceived benefits, which may be less prominent among younger women who often perceive themselves at lower risk (Al-Ani et al., 2024). Systematic evidence further indicates that attendance barriers are particularly evident in younger populations (Shpendi et al., 2025). The findings of the present study are therefore consistent with established behavioral and epidemiological evidence.

Marital status showed a strong association with screening adherence. Married women demonstrated substantially higher participation rates than unmarried women. This association may reflect greater social support, increased contact with healthcare services related to reproductive or family planning needs, or sociocultural norms that facilitate preventive health behavior. Comparable associations between marital status and screening attendance have been reported in European and Asian populations (Djordjevic et al., 2024; Pataki et al., 2024; Cui et al., 2022) as well as in lower-resource settings (Gebreegziabher et al., 2024; Hhera et al., 2025; Phaiphichit et al., 2022). Educational attainment and

employment were also positively associated with screening adherence. Women with secondary or higher education were more likely to participate in screening, which is consistent with findings from international studies demonstrating that education enhances health literacy, awareness of preventive services, and engagement with healthcare systems (Zhang et al., 2022; Emagneneh et al., 2025). Employment may facilitate financial access and structured interaction with healthcare providers, while also reflecting broader socioeconomic stability. Although crude odds ratios were relatively high for several determinants, these estimates may partly reflect clustering of social advantages and the relatively low adherence observed in the youngest age group. Therefore, while the direction of associations aligns with the literature, the magnitude of effect should be interpreted with caution.

Receipt of preventive counseling demonstrated one of the strongest associations with screening adherence. This finding has practical implications for public health strategies. Evidence from behavioral research indicates that provider communication can reduce perceived barriers, address misconceptions, and increase perceived benefits of screening (Al-Ani et al., 2024). Qualitative data further highlight that fear, embarrassment, and limited knowledge contribute to non-attendance (Shariati-Sarcheshme et al., 2024). In the present setting, women's consultation clinics function not only as service providers but also as educational platforms. Strengthening structured counseling and opportunistic health education during routine visits may therefore represent a feasible intervention to improve coverage.

Among screened women, more than one-third presented with abnormal cytology, and a substantial proportion had biopsy-confirmed cervical intraepithelial neoplasia. Early detection, defined as LSIL, HSIL, or any grade of CIN, was achieved in nearly one-third of screened participants. The identification of higher-grade lesions, including CIN II–III, highlights the importance of sustained screening adherence. Global data indicate that timely detection of precancerous lesions is central to cervical cancer prevention strategies (IARC, 2022; WHO, n.d.). Although direct comparison with other populations is limited by methodological differences, the distribution of CIN grades observed in this study falls within ranges reported in similar outpatient screening contexts (Zhang et al., 2022; Emagneneh et al., 2025). Importantly, only early-stage invasive cancer was detected, suggesting that screening within this healthcare setting contributes to identification of disease at potentially treatable stages.

The World Health Organization's cervical cancer elimination initiative emphasizes achieving high screening coverage and early detection (WHO, n.d.). The present findings suggest that, within the urban clinic context of Tashkent, overall adherence is relatively high but unevenly distributed. Younger women and socially less advantaged groups remain at greater risk of non-participation. Targeted interventions aimed at younger age groups, enhanced counseling, and systematic reminder mechanisms may help narrow this gap. Given the central role of women's consultation clinics in Uzbekistan's primary gynecological care system, strengthening preventive components within these facilities may support national cervical cancer control efforts.

This study utilized real-world clinical data from primary outpatient gynecological services and applied clearly defined adherence criteria based on documented screening history. The integration of cytological and histological findings enhances the clinical validity of reported outcomes. Several limitations should be acknowledged. First, the retrospective design relies on the accuracy and

completeness of medical records and may be subject to information bias. Second, the study was conducted in clinics within Tashkent and may not fully represent rural or less resourced regions. Third, crude odds ratios may overestimate the strength of association due to residual confounding between correlated socioeconomic factors. Fourth, screening conducted in private facilities outside the consultation clinics may not have been captured in the available records. Finally, the study did not include data on HPV vaccination status, detailed income measures, or behavioral risk factors, which may also influence screening behavior.

CONCLUSION

In this cohort of women attending consultation clinics in Tashkent, 74.8% adhered to recommended cervical cancer screening intervals. Adherence was significantly higher among women aged 30–49 years and was strongly associated with marital status, higher education, employment, and receipt of preventive counseling, while parity showed no significant relationship. Screening detected abnormal cytology in 34.4% of examined women and biopsy-confirmed CIN in 25.6%. Early-stage lesions (LSIL, HSIL, CIN I–III) were identified in 32.5% of screened participants, and only stage I invasive cancer was detected. Although screening services are functioning within this outpatient setting, lower participation among younger women indicates the need for targeted strategies to improve coverage and strengthen early detection within primary gynecological care.

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