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Original Article

Factors Associated with Pre-cancerous Cervical Lesions among Women Attending Cervical Cancer Screening Centers in Selected Tertiary Hospitals in Bangladesh: A Case-control Study

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Abstract

Background and objectives: Cervical cancer, driven mainly by persistent high-risk human papillomavirus infection, remains a major public health problem in Bangladesh, with an estimated 9,640 new cases in 2022. Early detection of pre-cancerous cervical lesions (PCL) is essential, yet limited evidence exists on factors associated with PCL among Bangladeshi women. This study aimed to identify factors associated with PCL among women attending cervical cancer screening centers at selected tertiary hospitals.

Methods: An age-matched (±5 years) case-control study was conducted in two tertiary hospitals. Cases were women with colposcopic findings suggestive of PCL, and controls were visual inspection with acetic acid-negative women attending the same screening centers. No histopathological confirmation was performed. A total of 38 cases and 76 controls were included. Data were collected through face-to-face interviews using a questionnaire. Multivariable logistic regression estimated associations with PCL, with significance set at $p < 0.05$.

Results: A history of sexually transmitted infections (adjusted odds ratio (AOR) = 36.73; 95% confidence interval (CI): 3.25–414.83), pelvic infections (AOR = 6.48; 95% CI: 1.24–33.85), not living with a husband (AOR = 4.48; 95% CI: 1.06–18.90), and overweight/obesity (AOR = 3.58; 95% CI: 1.14–11.22) were significantly associated with higher odds of PCL. Menstrual irregularity, genital ulcer history, and number of lifetime sexual partners showed no significant association after adjustment. These estimates should be interpreted cautiously given the small sample and wide CIs.

Conclusions: Sexually transmitted infections, pelvic infections, overweight/obesity, and not living with husband were reported to be associated with colposcopy-suggestive PCL in this hospital screening sample. The findings are exploratory and warrant verification in larger studies. Strengthened infection prevention, lifestyle counseling, and targeted health education may support ongoing cervical cancer prevention efforts in Bangladesh.

Introduction

Cervical cancer remains a major global public health concern, ranking as the fourth most common cancer among women worldwide.[1,2]

In Bangladesh, cervical cancer is the second most common cancer among women.[3] An estimated 9,640 new cervical cancer cases occurred in Bangladesh in 2022.[4]

Cervical cancer is caused by the sexually transmitted human papillomavirus (HPV), which is one of the most common viral infections of the reproductive tract. Survival of cervical cancer patients is strongly determined by stage at diagnosis. Due to the late stage of diagnosis and inadequate management facilities, mortality rates from cervical cancer are very high in Bangladesh. The overall five-year relative survival for early and localized cancers is 73.2%, but can be as low as 7.4% for advanced-stage disease.[5,6]

Cervical cancer usually develops after a prolonged phase of pre-invasive lesions in the cervix.[7] Therefore, early identification

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and treatment at its pre-invasive stage may benefit patients and decrease the burden of morbidity and mortality resulting from cervical cancer.[8,9]

The high disease burden is exacerbated by limited access to preventive services, delayed diagnosis, and inadequate treatment infrastructure. Facilities for radical surgery and radiotherapy remain restricted to a handful of government institutions, posing major barriers to timely and effective management.[10]

Bangladesh has launched a nationwide Cervical Cancer Surveillance Program, operational in 601 facilities and supported by the National Centre for Cervical and Breast Cancer Screening and Training at BSMMU.[11,12] The program, known as EPBCBSP, provides visual inspection with acetic acid (VIA)-based screening every five years for women aged 30–60, with colposcopy and same-day "see-and-treat" management for screen-positive cases.[13,14] However, treatment of invasive cervical cancer remains costly and limited to a few government centers, underscoring the importance of prevention and the guidance of the National Strategy for Cervical Cancer Prevention and Control (2017–2022).[11,13]

Globally, multiple studies have found that behavioural, reproductive, and socio-demographic factors are strongly associated with pre-cancerous cervical lesions (PCL). For example, a case-control study in the Amhara region, Ethiopia, found that early coitarche, multiple sexual partners, history of sexually transmitted infections (STIs), and use of oral contraceptives were significant risk factors (adjusted odds ratios [AORs] ranging ~2.5–4) for precancerous lesions, while higher education and normal body mass index (BMI) were protective against risk.[15] In Addis Ababa, another case-control study reported that women aged 40–49, having multiple lifetime sexual partners, and having a husband with more than one lifetime sexual partner were also associated with higher odds of precancerous lesions.[16] Similarly, among human immunodeficiency virus-positive women in Gondar, Ethiopia, the prevalence of VIA-positive precancerous or cancerous cervical lesions was high, with human immunodeficiency virus infection significantly elevating risk, alongside behavioral factors such as sexual history.[17]

In Bangladesh, though some studies have examined colposcopy findings and histopathological correlations for VIA-positive women, few have rigorously assessed how socio-demographic, behavioral, reproductive, and clinical factors jointly influence the risk of PCL in tertiary hospital settings.[18,19] Moreover, case-based data from the national electronic registry covering January 2018 to May 2023 documented more than 1.5 million screened women and suboptimal follow-up to colposcopy and treatment, with regional and facility-level variations in screening and follow-up.[4] Therefore, the present case-control study aimed to identify factors associated with PCL among women in selected tertiary hospitals in Bangladesh.

Materials and methods

Study design and setting

We conducted an age-matched (±5 years) case-control study at two tertiary care hospitals: Dhaka Medical College Hospital (DMCH) and Sir Salimullah Medical College Mitford Hospital (SSMCH). Both DMCH and SSMCH serve as major tertiary care centers in Dhaka, providing cervical cancer screening services to large catchment populations. The study was conducted over an eight-month period, from November 2023 to June 2024.

Study participants

The study population included women attending the VIA and Colposcopy Centers of the selected hospitals for cervical cancer screening. Cases were defined as women with colposcopic findings suggestive of pre-cancerous cervical lesions, as assessed by trained colposcopists. No histopathological confirmation was performed. Controls were women with negative VIA screening results and no history of gynecological malignancy. Participants were selected purposively, and each case was matched with two controls by age (±5 years) to minimize age-related confounding. Women were eligible if they attended the screening centers, were aged 18 years or above, and provided informed consent. Exclusion criteria included a diagnosis of invasive cervical carcinoma, a history of total hysterectomy, or inability to provide informed consent (Fig. 1).

Sample size

Sample size was calculated using Epi Info version 7, assuming a 95% confidence interval (CI) level, 80% power, and a case-to-control ratio of 1:2. Based on a prior study from Adama, Ethiopia, an AOR of 3.72 for early sexual exposure was considered, with 45.5% of cases and 18.3% of controls reportedly exposed.[20] The minimum required sample size was 114 participants, including 38 cases and 76 controls.

Data collection

Data were collected through face-to-face interviews using a pretested questionnaire administered by trained data collectors. Interviews gathered information on socio-demographic characteristics, reproductive and sexual history, contraceptive use, and medical history. Anthropometric measurements (weight and height) were also obtained following standardized procedures. Weight was measured using a digital scale (to the nearest 0.1 kg), and height was recorded using a stadiometer (to the nearest 0.1 cm). BMI was calculated as weight in kilograms divided by height in meters squared and classified per World Health Organization guidelines.

Definitions used included:

- *PCL:* Colposcopy-suggestive pre-cancerous cervical lesions.
- *Colposcopy-positive:* Women with colposcopy findings suggestive of PCL.
- *VIA negative:* No acetowhite lesion on the cervix upon acetic acid inspection by trained providers.
- *Nutritional status (BMI-based):* Categorized as underweight (<18.5 kg/m^2), normal (18.5–24.9), overweight (25–29.9), and obese (≥30). Overweight and obesity were presented as a combined category in the results tables.

The main outcome variable was the presence of PCL. Independent variables included socio-demographic factors, reproductive and obstetric history, contraceptive use, and sexual practices.

Data management

Collected data were entered into a Microsoft Excel spreadsheet, secured on a password-protected device under the investigator's supervision. Data ownership remained with the Institute of Epidemiology Disease Control and Research (IEDCR), and access was restricted to authorized personnel only. All data were stored in compliance with the Ministry of Health and Family Welfare policy for a minimum of five years, ensuring confidentiality and data protection.

Statistical analysis

Data were analyzed using StataIC 17 (64-bit). Descriptive statistics summarized socio-demographic, clinical, and behavioral characteristics, with categorical variables presented as frequencies and percentages and continuous variables as means (±standard devia-

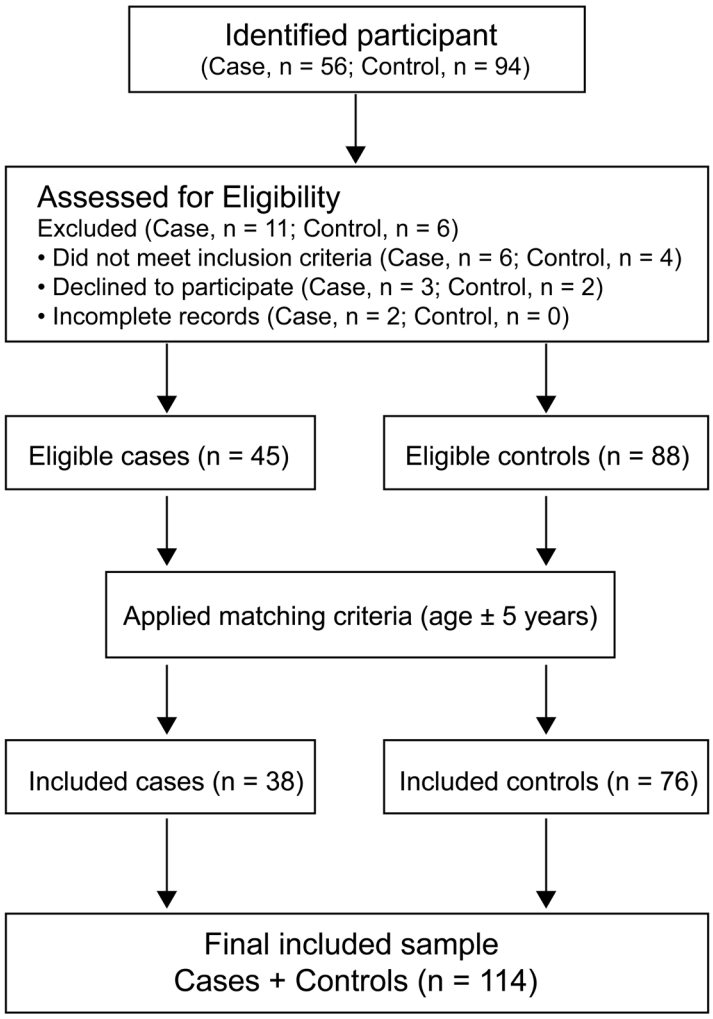

Fig. 1. Participant flow diagram for case–control study.

tion) or medians depending on distribution. Associations with PCL were initially assessed using Chi-square or Fisher's Exact tests.

Bivariate logistic regression was performed to estimate crude odds ratios (COR) with 95% CIs, and variables with $p < 0.20$ or biological plausibility were considered for inclusion in the multivariable logistic regression model. Confounders were selected based on bivariate results and prior literature. Backward elimination was used to derive the most parsimonious model, sequentially removing non-significant variables while retaining key confounders. Collinearity between variables was assessed using a correlation matrix; variables with high collinearity (correlation >0.8) were excluded, with parity removed due to collinearity. AORs with 95% CI were reported, and variables with $p < 0.05$ were considered statistically significant. Model fit was evaluated using the Hosmer-Lemeshow test ($\chi^2 = 11.98$, $p = 0.1522$), and discrimination was assessed via the receiver operating characteristic curve (area under the curve = 0.944). Sensitivity analyses were conducted to assess the robustness of the multivariable model. These included excluding influential observations identified by deviance residuals, recoding BMI as a continuous variable, and performing separate analyses by hospital site (DMCH and SSMCH). Numerical results from these sensitivity analyses were not reported.

Quality assurance

Prior to data collection, the questionnaire was piloted among 5% of the target population to assess feasibility and clarity. Necessary adjustments were made based on the pilot findings. Daily review of collected data ensured completeness and consistency. Regular supervision was conducted by the investigator to maintain the quality and integrity of the data.

Ethical considerations

The study was conducted in accordance with the ethical standards of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of IEDCR, Dhaka (Memo No. IEDCR/IRB/2023/14). Written informed consent was obtained from all participants. Participation was voluntary, and confidentiality was strictly maintained throughout the study.

Results

Socio-demographic characteristics

A total of 38 cases and 76 controls were included in the study.The

30–39-year age group accounted for the largest proportion of both cases (44.7%) and controls (56.6%). Nearly half of the cases (44.7%) and more than half of the controls (56.6%) had completed education up to the primary level. The majority of respondents were married (89.5% of cases vs. 96.1% of controls) and housewives (92.1% of cases vs. 93.4% of controls). Among husbands with reported education data, secondary-level education was reported for 35.1% of cases' husbands and 28.9% of controls' husbands. Overweight or obesity was more frequent among cases (68.4%) than controls (56.6%). Most respondents reported monthly family expenditure between Bangladeshi Taka 10,001–30,000 in both groups (73.7% vs. 80.3%). A family history of cervical cancer was noted in 15.8% of cases and 10.5% of controls. Compared with controls, a higher proportion of cases were not living with their husbands at the time of the study (36.8% vs. 17.1%) (Table 1).

Reproductive health characteristics

More than half of the cases (52.6%) had irregular or no menstruation, compared to 36.8% of controls. Early marriage was common in both groups, with nearly three-fourths of women married at or before 18 years of age (73.7% of cases and 75.0% of controls). Similarly, early age at first childbirth (≤20 years) was also prevalent (68.4% of cases vs. 75.4% of controls). The majority of participants were multiparous (84.2% of cases and 86.8% of controls). A higher proportion of cases initiated sexual activity at age 18 years or earlier (81.6%) compared to controls (73.7%) (Table 2).

Obstetric history and contraceptive use

Vaginal delivery was the most common type of childbirth in both groups (63.2% of cases vs. 66.7% of controls). A history of abortion was more frequent among cases (60.5%) than controls (50.0%), with induced abortion being predominant in both groups. Regarding management, spontaneous resolution was reported by 43.5% of cases and 26.3% of controls, while others underwent menstrual regulation or dilatation and curettage. Ever-use of contraceptives was slightly lower among cases (78.9%) compared to controls (92.1%), and current contraceptive use was also less frequent (26.3% vs. 42.1%).Among participants who had ever used any contraceptive method, oral contraceptive pills were the most widely used method, reported by 93.3% of cases and 90.0% of controls. Duration of pill use ≥ 5 years was slightly higher among cases (42.9%) than controls (33.3%). Among ever-users of any contraceptive method, injectable use was reported by 36.7% of cases and 50.0% of controls. Implant use was infrequent, while other methods were reported by 40.0% of cases and 47.1% of controls among ever-users of any contraceptive method (Table 3).

Sexual behavior history

Histories of STI, pelvic infection, and genital ulcer were more prevalent among cases compared to controls (18.4% vs. 1.3%, 28.9% vs. 7.9%, and 15.8% vs. 3.9%, respectively). Multiple lifetime sexual partners were reported by 31.6% of cases and 9.2% of controls. Husbands having multiple lifetime partners was also more frequent among cases (18.4%) than controls (13.2%) (Table 4).

Bivariate analysis

In bivariate analysis, women not living with their husbands had higher odds of PCL compared to those living with their husbands (COR: 2.82; 95% CI: 1.16–6.87; $p = 0.04$). Ever-use of contraceptives had a COR below 1, with a CI extending to 1 (COR: 0.32; 95% CI: 0.10–1.00; $p = 0.05$). Higher crude odds of PCL were reported for STI history (COR: 16.93; 95% CI: 1.99–143.46; $p < 0.01$), pelvic infection (COR: 4.75; 95% CI: 1.59–14.12; $p < 0.01$), genital ulcer (COR: 4.56; 95% CI: 1.07–19.38; $p = 0.04$), and having two or more lifetime sexual partners (COR: 4.54; 95% CI: 1.62–12.81; $p < 0.01$). Overweight or obesity was not significantly associated with PCL in the bivariate analysis (COR: 1.70; 95% CI: 0.73–3.95; $p = 0.22$) (Table 5).

Multivariable analysis

In multivariable logistic regression, being overweight/obese was associated with increased odds of PCL after adjustment (AOR: 3.58; 95% CI: 1.14–11.22; $p = 0.02$). Women not living with their husbands had higher reported odds of PCL (AOR: 4.48; 95% CI: 1.06–18.90; $p = 0.03$). Higher adjusted odds were reported for STI history (AOR: 36.73; 95% CI: 3.25–414.83; $p = 0.02$), and for pelvic infection (AOR: 6.48; 95% CI: 1.24–33.85; $p = 0.02$). Although genital ulcer and multiple sexual partners showed higher crude odds in bivariate analysis, their associations were not statistically significant after adjustment. The point estimate for injectable contraceptive use was below 1, but the CI included 1 and did not establish a protective association (AOR: 0.29; 95% CI: 0.08–1.07; $p = 0.06$) (Table 6).

Discussion

This case-control study explored factors associated with PCL among women screened at tertiary hospitals in Bangladesh. The multivariable analysis reported associations of STI history, pelvic infections, not living with one's husband, and overweight/obesity with colposcopy-suggestive PCL. These findings are exploratory given the small sample, wide CIs, and reporting uncertainties.

STI history had the largest reported AOR, but the wide CI indicates considerable uncertainty. Other studies have examined STIs in relation to HPV infection or cervical precancer.[15,21,22] HPV was not measured in this study, so a mechanistic link could not be assessed.

Similarly, pelvic infection was associated with higher reported odds of PCL. Previous research in Ethiopia has reported an association between multiple lifetime sexual partners and cervical precancer.[23] The present study did not evaluate the biological mechanisms underlying these associations.

Overweight and obese women exhibited higher odds of precancerous lesions,although a large US screening study reported lower detection of cervical precancer and higher cervical cancer risk with increasing BMI, suggesting possible underdiagnosis of precancer.[24] Another study in perimenopausal women found little effect of obesity on HPV detection or loss of detection.[25]

Irregular or absent menstruation showed higher odds of PCL in bivariate analysis; however, the association was not statistically significant.

Women not living with their husbands had higher odds of precancerous lesions,but this association does not establish a behavioral or social explanation. Multiple lifetime sexual partners were associated with higher crude odds, but the adjusted CI included 1. Previous research has examined sexual exposure in relation to cervical lesions.[23,26,27] However, no significant association was observed with the husband/partner's number of sexual partners.

Thereported estimates for contraceptive use should be interpreted cautiously because the denominators for method-specific summaries differ from the full study sample, and some crude estimates do not agree with the descriptive counts. The adjusted CI for injectable use included 1, so these data do not establish a protective association.

Parity was excluded from the multivariable model because of

Table 1. Distribution of socio-demographic characteristics of respondents at tertiary hospitals, Bangladesh

Variables	Case n(%)	Control n(%)
Age group		
30–39 years	17 (44.74)	43 (56.58)
40–49 years	13 (34.21)	20 (26.32)
50–60 years	8 (21.05)	13 (17.10)
Educational status		
Up to primary education	17 (44.74)	43 (56.58)
Secondary education	13 (34.21)	20 (26.32)
Higher secondary and above	8 (21.05)	13 (17.11)
Marital status		
Married	34 (89.47)	73 (96.05)
Divorced	1 (2.63)	0 (0.0)
Widow	3 (7.89)	3 (3.95)
Occupation		
Housewife	35 (92.11)	71 (93.42)
Govt service	0 (0.0)	2 (2.63)
Private service	1 (2.63)	3 (3.95)
Labor	2 (5.26)	0 (0.0)
Husband's educational status		
No formal education	12 (32.43)	24 (31.58)
Primary education	3 (8.11)	12 (15.79)
Secondary education	13 (35.14)	22 (28.95)
Higher secondary and above	9 (24.32)	18 (23.68)
Nutritional status		
Normal	11 (28.95)	31 (40.79)
Overweight and obese	26 (68.42)	43 (56.58)
Underweight	1 (2.63)	2 (2.63)
Monthly family expenditure (BDT)		
≤10,000	1 (2.63)	1 (1.32)
>10,000–30,000	28 (73.68)	61 (80.26)
>30,000–50,000	9 (23.68)	10 (13.16)
>50,000	0 (0)	4 (5.26)
Family history of cervical cancer		
No	32 (84.21)	68 (89.47)
Yes	6 (15.79)	8 (10.53)
Husband's living status		
Living together	24 (63.16)	63 (82.89)
Not living with husband	14 (36.84)	13 (17.11)

BDT, Bangladeshi Taka. For husbands' education, the reported counts total 37 for cases and 76 for controls; percentages use these denominators.

reported collinearity; therefore, no adjusted estimate was available.

Bangladesh has scaled up HPV vaccination. A report on the final phase of the 2024 campaign described coverage of approximately 93% among the target girls aged 10–14, including marginalized populations.[28] In a study of 400 rural women in Tangail District, only 4.3% reported cervical cancer screening before a health

Table 2. Distribution of reproductive health characteristics of respondents at selected tertiary hospitals, Bangladesh

Variables	Case n(%)	Control n(%)
Type of menstruation		
Regular	18 (47.37)	48 (63.16)
Irregular and no menstruation	20 (52.63)	28 (36.84)
Age at first marriage		
≤18 years	28 (73.68)	57 (75.0)
>18 years	10 (26.32)	19 (25.0)
Age at first childbirth		
≤20 years	26 (68.42)	52 (75.36)
>20 years	12 (31.58)	17 (24.64)
Parity		
Nulliparous	0 (0.0)	7 (9.21)
Primiparity	6 (15.79)	3 (3.95)
Multiparity	32 (84.21)	66 (86.84)
Age at first sexual exposure		
≤18 years	31 (81.58)	56 (73.68)
>18 years	7 (18.42)	20 (26.32)

Percentages are calculated using the total number of participants in each group unless otherwise specified. For age at first childbirth, nulliparous women were excluded because this variable was not applicable; therefore, the denominator was 38 for cases and 69 for controls.

education intervention.[29] Screening challenges include workforce shortages, inadequate infrastructure, low uptake and follow-up, and incomplete surveillance.[30] Integration of high vaccination coverage with strengthened screening programs is essential to reduce the burden of cervical cancer.

Health education and access to sexual health services may complement vaccination and screening. Condom use may reduce HPV transmission.[31,32] Health education can improve knowledge of cervical cancer and screening, while smoking cessation supports cervical cancer prevention.[29,33] Public awareness campaigns and community engagement are crucial for improving uptake of preventive interventions and screening services.

These findings may inform further research on cervical cancer prevention in Bangladesh. Addressing preventable factors associated with PCL such as STIs, pelvic infections, and obesity through health education, sexual health services, and lifestyle modification programs may support prevention efforts, although intervention effects were not evaluated in this study. Ultimately, integrating these interventions with HPV vaccination and VIA-based screening may support ongoing cervical cancer prevention efforts.

This study is one of the few hospital-based case–control studies in Bangladesh to systematically examine factors associated with PCL; however, several limitations should be considered. First, as with any observational design, causality cannot be established. Second, although age matching was applied, the limited number of matching variables may have resulted in residual confounding, and unmeasured behavioral factors were not captured. Third, reliance on self-reported histories of sexually transmitted and pelvic infections introduces the potential for recall bias and measurement error. Fourth, the study population was drawn from tertiary hospital screening centers, which may limit generalizability to women in community or rural settings. Fifth, the relatively small sample size and sparse exposure categories may have contributed to wide CIs and unstable adjusted estimates. Sixth, cases were assessed by colposcopy without histopathological confirmation, whereas controls were identified by negative VIA results; these different assessments may have led to outcome misclassification. Seventh, HPV testing was not performed, limiting assessment of HPV-related pathways. Eighth, regression sample sizes, the handling of matching, and numerical sensitivity-analysis results were not reported. Unresolved inconsistencies in some reported frequencies and regression statistics limit interpretation, particularly for parity and contraceptive use. Future studies should include community-based cohorts, incorporate laboratory-confirmed STI and HPV testing, address biological pathways linking obesity and marital circumstances with cervical precancer, and apply more robust adjustments for confounding.

Conclusions

In this two-center hospital screening sample, histories of STIs and pelvic infections, not living with a husband, and overweight/obesity were associated with colposcopy-suggestive PCL in the reported multivariable analysis. The findings are exploratory and require verification given the wide CIs and unresolved reporting inconsistencies. Strengthening HPV vaccination coverage, promoting safer sexual practices, improving screening and management of reproductive tract infections, and encouraging healthy lifestyle modifications may support ongoing cervical cancer prevention efforts in Bangladesh.

Acknowledgments

The authors gratefully acknowledge the Director and all staff members of the Cervical and Breast Cancer Screening Centers

Table 3. Distribution of obstetric and contraceptive use characteristics of respondents at selected tertiary hospitals, Bangladesh

Variables	Case n(%)	Control n(%)
Delivery type		
Vaginal delivery	24 (63.16)	46 (66.67)
Cesarean section delivery	3 (7.89)	11 (15.94)
Both	11 (28.95)	12 (17.39)
Total	38 (100)	69 (100)
History of abortion		
No	15 (39.47)	38 (50.00)
Yes	23 (60.53)	38 (50.00)
Total	38 (100)	76 (100)
Type of abortion		
Spontaneous	9 (39.13)	11 (28.95)
Induced	14 (60.87)	27 (71.05)
Total	23 (100)	38 (100)
Management taken for abortion		
Abort by itself	10 (43.48)	10 (26.32)
Took tablet	0 (0.0)	10 (26.32)
Menstrual regulation (MR)	5 (21.74)	11 (28.95)
Dilatation and curettage (D & C)	8 (34.78)	7 (18.42)
Ever used any contraceptive methods		
No	8 (21.05)	6 (7.89)
Yes	30 (78.95)	70 (92.11)
Total	38 (100)	76 (100)
Ever used oral contraceptive methods		
No	2 (6.67)	7 (10.00)
Yes	28 (93.33)	63 (90.00)
Total	30 (100)	70 (100)
Time of using OCP		
<5 years	16 (57.14)	42 (66.67)
≥5 years	12 (42.86)	21 (33.33)
Total	28 (100.00)	63 (100.00)
Ever used injectable contraceptive		
No	19 (63.33)	35 (50.00)
Yes	11 (36.67)	35 (50.00)
Total	30 (100.00)	70 (100.00)
Ever used any implant contraceptive		
No	28 (93.33)	69 (98.57)
Yes	2 (6.67)	1 (1.43)
Total	30 (100.00)	70 (100.00)
Ever used any other contraceptives		
No	18 (60.00)	37 (52.86)
Yes	12 (40.00)	33 (47.14)
Total	30 (100.00)	70 (100.00)
Currently use any contraceptive methods		
No	28 (73.68)	44 (57.89)
Yes	10 (26.32)	32 (42.11)

For delivery type, nulliparous women were excluded; therefore, the denominator was 38 for cases and 69 for controls. For each variable, percentages use the totals shown in the table. Method-specific contraceptive summaries use 30 cases and 70 controls; duration of oral contraceptive use uses 28 cases and 63 controls. OCP, oral contraceptive pill.

Table 4. Distribution of respondents by their history of sexual behavior at selected tertiary hospitals, Bangladesh

Variables	Case n(%)	Control n (%)
Ever suffered from STI		
No	31 (81.58)	75 (98.68)
Yes	7 (18.42)	1 (1.32)
Total	38 (100.00)	76 (100.00)
History of pelvic infection		
No	27 (71.05)	70 (92.11)
Yes	11 (28.95)	6 (7.89)
Total	38 (100.00)	76 (100.00)
History of genital ulcer		
No	32 (84.21)	73 (96.05)
Yes	6 (15.79)	3 (3.95)
Total	38 (100.00)	76 (100.00)
Number of lifetime sexual partner(s)		
One	26 (68.42)	69 (90.79)
Two or more	12 (31.58)	7 (9.21)
Total	38 (100.00)	76 (100.00)
Husband/partner's lifetime sexual partner(s)		
One	31 (81.58)	66 (86.84)
Two or more	7 (18.42)	10 (13.16)
Total	38 (100.00)	76 (100.00)

STI, sexually transmitted infection.

Table 5. Bivariate analysis of socio-demographic factors associated with pre-cancerous cervical lesions in women at selected tertiary hospitals, Bangladesh

Variables	COR (95% CI)	*p*-value
Educational status		
Up to primary education	Ref	
Secondary education	1.64 (0.67–4.02)	0.62
Higher secondary and above	1.55 (0.54–4.42)	0.74
Marital status		
Married	Ref	
Widow	2.14 (0.41–11.19)	0.91
Occupation		
Housewife	Ref	
Govt service	Omitted	
Private service	0.67 (0.06–6.73)	0.73
Husband's educational status		
No formal education	Ref	
Primary education	0.50 (0.11–2.11)	0.34
Secondary education	1.18 (0.44–3.13)	0.73
Higher secondary and above	1.00 (0.34–2.88)	1.00

(continued)

Table 5. *(continued)*

Variables	COR (95% CI)	*p*-value
Husband's occupational status		
Unemployment	Ref	
Govt service	1.00 (0.16–6.05)	1.00
Private service	1 (0.26–3.852)	1.00
Labor	0.81 (0.33–1.96)	0.64
BMI-based nutritional status		
Normal	Ref	
Overweight and obese	1.70 (0.73–3.95)	0.22
Underweight	1.40 (0.11–17.11)	0.27
Monthly family expenditure (BDT)		
≤10,000	Ref	
>10,000–30,000	0.46 (0.27–7.60)	0.58
>30,000–50,000	0.9 (0.04–16.59)	0.94
Family history of cervical cancer		
No	Ref	
Yes	1.59 (0.51–4.97)	0.42
Husband's living status		
Living together	Ref	
Not living with husband	2.82 (1.16–6.87)	0.04
Type of menstruation		
Regular	Ref	
Irregular and no menstruation	1.90 (0.86–4.19)	0.52
Age at first marriage		
≤18 years	Ref	
>18 years	1.07 (0.44–2.60)	0.87
Age at first childbirth		
≤20 years	Ref	
>20 years	1.41 (0.58–3.39)	0.52
Parity		
Nulliparous	Omitted	
Primiparity	Ref	
Multiparity	0.48 (0.32–0.74)	<0.01
Age at first sexual exposure		
≤18 years	Ref	
>18 years	0.63 (0.24–1.66)	0.35
Delivery type		
Vaginal delivery	Ref	
Cesarean section delivery	0.52 (0.13–2.05)	0.35
Both	1.75 (0.67–4.56)	0.24
History of abortion		
No	Ref	

(continued)

Table 5. *(continued)*

Variables	COR (95% CI)	*p*-value
Yes	1.51 (0.67–3.39)	0.31
Type of abortion		
Spontaneous	Ref	
Induced	0.81 (0.34–1.97)	0.65
Management taken for abortion		
Abort by itself	Ref	
Took tablet	Omitted	
Menstrual regulation (MR)	0.45 (0.12–1.79)	0.26
Dilatation and curettage (D & C)	1.14 (0.29–4.36)	0.84
Ever used any contraceptive methods		
No	Ref	
Yes	0.32 (0.10–1.00)	0.05
Ever used oral contraceptive methods		
No	Ref	
Yes	0.52 (0.20–1.3)	0.59
Time of using OCP		
<5 years	Ref	
≥5 years	1.27 (0.51–3.15)	0.38
Ever used injectable contraceptive		
No	Ref	
Yes	0.57 (0.24–1.39)	0.22
Ever used any implant contraceptive		
No	Ref	
Yes	4.16 (0.36–47.47)	0.25
Ever used any other contraceptives		
No	Ref	
Yes	0.57 (0.25–1.29)	0.17
Currently use any contraceptive methods		
No	Ref	
Yes	0.49 (0.20–1.15)	0.10
Ever suffered from STI		
No	Ref	
Yes	16.93 (1.99–143.46)	<0.01
History of pelvic infection		
No	Ref	
Yes	4.75 (1.59–14.12)	<0.01
History of genital ulcer		
No	Ref	
Yes	4.56 (1.07–19.38)	0.04
Number of lifetime sexual partner(s)		
One	Ref	

(continued)

Table 5. *(continued)*

Variables	COR (95% CI)	*p*-value
Two or more	4.54 (1.62–12.81)	<0.01
Husband/partner's lifetime sexual partner(s)		
One	Ref	
Two or more	1.49 (0.51–4.28)	0.45

BDT, Bangladeshi Taka; BMI, body mass index; CI, confidence interval; COR, crude odds ratios; OCP, oral contraceptive pill; STI, sexually transmitted infection. Regression sample sizes and the test underlying each p value were not specified. Inconsistencies between some crude estimates and the descriptive frequencies could not be resolved from the reported information, particularly for parity and contraceptive use.

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Table 6. Multivariable analysis of selected variables among study participants, Bangladesh

Variables	COR (95% CI)	AOR (95% CI)	*p*-value
Nutritional status			
Normal	Ref	Ref	
Overweight and obese	1.70 (0.73–3.95)	3.58 (1.14–11.22)	0.02
Underweight	1.40 (0.11–17.11)	3.01 (0.19–47.26)	0.50
Type of menstruation			
Regular	Ref	Ref	
Irregular and no menstruation	1.90 (0.86–4.19)	1.81 (0.62–5.25)	0.2
Husband's living status			
Living together	Ref	Ref	
Not living with husband	2.82 (1.16–6.87)	4.48 (1.06–18.90)	0.03
Ever used injectable contraceptive			
No	Ref	Ref	
Yes	0.57 (0.24–1.39)	0.29 (0.08–1.07)	0.06
Ever suffered from STI			
No	Ref	Ref	
Yes	16.93 (1.99–143.46)	36.73 (3.25–414.83)	0.02
History of pelvic infection			
No	Ref	Ref	
Yes	4.75 (1.59–14.12)	6.48 (1.24–33.85)	0.02
History of genital ulcer			
No	Ref	Ref	
Yes	4.56 (1.07–19.38)	1.91 (0.22–15.96)	0.50
Number of lifetime sexual partner(s)			
One	Ref	Ref	
Two or more	4.54 (1.62–12.81)	3.52 (0.89–13.99)	0.07

CI, confidence interval; COR, crude odds ratios; STI, sexually transmitted infection. The multivariable analysis sample size and handling of age matching were not specified. Some reported p values do not align with the corresponding CIs under a common Wald test; the test used for each p value was not specified. These estimates require cautious interpretation.

Conflict of interest

The authors declared no conflict of interest.

Author contributions

Study concept and design (MFI, AN, QAZ), acquisition of data (MFI, QAZ), analysis and interpretation of data (MFI, QAZ), drafting of the manuscript (MFI), critical revision of the manuscript for important intellectual content (AN, QAZ, TS), administrative, technical, or material support (MOQ, QAZ, TS), and study supervision (QAZ). All authors have made significant contributions to this study and have approved the final manuscript.

Ethical statement

The study was conducted in accordance with the ethical standards of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of IEDCR, Dhaka (Memo No. IEDCR/IRB/2023/14). Written informed consent was obtained from all participants.

Data sharing statement

The datasets analyzed in the current study are not publicly available due to data privacy restrictions but are available upon reasonable request from the Institute of Epidemiology, Disease Control and Research, Dhaka, Bangladesh (email: iedcrit@gmail.com).

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