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Comparison between Combination of Visual Inspection with Acetic Acid and Partial HR-HPV Genotype with Partial HR-HPV Genotype Standalone for Cervical Cancer Screening in Bangladesh

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ABSTRACT

OBJECTIVE

Comparing a combination of VIA and partial HPV genotyping and partial HPV genotyping standalone for detection of cervical intraepithelial neoplasia and cervical cancer (CC) to examine an effective and feasible screening and treatment method in urban setting of Bangladesh.

METHOD

This cross-sectional study was carried out in six tertiary healthcare facilities among apparently healthy women aged 35 years - 60 years from January 2023 to December 2023 (n = 4792). Women were selected in two groups. Women in the combined group had both VIA and HR-HPV partial genotyping (n = 2396) and women in the standalone group had HR-HPV partial genotyping (n = 2396). VIA positive women in the combined group had colposcopy and required management in the same visit. Detection and genotyping of HR-HPV were performed using polymerase chain reaction (PCR, Cobas 4800). HR-HPV positive women were scheduled for colposcopy on a later date. Statistical analyses were carried out using SPSS version 23.0.

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RESULT

Majority of the women were in the 35 years - 44 years age group (67.5%). Higher test positivity was found in the combined group (5.9%, n = 141) compared to standalone group (3.7%, n = 88). Colposcopically more CIN 2+ cases were detected in the combined group (n = 11, 0.4%) than the standalone group (n=3, 0.1%) (p-value <0.01). Significantly higher CC cases were histologically diagnosed in VIA-HR-HPV genotype (n = 7, 0.34%) than the HPV standalone group (n = 1, 0.04%) (p-value <0.05). More positive women in combined group (73.8%) attended for colposcopy contrasted to positive women in standalone group (56.8%).

CONCLUSION

VIA-HR-HPV group was more effective and feasible compared to the HR-HPV standalone group based on the high positivity rate, diagnosis of more CC cases and overall high compliance.

KEYWORDS

Cervical Cancer; Cervical intraepithelial neoplasia; High-risk human papillomavirus genotype; Visual inspection with acetic acid; Compliance

INRODUCTION

In Bangladesh, Cervical Cancer (CC) is the second most common cancer among women. Approximately 9640 women were diagnosed with CC and 5826 CC related deaths were reported in the year 2022, constituting about 13.3% of the female cancer in this country [1]. Effective CC screening programs have been successful in reducing the CC incidence and CC-related mortalities [2]. Government of Bangladesh (GOB) established national cervical cancer screening program since the year 2006 by adopting Visual Inspection of cervix with Acetic acid (VIA) as the primary screening method [3-5]. Till now about 600 cervical cancer screening centers have been established at primary, secondary and tertiary level health care facilities of 64 districts. VIA positive cases are being referred to the colposcopy clinics at secondary and tertiary care hospitals for evaluation and management [5,6].

VIA is a simple, low-cost method with a potential for immediate linkage with investigations and treatment. However, the low specificity of VIA is an issue of concern since VIA is entirely a provider dependent test and the result is based on the interpretation of the performer which leads to interobserver difference [7-10]. On the other hand, for primary screening of CC, HPV DNA testing is established through a number of studies [11-13]. The World Health Organization also recommends HPV test for primary CC screening, and it perfectly fits the WHO requirements of 90:70:90 goal by 2030 due to its' high sensitivity (88%-100%) [14].

HPV 16 and 18 are present in 65% to 80% of all cervical cancers [15], detection of HPV types 16 and 18 allows risk stratification allowing direct clinical management and reduces follow-up visits [16]. A cross-sectional study for the early detection of high-grade squamous intraepithelial lesions (HSIL) showed that adding a visual test to HPV testing resulted in a substantial increase in sensitivity, with a moderate decrease in specificity [17]. The objective of this study was to examine an effective and feasible screening and treatment method in an urban setting of Bangladesh. This study compared a combination of VIA and partial HPV genotyping and partial HPV genotyping standalone for detection of cervical intraepithelial neoplasia (CIN) and cervical cancer (CC).

METHODOLOGY

Study Design and Selection of Participants

This cross-sectional study was carried out in the colposcopy clinics of tertiary care hospitals in 6 major divisions (Dhaka, Chittagong, Mymensingh, Khulna, Rangpur, Rajshahi) of Bangladesh from January 2023 to December 2023. Apparently healthy-looking ever married women aged 35 years - 60 years were selected by systematic random sampling from the out-patient department of each hospital. The participants were selected in two groups (about 400 each). The first woman was selected for the combined VIA-HR-HPV genotype tests (group I) and the second woman was selected for HR-HPV genotype standalone test (group II). So, the odd serial numbers were for group I and even serial numbers were for group II. Women with chronic illness, pregnancy, hysterectomy/cervical amputation, menstruation at presentation and women treated for CIN and CC were not included. Approximately 800 women were selected from each centre after counseling on research procedure, VIA and HPV test, colposcopy, examination procedures, possible findings, treatment options, follow-up etc.

Sample Collection and HPV DNA Genotyping

In group I, HPV DNA sample was collected before VIA test. In group II, only HPV DNA samples were collected. HPV DNA specimen was collected using a cervical sampler by trained clinical staffs, suspended in a vial of preservative (Cobas PCR collection media) and stored in the fridge (40°C) before transported to the laboratory at BSMMU. Detection and genotype of HPV DNA were performed using polymerase chain reaction (PCR) by Cobas 4800 and nucleic acid hybridization to specifically identify HPV type 16, 18, and pooled detection of Other HR-HPV genotypes (31, 33, 35, 39, 45, 51, 52. 56, 58, 59, 66, and 68) [18] (Figure 1).

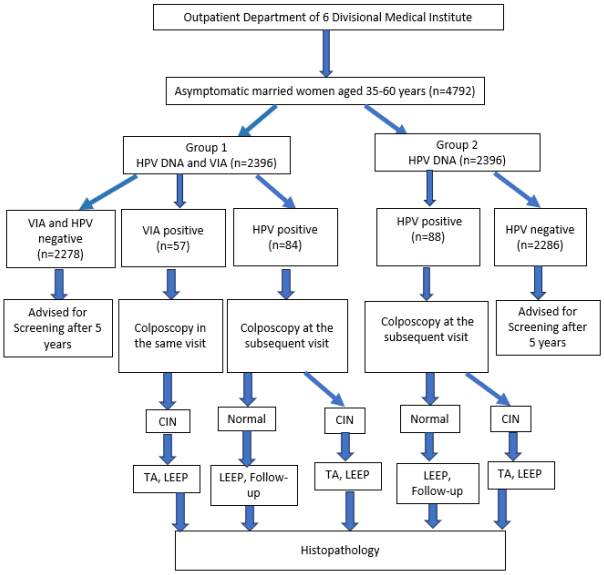


Figure 1: A flowchart of research methodology.

Management of Positive Findings

VIA positive women were evaluated by colposcopy during the same visit and treatment provided whenever applicable. All HR-HPV positive women from group I and group II were informed later on about HR-HPV genotype report and were recalled for colposcopy except the women who already received treatment. Women with colposcopy suspected CIN were treated by Loop Electrosurgical Excision Procedure (LEEP) or Thermal Ablation (TA). HR-HPV positive women with normal colposcopy findings were offered LEEP and among them, women unwilling to avail treatment were advised repeat HPV test and colposcopy after 1 year. Cervical cancer cases were referred to oncology department.

Data Analysis

The effectiveness and feasibility of combined and standalone groups in detecting CIN and CC diagnosis by colposcopy and histology were expressed as proportions. Statistical significance was inferred at 0.05 level. Statistical analyses were carried out using SPSS (Statistical Package for Social Sciences) software version 23.0.

RESULTS

Majority of the women were in the 35 years - 44 years age group (67.5%) and 42.8% had education upto secondary level and above (Table 1). There is no significant difference in the socio-economic and reproductive characteristics among the two groups. The mean age of first marriage and first delivery of the population were 17.7+/-3.9 years and 19.9+/-4.2 years respectively.

Socio-Demographic and Reproductive Characteristics	Group I (VIA and HR-HPV Genotype); N=2396	Group II (only HR-HPV Genotype); N=2396	*P-Value
Age Group			
35 Years - 39 Years	899 (37.5)	817 (34.1)	0.467
40 Years - 44 Years	720 (30.1)	795 (33.2)	
45 Years - 49 Years	472 (19.7)	438 (18.3)	
50 Years - 54 Years	200 (8.3)	246 (10.3)	
55 Years - 60 Years	105 (4.4)	100 (4.2)	
Educational Status			
No Schooling	407 (17.0)	387 (16.2)	0.571
Upto Primary	990 (41.3)	959 (40.0)	
SSC	484 (20.2)	496 (20.7)	
HSC	195 (8.1)	200 (8.3)	
Graduate & Above	320 (13.4)	354 (14.8)	
Occupation			
Housewife	2134 (89.1)	2113 (88.2)	0.339
Service Holder	262 (10.9)	283 (11.8)	
Monthly Family Income			
≤10000	982 (41.0)	981 (40.9)	0.892
10001-20000	722 (30.1)	730 (30.5)	
20001-50000	463 (19.3)	471 (19.7)	
>50000	229 (9.6)	214 (8.9)	
Parity			
Nulliparous	45 (1.9)	55 (2.3)	0.346
Primiparous	1284 (53.6)	1327 (55.4)	
Multiparous	1052 (43.9)	997 (41.6)	
Grand Multipara	15 (0.6)	17 (0.7)	
Age at 1st Marriage			
12 Years to 15 Years	820 (34.2)	765 (31.9)	0.145
16 Years to 17 Years	552 (23.0)	599 (25.0)	
18 Years and Above	1024 (42.7)	1032 (43.1)	
Age at First Delivery (n = 4706)			
14 Years to 15 Years	227 (9.7)	231 (9.8)	0.481
16 Years - 20 Years	1357 (57.7)	1308 (55.8)	
21 Years - 25 Years	511 (21.7)	551 (23.6)	
26 Years and Above	256 (10.9)	251 (10.8)	

*Pearson chi-square

Table 1: Socio-demographic and reproductive characteristics of the study population (N = 4792).

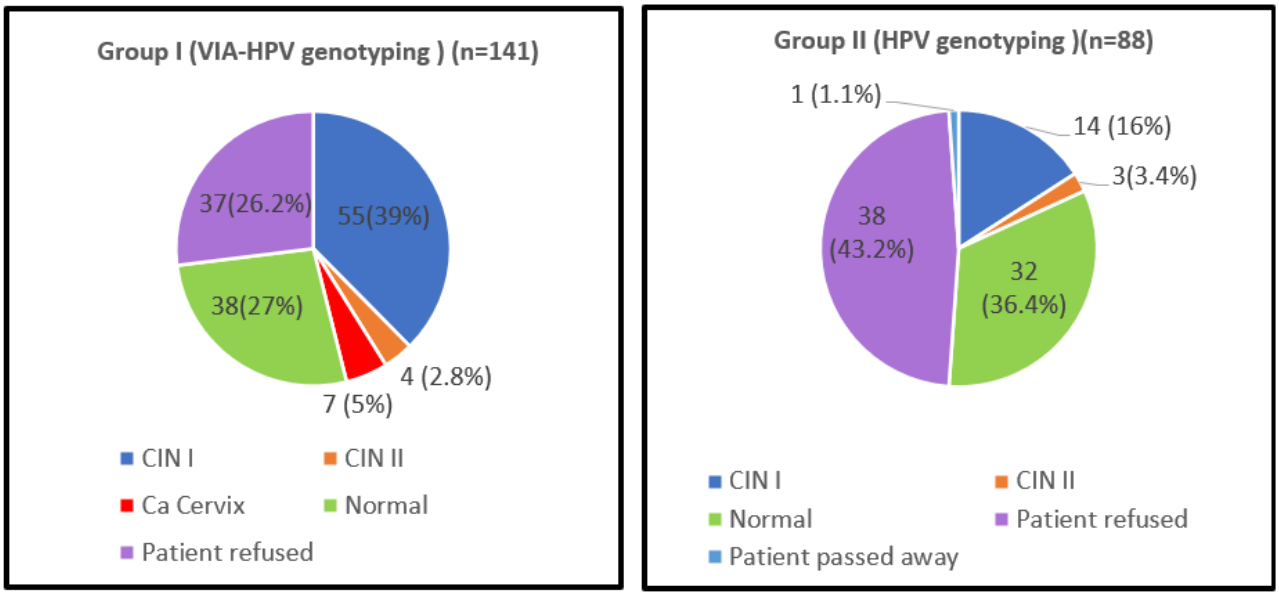
The combined VIA-HR-HPV genotype test group had higher positivity (5.9%, n = 141) compared to HR-HPV genotype standalone group (3.7%, n = 88) (Table 2) and the difference was statistically significant (p <0.01).

Type of Test (n = 4792)	Positive (%)	Negative (%)	Total (%)	*P-value
Group II (HPV Genotype) (n=2396)	88 (3.7)	2308(96.3)	2396 (100)	<0.01
Group I (VIA-HPV Genotype) (n=2396)	141(5.9)	2255(94.1)	2396(100)	
Only VIA Positive	47 (2.0)	-	-	-
Only HR-HPV Positive	84 (3.5)	-	-	
Combined VIA and HR-HPV Positive	10 (0.4)	-	-	

*Pearson Chi-Square

Table 2: Screen positivity rate of VIA-HR-HPV genotype and HR-HPV genotype standalone.

In figure 2, the colposcopy findings were disaggregated groupwise in figure2 (A) and figure 2(B). In combined VIA-HR-HPV genotype group, 4 (2.8%) women had colposcopy suspected CIN II, 7 (5%) had CC and 37 (26.2%) positive women did not avail colposcopy examination. In HPV genotype standalone group, 3 (3.4%) had colposcopy suspected CIN II and 38 (43.2%) HPV positive women did not avail colposcopy examination. The reasons for non-compliance to colposcopy were financial constraints (39.5%), having no health problem (13.2%), lives in remote areas (21.0%), unable to attend due to household/children's responsibilities (18.4%), conservative attitude (7.9%).



(A) Colposcopy findings of VIA-HPV genotype **(B) Colposcopy findings of HPV-genotype**

Figure 2: Colposcopy findings of screen positive women in VIA-HR-HPV and HR-HPV genotype standalone groups.

Colposcopically more CIN 2+ cases were detected in the combined group (n = 11, 0.4%) compared to the standalone group (n = 3, 0.1%) (p-value <0.01). Histologically significantly higher CC cases were diagnosed in VIA-HR-HPV genotype (n=7, 0.34%) compared to HPV standalone group (n = 1, 0.04%) (p-value <0.05) (Table 3).

Statistically more cases of CIN I (55, 2.3%) were detected by colposcopy in the combined group than in the HPV standalone group (14, 0.6%) (p <0.01). However, in comparison to colposcopy a smaller number of women had histology diagnosed CIN I in the combined (n = 12, 0.5%) and standalone group (n = 7, 0.3%), indicating that a large number of colposcopy-diagnosed low-grade lesions did not show histologic abnormality (Table 3).

Colposcopy Findings (N = 4792)	Group I (VIA & HPV) (N = 2396)	Group II (HPV) (N = 2396)	*P-value
CIN I	55 (2.3%)	14 (0.6%)	<0.01
CIN II+ (II, III, CC)	11 (0.4%)	3 (0.1%)	0.032
Normal	38(1.54%)	32 (1.3%)	0.544
Failure of Colposcopy	37 (1.5%)	38 (1.6%)	0.907
Colposcopy not Necessary	2255 (94.1%)	2309 (96.3%)	<0.01
Total	2396 (100%)	2396 (100%)	
Histopathology Findings (n=4792)			***P-value**
CIN I	12 (0.5%)	7 (0.3%)	0.25

CIN II-III	2 (0.08%)	4(0.17%)	0.414
Ca-Cervix	7 (0.34%)	1 (0.04%)	0.034
Normal	32 (1.3%)	13 (0.5%	0.004
Histopathology not Necessary	2306 (96.2%)	2332 (97.3%)	0.033
Failure of Colposcopy	37 (1.5%)	39 (1.6%)	0.817
Total	2396 (100%)	2396 (100%)	

*Pearson chi-square.

Table 3: Colposcopy and histopathology reports of VIA-HPV genotype and HPV genotype groups.

In VIA-HPV genotype group, 12 cases had CINI, 2 had CIN II-III and 7 CC cases were diagnosed. In HPV genotype standalone group, only 1 woman was histologically diagnosed with squamous carcinoma, 7 women had CIN I and 4 had CINII-III diagnosis (Table 4).

Histopathology Report	**Group I (VIA-HPV Genotype Group) (n = 53)**				**Group II (HPV Genotype) (n = 25)**		
	TA + Punch Biopsy	**LEEP**	**Cervical Biopsy**	**Total**	**TA + Punch Biopsy**	**LEEP**	**Total**
CIN I	7 (38.9%)	5 (17.9%)	-	12 (22.6%)	2 (100%)	5 (21.7%)	7 (28.0%)
CIN II-III	-	2 (7.1%)	-	2 (3.8%)	-	4 (17.4%)	4 (16.0%)
Squamous Carcinoma	-	-	6 (85.7%)	6 (11.3%)	-	1(4.3%)	1 (4%)
Adeno Carcinoma	-	-	1 (14.3%)	1 (1.9%)	-	-	-
Normal	11 (61.1%)	21 (75.0%)		32 (60.4%)	-	13 (56.5%)	13 (52.0%)
Total	18 (100%)	28 (100%)	7 (100%)	53 (100%)	2 (100%)	23 (100%)	25 (100%)

*Pearson chi-square.

Table 4: Histopathology reports of VIA-HR-HPV genotype and HR-HPV genotype standalone women who had biopsy/LEEP.

DISCUSSION

This cross-sectional study aimed to identify effective and feasible screening method (VIA + HPV or HPV standalone) for detection of cervical pre-cancer or cancer among women in urban tertiary healthcare facilities across six divisions of Bangladesh.

In the combined group, 2.0% women were tested positive for VIA and 0.4% were positive for both VIA and HPV (Table 2). Comparable studies in Ghana, Cote d'Ivoire and Pakistan reported varying VIA positivity (2.1%, 6.2% and 5.4% respectively) and similar combined VIA-HPV positivity (1.1%, 0.8% and 0.5% respectively) [19-21]. Moreover, combined VIA-HPV genotype group (5.79%) had higher test positivity compared to HPV standalone group (3.66%) and the difference is statistically significant (p-value <0.01) (Table 2). In this study, histologically 7 CC cases were detected in combined VIA-HPV genotype group compared to only one case of CC in HPV genotype standalone group (Table 4). Therefore, the detection of overt CC is higher in the combined group than in the HPV standalone group.

The HR-HPV positivity is almost similar in combined VIA-HPV genotype (3.5%) and HPV standalone group (3.7%) (Table 2). Studies in Bangladesh reported similar HR-HPV prevalence (4.2% and 3.6%) [22,23]. On the other hand, a cross-sectional study in Pakistan reported lower HR-HPV prevalence (1.5%) [21]. Ghana, Cote d'Ivoire, Bhutan, Nepal, South India and East India reported higher HPV prevalence (17.9%, 9.4%, 14.8%,11.4% 10.5% and 9.9% respectively) [19,20,24-27]. High HR-HPV prevalence in African countries might be related to low level of education, more oral contraceptive usage, high risk sexual behaviors and presence of HIV infection [28-31]. The presence of high HR-HPV prevalence in some of the South Asian countries might be attributed to early marriage, multiple parity, risky sexual behaviors [25,27]. Low HR-HPV prevalence in Bangladesh suggests that effective screening should help in eliminating CC since a smaller number of women need to be treated.

The combined VIA-HPV genotype group witnessed 26.2% non-compliance whereas HPV genotyping standalone group witnessed 43.6% (Figure 2). Non-compliance in

HPV genotype standalone group is an important concern as 43.2% of HR-HPV positive women failed to attend for colposcopy and management. According to the present study protocol, HR-HPV-positive women in HPV standalone group were advised for a second visit to the healthcare center and this resulted in non-compliance. Even after repeated phone calls and communication, they did not attend for colposcopy. Though the study centres are tertiary referral centres, a good number of women attend these centres from rural areas, and they failed to attend the second visit. 21% of them did not attend as they live in remote areas, 39.5% had financial difficulties, 13.2% were not convinced to attend as they did not have any health complaints, 18.4% could not leave home due to household/children's responsibilities, 7.9% cited conservative attitude of family. Therefore, adhering to less visit approach is crucial for detection of more CIN 2+ cases in low-resource countries like Bangladesh. Several studies also reported that multiple visits to the healthcare department resulted in loss of follow-up (16%-34%) [32-35]. Compliance can also be improved by decentralization of the evaluation and treatment services up-to the sub-district level in Bangladesh. Even though the VIA-based screening services are decentralized up-to the sub-district level, evaluation and management of the positive cases are available at the district level only. The sub-district healthcare facilities can easily be used for the management of HR-HPV-positive women by identification of suitability of treatment by TA as trained VIA nurses are available there. Only supply of simple equipment of TA would create a great opportunity for treating HR-HPV positive women at the sub-district level without colposcopy referral, particularly women with HPV 16 and 18 positive reports. The women are not suitable for TA can be referred to the nearest referral centre. Bangladesh is already practicing TA by SSNs at the district level and screening campaign services at the upazila level [6, 36-38]. The government should incorporate this approach in the national strategy, particularly when the HR-HPV is accepted as the primary screening method in the national strategy. At the sub-district level, HR-HPV sample collection can be done, and they can be sent to the district level for test. Upon HR-HPV genotyping, the women can be recalled at the sub-district level healthcare facilities to evaluate and treat by TA. Treatment by TA is affordable, no gas required and can be used with simple electricity, nurses can perform without any risk of bleeding. Therefore, decentralization of TA by SSNs to the sub-district level is achievable and this will improve compliance because the service centre is near their doorstep.

HR-HPV testing is not yet established as a primary screening method in Bangladesh and implementing HR-HPV DNA test would take time as Bangladesh is a densely populated country and the test itself is expensive and less affordable. So, VIA needs to be continued for some time as the primary screening test. Exclusion of VIA test from the screening strategy in Bangladesh is not a viable option at the moment and combination of VIA and HR-HPV genotype can be alternative strategy for several years till the CC incidence is reduced substantially. Bangladesh has well-developed VIA-based CC screening centers with approximately 600 centers across the country and the addition of HR-HPV genotype would significantly improve the detection rate of cervical pre-cancer and cancer. Moreover, implementing HR-HPV tests as standalone might reduce the efficiency of the VIA trained nurses and doctors.

This study showed that combined VIA-HPV genotype tests are promising methods for the early detection of cervical pre-cancer and cancer. Histopathological diagnosis of CIN I and CIN II/III had no statistical significance between both the groups (p-value >0.05) (Table 3). However, diagnosis of CC was significantly higher (p-value <0.05) in VIA-HPV genotype group (13.2%, n = 7) compared to HPV genotype standalone group (4.0%, n = 1) (Table 3 and

Table 4). Comparative studies of combined VIA-HPV and HPV standalone tests are scarce in literature. A prospective study in West Cameroon also showed higher HSIL (14.7%) diagnosis in VIA-HPV positive participants compared to HPV standalone (5.1%), but VIA-HPV group reported lower CC cases (0.5%) compared to HPV standalone group (1.5%) [39]. However, a comparative study in Kenya reported similar HSIL detection in both the VIA-HPV genotype group (5.4%) and HPV standalone group (6.3%) with similar detection rate of CC cases (1.3% and 1.6% respectively) [40]. In the present study, VIA-HPV genotype group was more successful in diagnosing CC cases compared to HPV genotype standalone group, further implying that the addition of visual inspection significantly improved the diagnosis of CC. All these findings indicate the importance of implementing combined VIA- HPV test in developing CC control strategy at least for several years as CC is still the second most common cancer among in Bangladesh.

In VIA-HPV genotype group, 55 (2.3%) positive women had colposcopy suspected CIN I and 11 (0.4%) had CIN 2+. In HPV genotype standalone group, 14 (0.6%) had colposcopy suspected CIN I and 3 (0.1%) had CIN 2+ (Table 3). According to the National CC control strategy of Bangladesh, colposcopy suspected CIN I-III were treated by LEEP/TA [41]. In the study protocol, the national protocol was followed and besides that LEEP/TA were preferred for HPV genotype 16 and 18 women irrespective of colposcopy findings. Women with 'Other HR-HPV' positive report were offered treatment based on colposcopy findings. A study in Mozambique followed a similar treatment protocol to this study where HPV-positive women received cryotherapy or LEEP [42]. More treatment in the combined VIA-HPV genotype group with 46 women receiving treatment (LEEP = 28, TA = 18) for cervical pre-cancer could be explained by the management of both VIA and HPV-positive women. In HPV genotype standalone group, almost half of the women (n = 25) were treated (LEEP = 23, TA = 2) for cervical pre-cancer compared to the combined group. Based on the histological diagnosis (Table 3 and Table 4), there was notable overtreatment in both the groups with comparatively lower overtreatment in HPV genotype standalone group. Overtreatment was high in the combined VIA-HPV group because many colposcopy-suspected cervical pre-cancers received treatment following colposcopy diagnosis which later showed normal histological findings. Kietpeerakool et al. [43] reported that overtreatment was high among women with low-grade lesions or no lesions on colposcopy. These reports of overtreatment are not unusual in the treatment of cervical pre-cancer and cancer. Two studies with a screen-and-treat approach reported significant overtreatment of 11.4% and 61.1% [43,44]. The choice of screening approach depends on infrastructure including available facilities and trained manpower for screening, economic situation of the country. HPV test report is not immediately obtainable, and women may require second/third visit to the healthcare centre to avail the treatment which results in loss of follow-up. Therefore, screen-and-treat approach as per WHO [45] recommendation is still more suitable in the current economic situation of Bangladesh. The high treatment rate for HPV-positive women is of high importance.

STRENGTHS AND LIMITATIONS

The strengths of the study are that it is a cross-sectional study with a large sample size with systematic random sampling, avoiding bias. The limitations of the study are- randomly selected women with symptoms, such as pv bleeding, were not excluded from the study since these women were attending tertiary healthcare centers in urban areas; sensitivity and specificity could not be calculated for the two different approaches of testing; not all HPV positive women had the confirmatory biopsy test.

CONCLUSION

In conclusion, the combined VIA-HPV genotype group was more effective and feasible compared to the standalone group based on the high positivity rate, diagnosis of more CC cases, and overall high compliance. However, overtreatment was high in the combined VIA-HPV genotype group. VIA is an established primary screening test for CC in Bangladesh and the combination of VIA and HPV tests can be initiated for the next few years till the CC prevalence in Bangladesh is reduced. To improve compliance, less visit to the healthcare center is suggested for convenience. Also, decentralization of evaluation and treatment services up to the grassroots level is required for optimum compliance which could reduce the incidence of CC.

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ETHICAL STATEMENT

Participants were fully briefed on the purpose of the study and counselled on the research method. Through informed consent, the participants willingly agreed to participate. Ethical clearance to carry out this research was received from the Institutional Review Board of BSMMU. IRB: BSMMU/2022/4076.

DATA SHARING STATEMENT

The data collected for this study were analyzed and are contained within this published article. For maintaining data privacy, the data used are not made available public. Data can be made available after rational requests from researchers.

REFERENCES

1. Cancer Today Globocan (2022) International agency for research on cancer WHO.
2. Bouvard V, Wentzensen N, Mackie A, et al. (2021) The IARC perspective on cervical cancer screening. New England Journal of Medicine 385(20): 1908-1918.
3. Ahmed T, Rahman J (2008) Development of a visual inspection programme for cervical cancer prevention in Bangladesh. Reproductive Health Matters 16(32): 78-85.
4. Nessa A, Hussain MA, Rahman JN, et al. (2010) Screening for cervical neoplasia in Bangladesh using visual inspection with acetic acid. International Journal of Gynecology & Obstetrics 111(2): 115-118.
5. Holme F, Kapambwe S, Nessa A, et al. (2017) Scaling up proven innovative cervical cancer screening strategies: Challenges and opportunities in implementation at the population level in low-and lower-middle-income countries. International Journal of Gynecology & Obstetrics 138: 63-68.

6. Bhatla N, Nessa A, Oswal K, et al. (2021) Program organization rather than choice of test determines success of cervical cancer screening: Case studies from Bangladesh and India. International Journal of Gynecology & Obstetrics 152(1): 40-47.
7. Gaikwad V, Gaikwad S, Yalla S, et al. (2023) A prospective comparative study between pap smear, visual inspection with acetic acid, visual inspection with Lugol's Io-Dine, colposcopy and histopathology for diagnosis of cervical intraepithelial neo-plasia and early carcinoma cervix. Journal of Pharmaceutical Negative Results: 1817-1826.
8. Jain R, Jatav J, Jain A (2022) Diagnostic utility of pap smear and visual inspection of acetic acid for the detection of various cervical lesions. Asian Journal of Medical Sciences 13(9): 213-218.
9. Srivastava A, Sinha P, Vatsal P, et al. (2020) Visual inspection with acetic acid versus papanicolaou test in cervical cancer screening. Indian Journal of Gynecologic Oncology 18(3): 86.
10. Baena A, Mesher D, Salgado Y, et al. (2023) Performance of visual inspection of the cervix with acetic acid (VIA) for triage of HPV screen-positive women: Results from the ESTAMPA study. International Journal of Cancer 152(8): 1581-1592.
11. Wright TC, Stoler MH, Behrens CM, et al. (2015) Primary cervical cancer screening with human papillomavirus: End of study results from the ATHENA study using HPV as the first-line screening test. Gynecologic Oncology 136(2): 189-197.
12. Zhao Y, Bao H, Ma L, et al. (2021) Real-world effectiveness of primary screening with high-risk human papillomavirus testing in the cervical cancer screening programme in China: A nationwide, population-based study. BMC Medicine 19: 1-11.
13. Arbyn M, Simon M, Peeters E, et al. (2021) 2020 list of human papillomavirus assays suitable for primary cervical cancer screening. Clinical Microbiology and Infection 27(8): 1083-1095.
14. https://www.who.int/news-room/fact-sheets/detail/cervical-cancer
15. Lorincz AT, Reid R, Jenson BA, et al. (1992) Human papillomavirus infection of the cervix: Relative risk associations of 15 common anogenital types. Obstetrics & Gynecology 79(3): 328-337.
16. Demarco M, Egemen D, Raine-Bennett TR, et al. (2020) A study of partial human papillomavirus genotyping in support of the 2019 ASCCP risk-based management consensus guidelines. Journal of Lower Genital Tract Disease 24(2): 144-147.
17. Shastri SS, Dinshaw K, Amin G, et al. (2005) Concurrent evaluation of visual, cytological and HPV testing as screening methods for the early detection of cervical neoplasia in Mumbai, India. Bulletin of the World Health Organization 83(3): 186-194.
18. Liu SS, Chan KK, Wei TN, et al. (2022) Clinical performance of the Roche Cobas 4800 HPV test for primary cervical cancer screening in a Chinese population. Plos One 17(8): e0272721.
19. Effah K, Tekpor E, Wormenor CM, et al. (2023) Concurrent HPV DNA testing and a visual inspection method for cervical precancer screening: A practical approach from Battor, Ghana. PLOS Global Public Health 3(4): e0001830.
20. Abdoulaye O, Alain Y, Blavo-Kouame EB, et al. (2017) Detection of cervical human papillomavirus in women attending for cervical cancer screening by visual inspection in Cte d Ivoire. Journal of Cancer Research and Experimental Oncology 9(3): 7-15.
21. Aliya A, Nawaz FH, Rizvi JH, et al. (2015) HPV adjunct testing to via as an alternative to cytology for cervical cancer screening in Pakistan. Gynecology & Obstetrics (Sunnyvale) 5(295): 2161-0932.

22. Nahar Q, Sultana F, Alam A, et al. (2014) Genital human papillomavirus infection among women in Bangladesh: Findings from a population-based survey. PLoS One 9(10): e107675.
23. Nessa A, Begum SA, Munshi SU, et al. (2024) High-risk Human Papillomavirus Infection among Urban and Rural Women in Bangladesh. Cancer Screening and Prevention 3(1): 36-46.
24. Clifford GM, Baussano I, Heideman DA, et al. (2023) Human papillomavirus testing on self-collected samples to detect high-grade cervical lesions in rural Bhutan: The REACH-Bhutan study. Cancer Medicine 12(10): 11828-11837.
25. Thapa N, Maharjan M, Shrestha G, et al. (2018) Prevalence and type-specific distribution of human papillomavirus infection among women in mid-western rural, Nepal-A population-based study. BMC Infectious Diseases 18: 1-8.
26. Sureshkumar BT, Shanmughapriya S, Das BC, et al. (2015) A population-based study of the prevalence of HPV in three districts of Tamil Nadu, India. International Journal of Gynecology & Obstetrics 129(1): 58-61.
27. Dutta S, Begum R, Mazumder D, et al. (2012) Prevalence of human papillomavirus in women without cervical cancer: A population-based study in Eastern India. International Journal of Gynecological Pathology 31(2): 178-183.
28. Mitchell SM, Sekikubo M, Biryabarema C, et al. (2014) Factors associated with high-risk HPV positivity in a low-resource setting in sub-Saharan Africa. American Journal of Obstetrics and Gynecology 210(1): 81-e1.
29. Okoye JO, Ofodile CA, Adeleke OK, et al. (2021) Prevalence of high-risk HPV genotypes in sub-Saharan Africa according to HIV status: A 20-year systematic review. Epidemiology and Health 43.
30. Taku O, Businge CB, Mdaka ML, et al. (2020) Human papillomavirus prevalence and risk factors among HIV-negative and HIV-positive women residing in rural Eastern Cape, South Africa. International Journal of Infectious Diseases 95: 176-182.
31. Liu G, Mugo NR, Brown ER, et al. (2022) Prevalent human papillomavirus infection increases the risk of HIV acquisition in African women: Advancing the argument for human papillomavirus immunization. AIDS 36(2): 257-265.
32. Umulisa MC, Franceschi S, Baussano I, et al. (2018) Evaluation of human-papillomavirus testing and visual inspection for cervical cancer screening in Rwanda. BMC Women's Health 18: 1-8.
33. Wang S, Dang L, Liu S, et al. (2024) Cervical cancer screening via visual inspection with acetic acid and lugol iodine for triage of HPV-positive women. JAMA Network Open 7(3): e244090-e244090.
34. Liang LA, Zeissig SR, Schauberger G, et al. (2022) Colposcopy non-attendance following an abnormal cervical cancer screening result: A prospective population-based cohort study. BMC Women's Health 22(1): 285.
35. Benski AC, Viviano M, Jinoro J, et al. (2019) HPV self-testing for primary cervical cancer screening in Madagascar: VIA/VILI triage compliance in HPV-positive women. PLoS One 14(8): e0220632.
36. Nessa A, Naud P, Esmy PO, et al. (2017) Efficacy, safety, and acceptability of thermal coagulation to treat cervical intraepithelial neoplasia: Pooled data from Bangladesh, Brazil and India. Journal of Clinical Gynecology and Obstetrics 6(3-4): 58-64.
37. Singh U, Verma ML, Sharma P, et al. (2024) Efficacy, safety and acceptability of thermal ablation (thermocoagulation) as treatment option for via (visual inspection with acetic acid) based screen and treat approach for cervical cancer screening programmeme: Experience at tertiary care centre of Northern India. Indian Journal of Gynecologic Oncology 22(2): 67.
38. Randall TC, Sauvaget C, Muwonge R, et al. (2019) Worthy of further consideration: An updated meta-analysis to address the feasibility, acceptability, safety and efficacy of thermal ablation in the treatment of cervical cancer precursor lesions. Preventive Medicine 118: 81-91.

39. Petignat P, Kenfack B, Wisniak A, et al. (2022) ABCD criteria to improve visual inspection with acetic acid (VIA) triage in HPV-positive women: A prospective study of diagnostic accuracy. BMJ Open 12(4): e052504.
40. Njue JK, Muturi M, Kamau L, et al. (2022) Primary and triage cervical screening diagnostic value of methods for the detection of cervical dysplasia. BioMed Research International 2022(1): 1930102.
41. National Strategy for Cervical Cancer Prevention and Control Bangladesh (2017-2022) (2017) Directorate general of health services division ministry of health and family welfare.
42. Salcedo MP, Oliveira C, Andrade V, et al. (2020) The Capulana study: A prospective evaluation of cervical cancer screening using human papillomavirus testing in Mozambique. International Journal of Gynecologic Cancer 30(9).
43. Kietpeerakool C, Cheewakriangkrai C, Suprasert P, et al. (2009) Feasibility of the 'see and treat'approach in management of women with 'atypical squamous cell, cannot exclude high-grade squamous intraepithelial lesion'smears. Journal of Obstetrics and Gynaecology Research 35(3): 507-513.
44. Rongthongaram W, Plumworasawat S, Charakorn C, et al. (2023) Overtreatment in the see-and-treat approach for high-grade squamous cervical cytology. European Journal of Obstetrics & Gynecology and Reproductive Biology: X 19: 100205.
45. WHO (2021) WHO guideline for screening and treatment of cervical pre-cancer lesions for cervical cancer prevention web Annex B: Evidence to decision tables 2021.