

Comparison of Visual and Cytology Cervical Cancer Screening in Maharashtra, India

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Abstract

Background: The feasibility of using a smartphone-based mobile colposcope for visual cervical cancer screening in urban India was assessed. First, visual screening was compared to standard of care cytology in a hospital-based setting. Thereafter, the technology was tested in field conditions of urban screening camps, where visual screening using the mobile colposcope was used instead of visual inspection with acetic acid (VIA). **Methods:** In the hospital setting, N=321 patients underwent routine cytological screening, followed by visual screening using a mobile colposcope. In the Camp, N=150 patients were screened with the mobile colposcope. Clinical decisions and socioeconomic information were entered in the colposcope mobile application. **Results:** Agreements between visual and cytology were found in 157 cases. For dysplasia, there were 14 vis+/Cyt- patients, but only one vis-/Cyt+ patient. For cervicitis, there were 29 vis+/Cyt- patients, but 117 vis-/Cyt+ patients. Approximately 60% of the 23 patients called back for colposcopy and biopsy were lost to follow up. Use of the mobile colposcope in the screening camp allowed for improved workflow and documentation, and the experience was more positive than VIA for both patients and providers. **Conclusion:** Feasibility of visual cervical cancer screening with a mobile colposcope was demonstrated in two different clinical scenarios.

New Technologies

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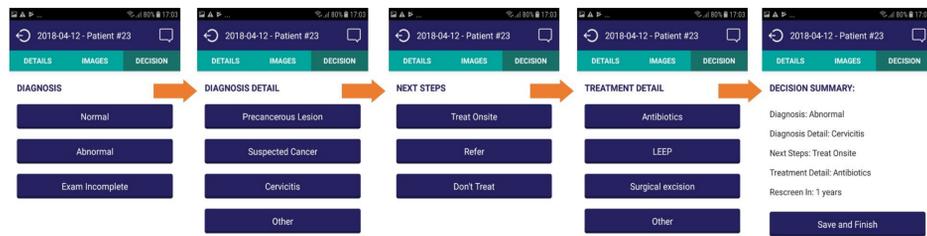
Introduction and Objectives

India is home to one fourth of all deaths from cervical cancer worldwide.[1] Many deaths are attributed to loss to follow up (LTFU); up to 80% never return for a follow-up examination or treatment.[2] To reach all women in India, a low-cost and high-quality screening method is needed to reach diverse populations. Visual inspection with acetic acid (VIA) is the least expensive screening method, but its effectiveness is highly dependent upon provider skill level.[3 Both cytology and HPV testing use significant laboratory and human resources, and require multiple patient visits, resulting in high LTFU rates.[2]

To address these challenges, the Enhanced Visual Assessment (EVA) System (MobileODT) – a low-cost connected colposcope – was developed on a mobile platform (Fig. 1). The EVA System mobile application also has integrated engines for workflow management and remote quality assurance. In this study, we assess the feasibility of using a mobile colposcope as a screening tool for underserved urban populations in the Mumbai region, both in a hospital setting, and in community-based screening camps. Comparisons are made with conventional cytology, VIA, and histopathology when available. Together these results suggest that the mobile colposcope has a role to play in screening underserved populations in India today.



Figure 1: EVA System



A

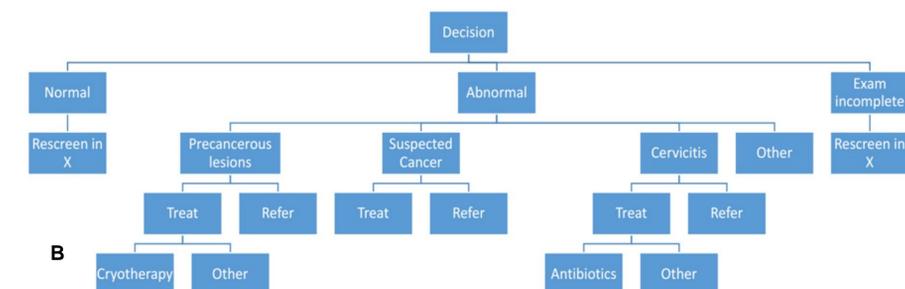


Figure 2: (A) Screenshots of Decision Support Job Aid on the EVA System APP. (B) Full decision tree of job aid.

Methods

The feasibility study presented here consisted of two components: a head-to-head comparison between visual screening and standard of care conventional cytology (Pap smears) in an urban hospital setting, and field testing in an urban slum screening camp where visual screening with EVA was compared to VIA. Both components were cross-sectional studies. Enrollment was limited to the patient age to 18-65, with pregnant, menstruating, or prior hysterectomy patients excluded.

Patient information was collected directly into the EVA System mobile app used to operate the device. Providers recorded their clinical impression on the decision support job aid, a workflow management engine integrated into EVA (Fig. 1B) according to the tree in Fig. 1C. All cytology and histopathology samples were sent to the hospital for routine processing and review. In urban screening camps, cytology was not provided given the operational constraints, and the comparison was made to VIA.

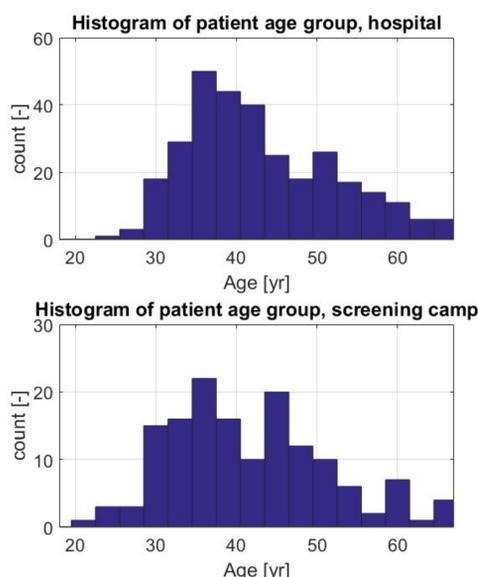


Fig 3: Distribution of patients by age in hospital (A) and screening camp (B).

A total of N=321 patients were recruited to enroll in the hospital-based setting, and a total of N=150 patients were enrolled in the screening camp (Fig. 3).

Results

Patients in the hospital-based setting were screened both visually and using standard of care cytology (Table 1). Most cases of disagreement involved misclassification of cervicitis rather than dysplasia. In comparison against histopathology, a total of 34 samples were called back for colposcopy with biopsy, 24 from the hospital-based setting and 10 from the Screening Camp; however, 20 of the 34 did not return back for biopsy.

	Normal Cyt	Inflam	ASCUS + Cyt unk.	
EVA normal	88	96	0	7
EVA cervicitis	24	64	0	5
EVA dysplasia	5	9	4	0
EVA other	5	12	1	1

Table 1: Comparison of EVA to cytology results.

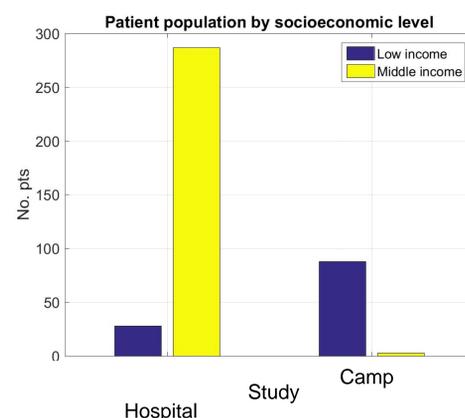


Figure 4: Socioeconomic makeup of patient populations

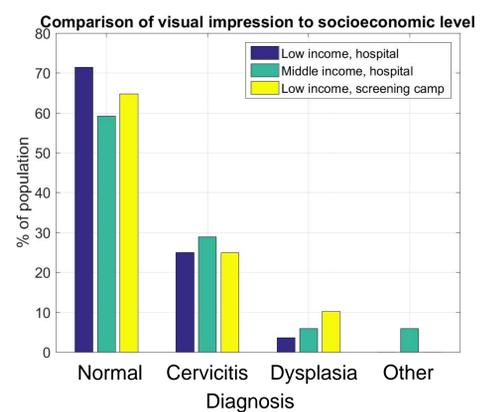


Figure 5: Comparison of different gynecological pathologies observed with EVA, as a function of socioeconomic level.

Another striking finding in this study was the histopathology analysis (Table 2): 20 of 34 patients called back (via email, text, and phone) for biopsy were LTFU. These patients are predominantly low-income patients (Figs. 4-5), which suggests that economic factors could have affected the LTFU rates.

On a qualitative level, provider feedback showed they felt the EVA device reduced the time of the exam because less "looking" had to be done than in VIA. The digitized data improved documentation of test results and increased trust among patients due to the ability to see the images.

BIOPSY	CIN2+	CIN1-	INC.
vis+ / Cyt +	1	2	
vis+ / Cyt -		2	11
vis+ / NO Cyt (hospital)	1	1	
vis- / NO Cyt (hospital)		1	1
vis- / Cyt -	1		3
vis+ / NO Cyt (camp)	2	3	5

Table 2: A summary of the histopathology results for dysplasia compared against visual and cytology screening.

Conclusion

In this study we assessed feasibility of visual cervical cancer screening using a mobile colposcope in urban clinical settings in India. In the hospital-based settings, visual screening detected more cases of dysplasia and less cases of cervicitis than conventional cytology. Histopathology results revealed very high LTFU rates. Under field conditions in a screening camp, visual screening using EVA allowed for capturing more pertinent information about the (underserved) patient population, and overall there was a more positive experience for both the provider and the patient.

References

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