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Opportunistic screening for oral, breast and cervical cancer among vulnerable urban patients: A cross-sectional descriptive study

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Abstract:

Oral, breast and cervical cancers remain major public health concerns in India, yet screening access is limited in vulnerable urban populations. Therefore, it is of interest to evaluate the opportunistic screening among 50 adults attending a primary care facility using oral examination, clinical breast examination and visual inspection with acetic acid. Oral examination was performed in 36 (72.0%) patients, clinical breast examination in 13 (26.0%), visual inspection with acetic acid in 11 (22.0%) and 10 (20.0%) received multiple screening tests. Suspicious oral lesions were identified in 3 (6.0%) male tobacco and/or alcohol users, but no diagnosis was confirmed because of incomplete follow-up. Thus, opportunistic screening is feasible in vulnerable urban populations, although strengthening post-screening follow-up is essential to improve early cancer detection.

Keywords: Opportunistic screening, oral cancer, breast cancer, cervical cancer, primary health care, urban slum, migrant health, loss to follow-up, vulnerable populations

Background:

Cancer is a major public health challenge in India, with breast, oral cavity and cervical cancers accounting for a substantial proportion of the national cancer burden and cancer-related mortality [1]. Population-based trials have shown that low-cost visual screening methods, including oral visual examination, clinical breast examination and visual inspection with acetic acid, can reduce cancer-specific mortality when delivered systematically by trained health workers [2]. Based on this evidence, the National Health Mission recommends screening for oral, breast and cervical cancers for adults aged 30 years and above through primary healthcare services [3]. Despite these recommendations, screening coverage remains low, particularly among migrant, slum-dwelling and other socioeconomically disadvantaged urban populations who have limited access to organized screening programs [4, 5]. Opportunistic screening during routine healthcare visits has therefore been proposed as a practical strategy to improve screening coverage in these underserved groups [6]. Previous Indian studies have showed reasonable participation in community-based screening programs but consistently reported poor follow-up among individuals with positive screening results [7, 8]. Tobacco and alcohol use are well-established risk factors for oral cancer, while sociocultural barriers and limited awareness continue to reduce breast and cervical cancer screening uptake among women [9, 10]. Therefore, it is of interest to evaluate the feasibility, uptake and yield of opportunistic oral, breast and cervical cancer screening among vulnerable urban patients attending a primary care facility.

Materials and Methods:

This cross-sectional descriptive study was conducted in the general outpatient department of a primary care facility serving a predominantly low-income catchment population comprising urban slum residents, resettlement colony residents, rural-to-urban migrants and other urban low-income households, after obtaining institutional ethics committee approval and written informed consent from all participants. Fifty consecutive adults

aged 30-65 years attending the facility for any reason-the presenting complaint served as the opportunistic entry point rather than an eligibility criterion-were enrolled. Socio-demographic characteristics (age, gender, residence type, education, occupation) and behavioral and family-history variables (tobacco use, alcohol use, first-degree family history of cancer) were recorded on a structured proforma by trained facility staff. Screening was offered opportunistically and was not mandatory: oral visual examination was offered to eligible patients of either sex, clinical breast examination was offered to women and visual inspection of the cervix with 5% acetic acid (VIA) was offered to women without contraindications (active pregnancy, menstruation, or prior hysterectomy), consistent with National Health Mission operational guidelines for the prevention, screening and control of common cancers at the primary care level [3]. The number and combination of tests offered to each patient depended on sex, eligibility, staff availability and patient consent at the time of the visit. Screening was performed by trained primary care providers and frontline health workers. Patients with a suspicious finding on any test were referred for diagnostic work-up at a higher centre; referral uptake, completion of work-up and final clinical outcome was tracked through facility records for the duration of the study.

Outcome measures:

The primary outcomes were the proportion of patients offered each opportunistic screening test (oral visual examination, CBE, VIA) and the screen-positivity yield (suspicious finding) by test type. Secondary outcomes were the distribution of presenting complaints that served as opportunistic entry points; the proportion of screen-positive patients referred for diagnostic work-up; completion of the referred work-up; and the final clinical outcome, categorized as no abnormality, benign finding, malignancy confirmed, lost to follow-up, or pending.

Statistical analysis:

Continuous variables (age) are expressed as mean $\pm$ standard deviation; categorical variables are expressed as frequencies and

percentages. Because only three screen-positive events occurred, the dataset was underpowered for formal inferential or association testing (*e.g.*, between tobacco/alcohol use and screen-positivity) and results for these comparisons are therefore reported descriptively rather than with hypothesis tests. All analyses were performed using Microsoft Excel and IBM® SPSS® Statistics.

Results:

A total of 29,155 individuals were screened across underserved areas of Delhi NCR over the twelve-month period, through 383 active screening camps. This overall screening activity, participant demographics and yield are summarized in Table 1. The cohort comprised of 13,294 males (45.6%) and 15,861 females (54.4%), with a male-to-female ratio of approximately 45:55. The predominant age cohort was 30-65 years, accounting for 75-85% of all participants. A total of 4,045 Pap smears were conducted and out of these, 51 smears (1.26%) returned abnormal. They were then classified by lesion grade, 32 (62.7%) were classified as low-grade squamous intraepithelial lesions (LSIL) and 19 (37.3%) as high-grade squamous intraepithelial lesions (HSIL). Among these 51 women, 29 completed follow-up at RGCIRC and 11 cases of cervical carcinoma were confirmed. This yields a cervical cancer detection rate of 0.27 per 100 Pap smears performed. Clinical breast examination identified 81 participants with palpable breast lumps and 61 (75.3%) were successfully followed up with appropriate radiological and histopathological investigations. 12 confirmed breast malignancies were detected, representing a conversion rate of 14.8% among all participants with identified lumps and 19.7% among those who completed follow-up. Visual oral inspection identified 1,096 oral potentially malignant disorders (OPMLs). Conservative management, including topical treatment and tobacco cessation counseling was administered in 864 cases (78.8%) at the community level. The remaining 232 (21.2%) were referred to RGCIRC for tertiary evaluation. 11 cases of oral carcinoma were confirmed among referred individuals. In total, 44 new cancer cases were detected across all three screened sites: oral cancer (n=11, 25%), breast cancer (n=22, 50%) and cervical cancer (n=11, 25%). Of these, 33 (75%) occurred in female participants and 11 (25%) in males. This aggregate detection from 29,155 screeners represents an overall detection yield of approximately 1.51 cancers per 1,000 individuals screened. Tobacco use data revealed that 67% of male participants were current tobacco users. Among female participants, 33% reported current tobacco use, while 73% had never used tobacco in any form. The high male tobacco prevalence is consistent with the predisposition to oral cavity cancers observed in this cohort and mirrors national epidemiological trends. Overall compliance rate of the retrospective study was recorded at 76%. The primary reasons for non-compliance we observed are listed in Table 2. Stigma around cancer was the most common barrier in all three screening streams. The asymptomatic or denial-mode response (15-20%) was similarly comparable in cervical and oral screenees, reflecting the well-documented phenomenon of

perceived invulnerability in cancer-naïve populations. Financial constraints (15%) were the major underlying factor for oral noncompliance which was in agreement with the predominantly low socioeconomic profile of camp populations. Follow-up was hampered by logistical obstacles at all sites, including migratory population dynamics (3-8%) and unreachable or wrong phone numbers (2-3%).

Table 1: Demographic profile, screening yield and cancer detection rates across oral, breast and cervical cancer screening programs under a community outreach initiative, Delhi NCR (n=29,155)

Total Camps (2025)	411 (Awareness: 28 Screening: 383)
Total Screened in Underserved Areas	29,155 (Males: 13,294 Females: 15,861)
Pap Smears Performed	4,045
Abnormal Pap Smears	51 (1.26%); Low-grade: 32 High-grade: 19
Cervical Cancers Detected	11 (detection rate: 0.27/100 smears)
Breast Lumps Detected	81 (12 confirmed malignancies; follow-up: 61)
OPMLs Identified	1,096 (Conservative Rx: 864 Referred: 232)
Total Cancers Detected	44 (Oral: 11 Breast: 22 Cervical: 11)
Female : Male Cancers	33 (75%): 11 (25%)
Program Compliance	76%
Tobacco Use (Men)	67% current users
Tobacco Use (Women)	33% current users 73% never-used tobacco products

Table 2: Reasons for Non-Compliance by Cancer Screening Site

Barrier	Oral (%)	Cervical (%)	Breast (%)
Cancer stigma	8	13-15	8-10
Asymptomatic / denial mode	15-20	15-20	2-3
Financial constraints	15	3-4	-
Migratory population	7-8	3-4	-
Unreachable phone number	2-3	2-3	2-3
Outstation camps	6,6	1-2	-
Myths about biopsy / mammography	7-8	-	3-4
Fear of biopsy	-	-	4-5

Discussion:

This cross-sectional study demonstrates that opportunistic oral, breast and cervical cancer screening can be integrated into routine primary care encounters for patients from urban slums, resettlement colonies and migrant communities, using visits for unrelated health concerns as opportunities for cancer screening. Nearly three-quarters of participants underwent oral examination and one-fifth received more than one screening test, indicating that opportunistic screening is operationally feasible even in resource-constrained primary care settings, consistent with previous reports from low- and middle-income countries showing that opportunistic screening complements organized population-based programs by improving access among underserved populations [11, 12]. The overall screen-positivity rate of 6.0%, entirely attributable to oral lesions in male tobacco and/or alcohol users, is consistent with evidence demonstrating that tobacco use, alcohol consumption and male sex are major determinants of oral potentially malignant disorders and oral cancer in India [13, 14]. The absence of suspicious breast or cervical lesions in this cohort is likely related to the small number of women screened and agrees with previous studies reporting comparatively lower detection rates for breast and cervical abnormalities during opportunistic screening in primary healthcare settings [15, 16]. The most important finding was the poor completion of the referral pathway after a positive

screening result. Although all three patients with suspicious oral lesions were referred for further evaluation, two were lost to follow-up and the remaining patient had not completed diagnostic assessment by the end of the study. Similar challenges have been widely reported in cancer screening programs, where failure to complete referral substantially reduces the effectiveness of early detection initiatives [17, 18]. Multiple factors contribute to poor follow-up after positive screening, including financial constraints, transportation difficulties, competing occupational responsibilities, low health literacy, fear of cancer diagnosis and inadequate patient navigation systems, particularly among socioeconomically disadvantaged populations [19]. These barriers are likely to be even more pronounced among migrant workers and residents of urban slums, whose unstable living conditions and limited healthcare access further hinder continuity of care [20].

Conclusion:

Opportunistic screening for oral, breast and cervical cancers were feasible among vulnerable urban populations attending primary care. The lack of confirmed diagnoses among screen-positive participants highlights a critical gap in diagnostic follow-up. Integrating screening with patient navigation and active follow-up is essential to achieve meaningful early cancer detection.

Limitations:

This study has several limitations. The sample size was small (n = 50) and was drawn opportunistically from a single facility over a defined observation period, which limits generalizability and precludes formal statistical testing of associations between risk factors (tobacco use, alcohol use, family history) and screen-positivity, given only three screen-positive events. Not all patients were offered all three screening tests and the choice of test depended on sex, eligibility, staff availability and patient consent rather than a fixed protocol, which may have introduced selection effects. Oral visual examination, CBE and VIA are screening rather than diagnostic tests and no histopathological confirmation was available within the study period for the pending or lost-to-follow-up cases, so the true positive-predictive value of the suspicious findings recorded here could not be established. Follow-up outcomes were captured only within the study observation window; the case recorded as pending may yet resolve and cases currently classified as lost to

follow-up may still present later. Finally, this analysis is descriptive and hypothesis-generating; it should not be used to estimate population-level prevalence of oral, breast, or cervical premalignant or malignant disease in similar communities.

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