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Expanding access to HPV screening through community health insurance schemes: lessons from a screening exercise for teachers in Ghana

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Abstract

Background Cervical cancer (CC) screening uptake remains low primarily owing to the absence of organized screening and lack of insurance coverage. Members of the Ghana National Association of Teachers (GNAT) contribute monthly to an insurance scheme which covers cancer (including CC) treatment but not cervical precancer screening/treatment. We conducted this study to examine health beliefs shaping cervical screening uptake among educators and to understand how the scheme could scale cervical precancer screening and treatment services for beneficiaries across the country.

Methods From February – July 2022, we performed cervical precancer screening with concurrent hr-HPV DNA testing and visual inspection with acetic acid (VIA) for 102 teachers in 3 districts in the Volta Region. From April – May 2024, we conducted a cross-sectional study among 498 female subscribers of the GNAT insurance scheme in the same districts using non-probability snowball sampling. Data on utilization of cervical cancer screening services and risk factors were collected using a self-administered questionnaire. Health beliefs and situational factors associated with screening uptake among school teachers were assessed.

Results Although all 498 female school teachers were enrolled in the cancer insurance scheme, cervical cancer screening uptake was reported by 116 (23.9%). Utilization of cervical cancer screening services was 25.3% among married women and 34.4% among women who reported limited access to screening. In the final adjusted logistic regression model, perceived barriers to screening (aOR, 0.55; 95% CI, 0.42–0.72) and being divorced/widowed (aOR, 2.11; 95% CI, 1.10–4.03 vs. married/cohabitating) were independently associated with cervical precancer screening uptake. The hr-HPV prevalence and VIA 'positivity' rate were 17.3% (95% CI, 9.9–24.8) and 1.0% (95% CI, 0.0–5.5), respectively.

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Conclusions Cervical precancer screening utilization among female teachers enrolled in the GNAT cancer insurance scheme was sub-optimal owing to barriers related to low awareness, limited access, and social factors. The cancer insurance scheme represents a golden opportunity to overcome the identified barriers and improve HPV screening access and outcomes in addition to increasing access to cervical cancer treatment and should be explored.

Keywords School teachers, Insurance coverage, Human papilloma virus, Screening uptake, Cervical cancer, Acetic acid

Introduction

Cervical cancer (CC) accounts for the majority of preventable cancer-related deaths among women from low- and middle-income countries (LMICs) most of whom are of productive age [1]. In sub-Saharan Africa alone, 34.8 new cases and 22.5 deaths are recorded per 100,000 women as compared with 6.6 new cases and 2.5 deaths per 100,000 women respectively among women in developed countries. In Ghana, CC (29.4%) ranks second to breast cancer (33.9%) among female cancers in prevalence [2]. Despite a crude incidence of 18.3 per 100,000 women and an estimated 2,200 deaths from CC in 2019, Ghana has a reported screening rate of less than 8% [3–5] and uptake of screening services is poor owing to implementation barriers related to access, awareness and costs associated with screening and treatment [6].

Since its establishment in 2003, the National Health Insurance Scheme (NHIS) has grown to encompass over 18 million active members, representing approximately 55% of the population and making it one of the most extensive social health interventions in sub-Saharan Africa [7]. Despite this achievement, the NHIS does not fully cover critical preventive services like cervical cancer screening. In April 2025, the Government of Ghana launched the Ghana Medical Trust Fund (Mahama Cares Programme), a policy initiative designed to provide financial support for individuals with chronic non-communicable diseases (NCDs) not covered by the National Health Insurance Scheme (NHIS) [8]. While the fund aims to cover treatment and medication costs, it does not address existing implementation barriers confronting preventive cervical cancer screening services.

The national policy on CC in Ghana recommends screening with Visual Inspection with Acetic acid (VIA) for women aged 25–45 years and cytology for women older than 45 years [9, 10]. As Ghana does not have an organized national cervical precancer screening program, screening is at best opportunistic. Membership of health insurance schemes is thought to promote health-seeking behavior by influencing the individual's utilization of preventive healthcare services, particularly for chronic diseases or co-morbidities [11, 12]. However, in reality, the cost of VIA is not covered by the National Health Insurance Scheme (NHIS). The costs of Pap smears and precancer lesion treatment are at best only partially covered as official rates do not match market prices. In principle,

cervical precancer screening and treatment should be covered under the NHIS; however, in reality, most of the cost of screening and treatment is borne by patients through a copayment arrangement at the facility level [13].

Since 2012, the Ghana National Association of Teachers (GNAT), the umbrella professional society for pre-tertiary teachers in Ghana has sought to provide cancer treatment services to GNAT members and their families, leading to the purchase of the Sweden Ghana Medical Centre (SGMC) in September 2020 and the inauguration of a GNAT Cancer Foundation (GCF) in June 2024. Beneficiaries of the GCF, GNAT members who remit monthly contributions to the fund, receive treatment for cancers at the SGMC as needed [14]. Despite the successful inauguration of the GCF, the paucity of data on CC awareness, screening uptake, and perceptions/barriers to screening among female school teachers in Ghana constitute blind spots for stakeholders and undermines potential gains. Given the strategic importance of school teachers and their relevance to initiatives to reduce hr-HPV (and CC) risk among younger girls under their influence, studies are needed to assess these outcomes and to come up with solutions to increase self-efficacy among female school teachers. For context, the recently announced national cervical cancer vaccination programme is planned to be a school-based programme targeting adolescent girls [15].

All women, including sexually active, parous female school teachers, remain at risk of CC. As frontline workers, female school teachers play an active role as a port of entry to health literacy among adolescents (their students). They also play effective roles in communicating with, motivating, and educating young female students about the risk of sexually transmitted infections, including high-risk human papillomavirus (hr-HPV), which is essential to reducing their future risk of hr-HPV infection, and therefore, CC. Using a qualitative approach grounded in the Health Belief Model (HBM), our primary aim with this cross-sectional study was to assess CC risk awareness, uptake of screening services, and beliefs among female school teachers interviewed between April–May 2024 (hereafter, the HBM group) in the Volta Region of Ghana. We used the Health Belief Model (HBM), a behavioural framework that explains health-related decision-making based on individuals'

perceptions of risk, benefits, and barriers to explore how membership of the GNAT cancer insurance scheme shapes screening behaviours among female teachers. The HBM posits that a desirable health behaviour, such as cervical cancer screening uptake, is influenced by perceived susceptibility to and severity of cervical cancer, perceived benefits of screening, barriers such as limited access or awareness, cues to action (e.g., insurance scheme enrolment), and self-efficacy in navigating screening services [16, 17]. For the group that underwent actual cervical precancer screening between February–July 2022 (hereafter, the Screening group), our secondary aim was to model factors potentially associated with cervical precancer screening uptake among them. Our tertiary aim was to document screening outcomes following the interventions.

Materials and methods

Study design

A cross-sectional approach was used to assess CC risk awareness, uptake of screening services, and beliefs among female school teachers interviewed between April–May 2024 (hereafter, the HBM group) in the Volta Region of Ghana. Additionally, between February–July 2022, the Cervical Cancer Prevention and Training Centre (CCPTC), Catholic Hospital, Battor, organized a number of screening exercises targeting female educators in the Volta Region of Ghana as a priority population.

Study participants and setting

The female teachers were GNAT members who were opportunistically screened during a series of community screening campaigns organized by the CCPTC for female residents in the North Tongu, Central Tongu, and Adaklu-Anyigbe Districts. Data from the 2021 population and housing census shows that the districts have populations of 110,891, 83,803, and 38,649, respectively [18]. Screening was mainly performed using concurrent hr-HPV DNA testing and VIA. In April and May 2024, a survey was then conducted among teachers in these same districts. The North Tongu District is home to Catholic Hospital, Battor, where the CCPTC was founded to offer context-driven prevention services to halt the incidence of CC in Ghana [19, 20]. All three districts are located in the Eastern Corridor of Ghana, specifically in the Volta Region.

GNAT as an intermediary agency between female teachers and cervical screening/treatment services

The GNAT is a non-partisan, non-sectarian, and equal-opportunity teacher union that represents teachers across Ghana at all levels in the pre-tertiary education sector [14]. The association was formed to represent the teachers in labor issues; however, it has evolved to

prioritize teachers' welfare in matters related to education and professional development, financial benefits, and healthcare. GNAT is also committed to promoting and protecting the rights and safeguarding the health of school children. To promote the health of its members, this association partnered with the SGMC to provide cancer treatment services to GNAT members and their families [14]. The SGMC provides treatment of cancer according to an insurance model which covers a member, their spouse, and two children younger than 18 years. The SGMC was founded in 2014 and provides treatment for over 20 cancer types, including CC. The partnership also provides screening services to detect breast, cervical, and prostate cancers following a medical request [14].

HBM group: sampling approach and sample size

All female pre-tertiary school teachers within the Volta Region who were members of the GNAT and subscribers to the cancer insurance scheme were eligible to be included in the study. Study districts and schools were purposively selected based on the availability of resources and the needs of the training program at the CCPTC. To achieve a 4% precision rate in determining the percentage of women who have undergone cervical precancer screening, the minimum required sample size was determined to be 485. The sample size was determined using the single proportion formula: $n = \frac{z^2 p(1-p)}{E^2}$, where n is the sample size, z is the standard normal distribution critical value of 1.96 for a 95% confidence interval (CI), p is the estimated proportion of women screened for CC (set at 28%) [21], and E represents the margin of error (set at 4%).

HBM group: community engagement and interviews

School teachers were recruited by School Health Extension Programme (SHEP) coordinators who had previously been trained on study procedures and protocols. SHEP coordinators sensitized and mobilized school teachers during school visits and provided semi-structured interviews for data capture. A pre-validated instrument was used to capture respondents' demographics, self-reported awareness of CC, accessibility of screening services, health beliefs regarding cervical precancer screening, and willingness to recommend preventive health services (Additional file 1: Modified HBM Questionnaire). Health belief measures were adopted from similar work based on the HBM [21].

Screening group: community-based cervical screening campaigns

Female teachers enrolled in the GNAT cancer insurance scheme were invited to participate in a screening campaign conducted by the CCPTC through a collaboration

with the North Tongu District Health Directorate and the District Directorate of Education in North and Central Tongu, as well as Adaklu District. Female school teachers were informed through their district directors and those who were available and willing were screened. Education and counseling on CC were given after which informed consent was sought from the female teachers. A sample of 102 female teachers who consented to participate were screened primarily using HPV DNA testing and VIA. Of these, 1 underwent an hr-HPV DNA test and Enhanced Visual Assessment (EVA) mobile colposcopy while 1 was screened using hr-HPV DNA testing, EVA mobile colposcopy, and conventional cytology. Two women had invalid HPV DNA test results. The remaining 98 had valid results/findings for both hr-HPV DNA tests and VIA (Fig. 1). Cervical precancer screening was conducted at the CCPTC clinic and also on outreaches. In the North Tongu District, 50 teachers were screened at the Avedzi Community Health Planning and Services zone, Juapong, and 15 at the CCPTC, Battor. In the Central Tongu District, a total of 16 female teachers were screened at Mafi Kumase Health Centre and 21 were screened during a women’s convention at Adaklu Wumenu in the Adaklu-Anyigbe district.

Screening group: cervical sample collection for hr-HPV DNA testing and visual inspection procedures

Cervical precancer screening was performed by trained nurses. After seeking verbal informed consent, participants’ information was collected via a structured questionnaire (Additional file 2: CCPTC Screening Questionnaire) in REDCap version 11.0.0 (Vanderbilt University, Nashville, TN, USA). The woman was placed in the dorsal lithotomy position and a sterile vaginal speculum was inserted to expose the cervix. A cotton-tipped applicator or cytobrush was used to take samples that were sent to the laboratory for testing in labeled tubes with laboratory request forms labeled with two or more identifiers.

In performing VIA, cotton swabs soaked in 5% acetic acid were applied to the cervix under a good source of light and the results were interpreted as either positive or negative using the naked eyes to visualize the cervix after 2 min. EVA mobile colposcopy was performed immediately for women who tested positive (acetowhitening on the cervix) on VIA to obtain images for quality assurance. EVA mobile colposcopy was also performed for 2 of the teachers who decided to pay for extra services beyond the VIA which was offered to all the women. The EVA system (MobileODT, Tel Aviv, Israel) which is a type of mobile colposcope built around a smartphone enabled images to be taken under magnification, anonymized, and stored before and after applying acetic acid on the cervix. The

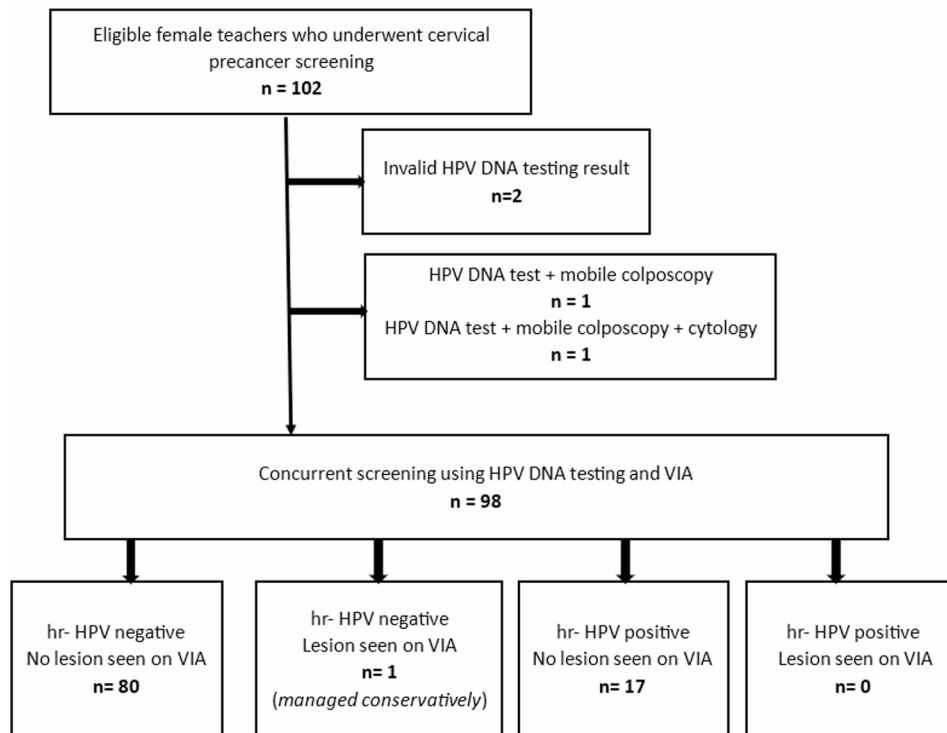


Fig. 1 Flow chart for cervical precancer screening, outcomes, and management among the teachers in the screening group. hr-HPV, human papilloma-virus; VIA, Visual Inspection with Acetic acid

colposcopy findings were reported using the Rio 2011 Colposcopy Nomenclature of the International Federation for Cervical Pathology and Colposcopy (IFCPC) [22].

Screening group: laboratory procedures– HPV DNA extraction and detection

Each cervical sample was processed and tested with the HPV 13 + 2 DNA diagnostic kit (S3057E; Sansure Biotech Inc., Hunan, China) on an MA-6000 real-time PCR device. HPV DNA extraction and detection procedures were performed in strict conformity with the manufacturer's instructions [23], additional details of which have been reported previously [24]. The semi-quantitative module of the test, which was used, is configured to detect four dyes: the FAM dye (HPV 18 DNA); HEX dye (beta-globin, as an internal control); CY5 dye (HPV 16); and ROX dye (detects a combination of HPV 31, 33, 35, 39, 45, 51, 52, 53, 56, 58, 59, 66, and 68, as *other* hr-HPV genotypes).

Screening group: participant triage, treatment, and follow-up

Follow-up of screen positives by the CCPTC team generally followed an algorithm where clients with cervical lesions could opt for Loop Electrosurgical Excision Procedure (LEEP) and be booked for this in Catholic Hospital, Battor by the CCPTC team. To mitigate the risk associated with loss to follow-up, a screen-and-treat approach was used if possible and acceptable to clients [25]. Although hr-HPV testing was performed, the results could not be obtained in real time; thus, the results were used to retrospectively confirm the decision to treat and give follow-up recommendations. Women with cervical lesions could opt for onsite treatment even before the HPV results were available. Clinically significant cervical lesions could be treated onsite using a handheld thermal coagulator (MTA-100 Thermal Ablation System, Liger Medical, United States). Eligibility for thermal coagulation was assessed strictly according to the WHO guidelines [26]. Briefly, a woman was deemed eligible for this treatment if there was no suspicion of invasive disease at colposcopy and an entirely visible lesion without extension into the endocervical canal, or a type 1 TZ lesion, or a type 2 TZ lesion for which the probe tip could achieve thorough ablation of the SCJ (reach the upper limit of the TZ) [27]. Women who showed minor changes (thin acetowhitening) on colposcopy were counselled about the option of conservative management (rescreening in 6 months to 1 year) as such lesions (probably CIN1) could regress spontaneously or undergo immediate thermal ablation, which could be overtreatment, but potentially lifesaving for those who might never get the opportunity to ever rescreen. Women who tested hr-HPV negative

and showed no cervical abnormalities on VIA/mobile colposcopy were advised to rescreen after 5 years (3 years for HIV-positive clients). Participants who tested hr-HPV positive without corresponding cervical lesions were counselled to repeat HPV DNA testing in 1 year at a nearby facility or the CCPTC. Women who fell into these last two categories were counselled after HPV DNA tests were conducted at our central laboratory, not onsite [27, 28].

Instruments, measures and data analysis

The self-administered questionnaire was designed with six sections to capture demographic information and HBM constructs, including perceived susceptibility (risk factors like sexual activity), perceived severity (awareness of cervical cancer consequences), perceived benefits (value of screening), perceived barriers (access, cost, awareness), and cues to action (provision of screening services). The primary outcome variable was cervical cancer screening uptake, defined as a binary variable indicating whether a respondent reported ever having undergone cervical precancer screening (e.g., hr-HPV DNA testing, visual inspection with acetic acid [VIA], or a Pap smear) at the time of the survey. Participants' responses were captured electronically via REDCap (version 11.0.3).

Continuous variables were described using means and standard deviations (SDs), while skewed discrete data were described using medians and interquartile ranges (IQRs). Categorical variables were described using frequencies and percentages. Items in the HBM questionnaire were measured on a 1–5 scale (1– Strongly disagree, 5–Strongly agree). Scores for each item were averaged to obtain summary statistics for each of the health belief measures. The independent samples *t*-test was used to compare average scores of health belief domains according to cervical precancer screening status.

The prevalence of hr-HPV infection and clinically significant cervical lesions observed on VIA are reported as percentages with 95% CIs. We fit univariable and multivariable binary logistic regression models to explore factors associated with cervical precancer screening uptake. All multivariable models were fitted using the backward elimination procedure with an arbitrary probability threshold of 0.25 for variable removal. Effect sizes from the logistic regression and their directionality were reported using crude and adjusted odds ratios (ORs and aORs, respectively) alongside their 95% CIs. Each hypothesis was tested at a two-tailed significance level of 5%. All statistical analyses were performed using Stata version 14.2 (StataCorp LLC, College Station, TX, USA).

Ethical considerations

The study complied with the Declaration of Helsinki (1964) and its later amendments. Verbal informed consent was sought from the women before questionnaire administration, sample collection, and cervical screening.

Table 1 Sociodemographic characteristics of the study participants

Survey Respondents (HBM Group, n = 486)	n (%)
Age group, years; n (%)	
18–24	32 (6.6)
25–34	149 (30.7)
35–44	211 (43.4)
45–54	57 (11.7)
≥55	34 (7.0)
Missing	3 (0.6)
Highest level of education, n (%)	
High School	28 (5.6)
Undergraduate	304 (62.6)
Postgraduate	125 (25.7)
Missing	29 (6.0)
Marital status, n (%)	
Single (never married nor cohabiting)	83 (17.1)
Cohabiting	25 (5.1)
Married and living with a partner	273 (56.2)
Divorced	46 (9.5)
Widowed	33 (6.8)
Missing	26 (5.4)
Screening participants (Screening Group, n = 98)	(n = 98)
Age, years; mean (SD)	39.4 (9.6)
Age group, years; n (%)	
18–24	0 (0.0)
25–34	40 (40.8)
35–44	32 (32.7)
45–54	15 (15.3)
≥55	11 (11.2)
Missing	0 (0.0)
Marital status, n (%)	
Single	13 (13.3)
Has a steady partner	10 (10.2)
Married	69 (70.4)
Divorced	4 (4.1)
Widowed	2 (2.0)
Number of children, median (IQR)	2 (0 to 3)
Has tertiary level education, n (%)	95 (96.9)
Christian religious faith, n (%)	98 (100.0)
Has a history of contraceptive use, n (%)	50 (51.0)
Has hypertension, n (%)	15 (15.3)
Has diabetes, n (%)	2 (2.0)
Has asthma, n (%)	2 (2.0)
HIV status, n (%)	
Positive	0 (0.0)
Negative	52 (53.1)
Unknown	46 (46.9)

HBM: Health Belief Model; IQR: inter-quartile range

Ethical clearance was given by the Ethical Review Committee of Catholic Hospital, Battor (approval no. CHB-ERC 0120/06/22 and updated CHB-ERC 0130/04/24). The study was conducted in an environment with no form of coercion and volunteers were adequately informed of the purpose, nature, and procedures of the study. Privacy, confidentiality, and anonymity of responses were ensured by identifying them uniquely with alphanumeric codes.

Results

Sociodemographic and health characteristics

In total, survey responses from 486 female teachers and cervical screening data for 98 female teachers were analyzed. School teachers' sociodemographic and clinical history are presented here (Table 1). For the HBM group, teachers aged 35–44 years represented 43.4% of the study sample, followed by those of age between 25 and 34 who represented 30.7%. Teachers who were at least 55 years old represented 7% of the study sample. Almost 9 of every 10 teachers (in the HBM group) had an undergraduate or postgraduate education. A majority (61.3%) were married or living with a partner, 17.1% were single and living alone, and 16.3% were divorced or widowed.

For the Screening group who underwent hr-HPV DNA testing and VIA, the mean age was 39.4 (95% CI, 37.5–41.4) years. The median number of children of these female teachers was 2 (IQR: 0–3) and 70.4% of them were married. Approximately 97% had a post-secondary education and about 1 out of 2 (51%) had a history of contraception use.

Awareness of CC and its risk factors

Almost every 8 out of 10 teachers (79.1%) were aware of CC, however the majority (55.7%) were either unsure or could not indicate how they came by the knowledge. About 1 in 5 teachers (19.3%) learned about CC through health workers and 15.1% learned about CC through radio and television programs. Upon a detailed knowledge assessment, 27% indicated that they knew how to prevent CC. In general, approximately 1 in 2 teachers correctly responded that HPV infections (45.3%), sex before age 18 (46.7%), having multiple sex partners (49.2%), and smoking tobacco (46.1%) had causative links to CC. Approximately 2 in 3 teachers felt that a weak immune system (57.0%), sexually transmitted diseases (62.6%), having a sex partner with previous multiple sex partners (57.4%), and irregular medical exam of the reproductive system (63.8%) were causes of CC. Only a minority thought that having an uncircumcised sexual partner (20.0%), and having many children (21.8%) could increase a woman's risk for CC (Table 2). In a brief CC prevention knowledge test, 60.2% of teachers demonstrated correct knowledge for at least 5 of the 10 questions.

Table 2 Awareness of cervical cancer and its risk factors (*n* = 486)

Outcome	<i>n</i> (%)
Knows about cervical cancer, <i>n</i> (%)	
Yes	385 (79.2)
Unsure	3 (0.6)
No	98 (20.2)
Total points (knowledge check on causes of cervical cancer), <i>n</i> (%)	
0–4	193 (39.7)
5–10	293 (60.2)
Mode of cervical cancer awareness, <i>n</i> (%)	
Friends/family	17 (3.5)
Health workers	94 (19.3)
Social media/ internet sources	18 (3.7)
Public awareness campaign	12 (2.5)
Radio/television program	75 (15.4)
Unsure	63 (13.1)
Missing	207 (42.6)

Utilization and accessibility of cervical cancer screening services

Most (60.9%) teachers knew where to go for reproductive health counseling and 29.4% had used such services apart from attending antenatal clinic but only 17.5% of teachers indicated that there is enough access to CC services in their local region. Less than half (45.3%) of the teachers knew of a health facility they could visit for cervical precancer screening or treatment and 23.9% had ever been screened for cervical precancer/cancer. Despite the incompleteness of responses, the overwhelming majority of school teachers indicated a positive disposition to present for cervical precancer screening (87.2%), to encourage their students, friends, and relatives to undergo cervical precancer screening (90.2%), to receive protective HPV vaccination (88.6%), and to encourage their students, friends and relatives to receive HPV vaccination (87.1%) (Table 3).

Health beliefs – perceived susceptibility

Over half (53.9%) of teachers agreed or strongly agreed that they were at risk for CC and 72.2% agreed or strongly agreed that CC is one of the most common cancers among women of their age. Seven out of every 10 teachers (69.6%) agreed or strongly agreed that they could die as a result of CC. Almost 3 out of every 4 teachers (74.1%) disagreed or strongly disagreed that not having children meant they did not need cervical precancer screening, while 78.8% disagreed or strongly disagreed that not having any symptoms meant they did not need cervical precancer screening or treatment. Almost 7 out of every 10 teachers (73.5%) disagreed or strongly disagreed that not having sex meant that they did not need cervical precancer screening/treatment (Additional file 3: Supplementary Table).

Table 3 Accessibility of and attitude to cervical cancer screening services (*n* = 486)

Outcome	<i>n</i> (%)
Know where to go for reproductive counseling	
Yes	296 (60.9)
Unsure	47 (9.7)
No	143 (29.4)
Ever gone to the hospital for reproductive counseling or gynecologic examination other than the antenatal clinic	
Yes	143 (29.4)
Unsure	21 (4.3)
No	322 (66.3)
Know any clinic to go to for cervical cancer screening/treatment	
Yes	220 (45.3)
Unsure	38 (7.8)
No	228 (46.9)
Ever had a cervical examination with acetic acid/pap test/ high-risk HPV test	
Yes	116 (23.9)
Unsure	30 (6.2)
No	340 (70.0)
There is enough access to cervical cancer services in the region	
Yes	85 (17.5)
Unsure	247 (50.8)
No	154 (31.7)
Willing to undertake a cervical examination with acetic acid/pap test/ high-risk HPV test	
Yes	116 (87.2)
Unsure	0 (0.0)
No	17 (12.8)
Willing to encourage my students, friends, and relatives to undertake a cervical examination with acetic acid/pap test/ high-risk HPV test	
Yes	119 (90.2)
Unsure	3 (2.2)
No	10 (7.6)
Willing to receive vaccination to protect me from cervical cancer	
Yes	112 (88.6)
Unsure	5 (3.8)
No	15 (11.4)
Willing to encourage my students, friends, and relatives to receive vaccination to protect them from cervical cancer	
Yes	115 (87.1)
Unsure	5 (3.8)
No	12 (9.1)

Health beliefs – perceived severity

Approximately 8 out of every 10 teachers (82.9%) agreed or strongly agreed that CC is a serious health problem while 78.2% agreed or strongly agreed that it could lead to female infertility. Similarly, 78.6% of teachers agreed or strongly agreed that CC requires expensive treatment (e.g. chemotherapy or radiotherapy) and 73.9% agreed or strongly agreed that it could lead to death (Additional file 3: Supplementary Table).

Health beliefs – perceived barriers

About 4 out of 10 teachers agreed or strongly agreed that they avoid cervical screening due to being afraid of finding out that they have the disease. Others agreed or strongly agreed that they have avoided cervical screening because it is painful (34.6%), expensive (51.2%), they do not know how often they need to get screened (60.7%), unsure of what age to get screened (54.9%), wait time for screening is too long (43.0%), do not know where to get screened (52.9%), embarrassed to have a genital examination (37.7%), partner is not in favor of screening (18.5%), they are unmarried and people may think they are having sex (19.1%) (Additional file 3: Supplementary Table).

Health beliefs – cues to action

In terms of what will likely cause teachers to access cervical screening services, they agreed or strongly agreed that factors included neighbors speaking to them about it (64.4%), family members speaking to them about it (64.0%), if a religious leader spoke to them (64.4%), information is found in mass/social media (74.5%), if they could get screened at home privately (56.4%), or if informed by health worker to do so (70.0%) (Additional file 3: Supplementary Table).

Health beliefs – perceived benefits

An overwhelming majority of teachers (90.9%) agreed or strongly agreed that cervical precancer screening can save their lives. In addition, teachers agreed or strongly agreed that cervical precancer screening made them feel good as it meant they were taking care of their health (85.2%), helped them avoid a serious health problem

(85.2%), and could lead to a cure for CC if detected early (86.4%).

Perception of cervical precancer screening services in the HBM group

The mean ratings recorded for each domain of the HBM are shown in Table 4, separately for previously screened and screening-naïve women. In terms of perceived barriers, screening-naïve women showed significantly higher mean scores than those who had been previously-screened [mean rating, 2.92 (95% CI, 2.83–3.01) vs. 2.44 (95% CI, 2.28–2.59), respectively; p -value < 0.001]. In all other domains, no statistically significant differences in mean rating were found between previously-screened and screening-naïve women.

Exploring factors associated with the utilization of cervical screening among teachers

In the unadjusted analyses of the factors associated with the uptake of cervical screening, the odds of a teacher ever undertaking cervical precancer screening among those aged 35–44 years was 1.74 times that of those aged 18–34 years (95% CI, 1.08–2.79) (Table 5). Being aware of CC was statistically significantly associated with undertaking cervical precancer screening (OR, 3.07; 95% CI, 1.58–5.97). The average perceived barrier scores (OR, 0.53; 95% CI, 0.40–0.68) and average perceived benefits scores (OR, 1.32; 95% CI, 1.01–1.73) were also significantly associated with the uptake of cervical precancer screening. Highest educational level, marital status, having enough access to cervical screening, average perceived susceptibility score, average perceived severity score, average cues to action score, and causes of CC knowledge score were not statistically significantly associated with cervical precancer screening.

In the final adjusted model (Table 5), marital status and average perceived barrier scores were significantly associated with the uptake of cervical precancer screening. The adjusted odds of cervical screening among female teachers who were divorced or widowed was 2.11 times higher than their married or cohabiting counterparts (aOR, 2.11; 95% CI, 1.10–4.03; p -value = 0.024) after controlling for age and CC awareness. CC awareness did not maintain an independent association with prior screening uptake (aOR, 2.00; 95% CI, 0.98–4.08; p -value = 0.055) in the final adjusted model.

Cervical screening outcomes

Overall, 17 out of 98 of the female teachers tested positive for hr-HPV, resulting in a hr-HPV prevalence of 17.3% (95% CI, 9.9–24.8). The VIA ‘positivity’ rate was 1.0% (95% CI, 0.0–5.5). In general, female teachers who tested positive for hr-HPV tended to be older but this

Table 4 Perception of cervical screening services in the HBM group

Domain	Screened Mean rating (95% CI)	Screening-naïve Mean rating (95% CI)	p -value
Perceived susceptibility	2.85 (2.72–3.00)	2.88 (2.80–3.00)	0.683
Perceived severity	4.20 (4.03–4.37)	4.03 (3.93–4.14)	0.113
Perceived barriers	2.44 (2.28–2.59)	2.92 (2.83–3.01)	< 0.001
Cues to action	3.56 (3.40–3.67)	3.57 (3.47–3.67)	0.937
Perceived benefits	4.44 (4.30–4.58)	4.25 (4.16–4.34)	0.042

HBM: Health Belief Model; CI: confidence interval

Table 5 Logistic regression models exploring factors associated with cervical precancer screening uptake among teachers in Adaklu, North Tongu, and Central Tongu Districts of the Volta Region of Ghana

Model Variable	Univariable models		Fully-adjusted model		Final adjusted model	
	OR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value
Age group, years						
18–34 (Ref.)	1.00	-	1.00	-	1.00	-
35–44	1.74 (1.08–2.79)	0.022*	1.52 (0.90–2.59)	0.119	1.59 (0.95–2.66)	0.076
≥45	0.96 (0.50–1.82)	0.897	0.85 (0.39–1.84)	0.682	0.82 (0.38–1.74)	0.604
Education level						
High School	0.91 (0.36–2.34)	0.847	1.91 (0.60–6.06)	0.270	-	-
Undergraduate (Ref.)	1.00	-	1.00	-	-	-
Postgraduate	1.25 (0.78–2.01)	0.360	1.12 (0.67–1.88)	0.673	-	-
Marital status						
Never married/cohabitated	0.63 (0.34–1.17)	0.146	0.81 (0.41–1.62)	0.558	0.82 (0.42–1.59)	0.553
Married/cohabitating (Ref.)	1.00	-	1.00	-	1.00	-
Divorced/widowed	1.11 (0.64–1.93)	0.718	1.97 (1.01–3.85)	0.048	2.11 (1.10–4.03)	0.024
Aware of Cervical Cancer						
Yes	3.07 (1.58–5.97)	0.001	2.12 (1.00–4.46)	0.049	2.00 (0.98–4.08)	0.055
No/Unsure (Ref.)	1.00	-	1.00	-	1.00	-
Enough access to cervical screening						
Yes	1.52 (0.91–2.56)	0.111	1.15 (0.65–2.04)	0.637	-	-
No/Unsure (Ref.)	1.00	-	1.00	-	-	-
Average perceived susceptibility	0.95 (0.73–1.23)	0.683	-	-	-	-
Average perceived barriers	0.53 (0.40–0.68)	<0.001	0.53 (0.40–0.71)	<0.001	0.55 (0.42–0.72)	<0.001
Average perceived benefits	1.32 (1.01–1.73)	0.044	1.26 (0.95–1.66)	0.111	1.27 (0.96–1.68)	0.093
Average perceived severity	1.20 (0.96–1.51)	0.114	-	-	-	-
Average cues to action	0.99 (0.80–1.23)	0.936	-	-	-	-
Total points (knowledge check on causes of cervical cancer)						
0–4 (Ref.)	1.00	-	-	-	-	-
5–10	0.91 (0.60–1.40)	0.674	-	-	-	-

aOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio; Ref., reference category

Table 6 Cervical screening outcomes among school teachers ($n = 98$)

Outcome	Estimate
Prior cervical precancer screening ^a , n (%)	14 (14.3)
VIA transformation zone type ^b , n (%)	
Type 1	2 (2.0)
Type 2	14 (14.3)
Type 3	82 (83.7)
VIA positive, % (95% CI)	1.0 (0.0–5.5)
hr-HPV positive, % (95% CI)	17.3 (9.9–24.8)

^a 486 female teachers participating in a simulated screening program with previous screening history

^b Transformation zone types

Type 1 (TZ1): The entire circumference of the squamocolumnar junction is visible; fully ectocervical

Type 2 (TZ2): The entire circumference of the squamocolumnar junction is visible; partly or fully endocervical

Type 3 (TZ3): The entire circumference of the squamocolumnar junction is not visible; partly or fully endocervical

was not statistically significant [mean age difference: 3.8 years (95% CI, -1.2 to 8.9; p -value = 0.138)] (Table 6).

Discussion

To the best of our knowledge, this is the first report to simultaneously provide insights on the uptake of cervical screening services, the factors influencing screening practices, and the burden of hr-HPV infection and cervical lesions among female school teachers with varied screening history in a real-world context in Ghana. By focusing on school teachers' knowledge, health beliefs and behaviours, we spotlight their significance in the fight against CC and the potential for expanding access to routine screening services for similarly organized groups of women.

The establishment of a cancer insurance fund by the GNAT points to the difficulties confronting members who require treatment for late-stage disease, the threat of HPV-related cervicovaginal and oropharyngeal cancers on the well-being of female school teachers, and the need to explore viable early detection and preventive strategies.

However, the data presented here on school teachers' knowledge of CC, its causes, and risk factors based on an objective assessment of CC prevention knowledge and self-report highlights a significant knowledge gap that could potentially impact service utilization and HPV-related behavior among school teachers [21]. The observed screening utilization reported among educators was higher than what has been reported in Ghana among women 30–49 years (7.27%) [3], and in the general population (4.6–5%) [4, 5]. Nevertheless, compared to WHO targets for elimination, female school teachers have sub-optimal levels of utilization (23.9%) of cervical precancer screening services [29]. In general, the optimal elimination strategy for CC involves screening at least 70% of all eligible women with a high-performance test and ensuring that 90% of all screen-positives are mapped to treatment [30]. Low utilization of cervical precancer screening despite membership in the GNAT cancer fund and reported access to information on CC from healthcare workers regarding CC risk during enrollment represents a setback for early screening and detection of premalignant disease.

The HBM provides a useful lens for interpreting the sub-optimal cervical cancer screening uptake among female teachers in the GNAT insurance scheme [17]. High perceived barriers, such as limited access and low awareness, align with HBM predictions that barriers significantly deter health behaviors [16]. The GNAT insurance scheme, while covering cancer treatment, does not adequately serve as a cue to action for screening, resulting in a missed opportunity. We note that although school teachers contribute monthly to the community cancer insurance scheme; there are lingering challenges with respect to awareness of HPV and screening access that need to be addressed.

We propose that in order to address these gaps, interventions focused on reducing barriers such as low rates of awareness, decentralizing screening services and strengthening cues to action (e.g., integrating screening into insurance benefits and raising awareness through teacher-training programs would be needed). Educational interventions improve screening rates as they better compel awareness to action and promote health literacy [31–33]. For instance, a randomized clinical trial found that mailing HPV self-sampling kits, accompanied by educational materials, increased screening adherence compared to education alone [34]. Attention also needs to be given to the fact that not nearly enough primary healthcare workers have been equipped with the knowledge and skills to provide targeted counseling, cervical screening, ablative treatment of precancer lesions, referral to specialist management, and post-screening follow-up care [19, 35]. Thus, these findings show the importance of comprehensive educational interventions

on CC prevention that address knowledge and skill gaps on the part of healthcare providers and beneficiaries of health insurance [35, 36].

The inability to integrate cervical screening services with other reproductive services is another contributor to the low level of service utilization [37]. Consequently, during interactions between women and healthcare workers engaged in the provision of community health services in primary settings, women who are eligible for screening are only given information about CC without ensuring that they are actually offered screening or appropriately referred [38]. When viewed in light of the data on service availability, the low uptake of cervical precancer screening services also reflects the inadequate access to CC services in their local communities: only 1 in 5 teachers indicated that there was enough access to and had ever been screened for cervical precancer/cancer.

A study conducted in Nigeria found that secondary school teachers who had a good level of awareness of the HPV vaccine for preventing CC were favorably disposed to recommending its use [39]. Another study conducted in Ghana found that health education interventions, employing lectures, discussions, videos, and leaflets, can be critical in shaping knowledge of CC and screening, changing perceptions, and building self-efficacy toward cervical precancer screening [40]. A majority of school teachers indicated a positive disposition toward undergoing cervical precancer screening and encouraging their students, friends, and relatives to do so. In addition, they were generally willing to receive protective vaccination from CC and to encourage their students, friends, and relatives to receive vaccination to protect them from CC. This confirms existing research [35, 41] and further highlights the importance of school teachers and school-based interventions in promoting HPV screening and vaccination, suggesting that teachers can play a pivotal role in shaping students' health perceptions and behaviors in the region.

The finding that widowed/divorced marital status and average perceived barrier scores were significantly associated with the uptake of cervical precancer screening contradicts the broader public health literature that suggests marital status can influence health-seeking behaviors. Married individuals are generally observed to have greater social support and encouragement from their spouses to participate in health-promoting activities. The general observation may have been modified by region-specific cultural norms that require women to seek the approval of partners with respect to reproductive health decisions including cervical precancer screening [42]. The higher screening uptake among divorced/widowed women may reflect heightened perceived susceptibility or fewer social constraints, consistent with HBM

constructs. which posit that individual perceptions of barriers can impede the adoption of health behaviors. This is corroborated by a study conducted in a rural Nigerian community [43], which found that operational costs and lack of adequate health workforce and infrastructure were significant barriers to HPV vaccine delivery. Similarly, a qualitative study in a Chinese community highlighted perceptual, institutional, student and parental, and collaborator barriers that discouraged school teachers from organizing school-based HPV prevention programs [44].

Compared to a separate study of community-dwelling women screened using concurrent hr-HPV DNA testing and visual inspection methods [45], both the hr-HPV infection and VIA 'positivity' rates recorded in the Screening group were similar. The hr-HPV prevalence was however much lower than reported in another study of community-dwelling women in the North Tongu District [46] (32.3%; 95% CI, 30.2–34.5) and among women seeking reproductive health services in the Greater Accra and Ashanti regions (35.0%; 95% CI, 29.6–40.4) [47]. Nonetheless, there is a need for continuous primary and secondary preventive measures which include education on behavior modification, integration of screening and treatment of cervical precancerous lesions into the GNAT cancer care program. Although there was only 1 VIA positive (minor change) which was managed conservatively, the screen-and-treat approach that we propose for the management of screen-positives has been published elsewhere [27, 48] and can be relied upon when suspected lesions are encountered in a mass screening program.

There are several benefits to embedding a cervical precancer screening program within the framework and context of the GNAT cancer insurance scheme. Of note, the availability of an updated register of members to the GNAT leadership ensures that the potential of losing members to follow-up post-screening is significantly minimized. In comparison, years of opportunistic screening campaigns have not significantly improved the burden of CC in LMICs as has been seen in countries with organized screening programs [49]. Again, the screen-and-treat approach advocated for to address the existing challenge with follow-up can be limited by a lack of resources, making adequate insurance coverage indispensable [19, 49]. Nonetheless, it is clear from our work and reports by other authors that high insurance coverage alone does not necessarily ensure the uptake of recommended services [50–52]. This suggests that while health insurance can provide access to these services, additional strategies may be needed to encourage service adoption. Focusing more on community empowerment strategies such as using self-sampling screening protocols, promoting social norms around screening, and

encouraging support from trusted intermediaries could serve as facilitators [53] and need to be considered as well.

Strengths and limitations

The major strength of this study is that it is the first, to the best of our knowledge, to simultaneously report on cervical screening utilization and outcomes among a defined sample of school teachers in Ghana. Significantly, including women from the specific context of the teacher union-sponsored cancer insurance scheme makes our findings particularly interesting and compelling. However, there are a few caveats that must be borne in mind when interpreting the findings. First, social desirability bias may have influenced the self-reported cervical cancer screening uptake among the female teachers in our study, potentially leading to an overestimation of the screening utilization rate. This bias may occur if respondents provide answers they perceive as socially acceptable, such as reporting higher screening participation to align with perceived health-conscious behaviors or societal expectations. This could mask the true extent of implementation barriers, such as low awareness or limited access, and affect the accuracy of the logistic regression results. If social desirability bias disproportionately affected certain groups, it could skew the observed associations, making it harder to identify true predictors of screening uptake. To mitigate this bias, the study relied on self-administered questionnaires to reduce direct interviewer influence, but this may not fully eliminate the tendency to provide socially desirable responses. Future studies could incorporate objective verification of screening history or use indirect questioning techniques to minimize bias. Nevertheless, our findings still highlight critical implementation gaps in the GNAT insurance scheme, but the true screening uptake may be lower, necessitating improved access to screening services. We utilized a cross-sectional study, which required teachers to recall past events, potentially introducing recall bias. Although the teachers were sampled from the same region, we were unable to map screening outcomes onto survey responses owing to anonymization and distinct sampling periods. Again, our study findings may not be generalizable to other groups of women owing to the use of a purposive sample.

Conclusion

This study provides empirical data on the utilization of cervical precancer screening among school teachers enrolled in an innovative cancer insurance scheme and on the sociodemographic, cognitive, and behavioral factors associated with cervical precancer utilization, grounded in the HBM. Our study showed that cervical precancer screening utilization among female teachers

enrolled in the GNAT cancer insurance scheme was sub-optimal, primarily due to high perceived barriers such as low awareness, limited access, social factors (influencing perceived susceptibility), and health beliefs about screening that require attention. The hr-HPV prevalence of 17.3% among school teachers suggests that strategies to scale up screening for cervical precancer should be explored if the full benefits of the scheme may be realized for contributors. The GNAT scheme offers a strategic platform to enhance perceived benefits and self-efficacy by expanding coverage to include screening and treatment for precancerous lesions, integrating awareness education into school programs, and decentralizing screening services to reduce access barriers. By addressing these gaps, the scheme can support the scaling of cervical precancer screening nationwide through local teacher unions, ultimately reducing cervical cancer incidence and promoting health equity among educators and their communities.

Abbreviations

CCPTC	Cervical Cancer Prevention and Training Centre
DNA	Deoxyribonucleic acid
EVA	Enhanced Visual Assessment
GNAT	Ghana National Association of Teachers
HBM	Health Beliefs Model
hr-HPV	high-risk human papillomavirus
IFCPC	International Federation for Cervical Pathology and Colposcopy
LMIC	Low and middle-income country
PCR	Polymerase chain reaction
SGMC	Sweden Ghana Medical Centre
SHEP	School Health Extension Programme
VIA	Visual Inspection with Acetic Acid

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12913-025-13859-3>.

Supplementary Material 1
Supplementary Material 2
Supplementary Material 3
Supplementary Material 4

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Author contributions

Conceptualization and study design: KE, ET, CMW, EG, ETD, and JEA. Screening and data collection: ET, CMW, AED, EG, ETD, SK, SD, and KE; Data management and formal analysis: JEA, ETD, SD, SK, ET, CMW, NOME and KE; Writing—original draft: ETD, JEA, RA, ET, and KE. All the authors read and approved the manuscript in its current form.

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Data availability

The datasets used and/or analyzed during the current study are presented in the main manuscript and supporting files. In addition, data can be obtained from the Ethics Review Board of Catholic Hospital, Battor and the corresponding author on request.

Declarations

Ethics approval and consent to participate

The study complied with the Declaration of Helsinki (1964) and its later amendments. Verbal informed consent was sought from the women before questionnaire administration, sample collection, and cervical screening. Ethical clearance was given by the Ethical Review Committee of Catholic Hospital, Battor (approval no. CHB-ERC 0120/06/22 and updated CHB-ERC 0130/04/24) and the Committee for Human Research and Ethics, University of Energy and Natural Resources, Sunyani, Ghana (approval no. CHRE/AP/226/024). The study was conducted in an environment with no form of coercion and volunteers were adequately informed of the purpose, nature, and procedures of the study procedures.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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