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Cervical cancer knowledge among high school students in Southern Ghana

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Abstract

Background Cervical cancer (CC) causes significant morbidity and mortality in low-and middle-income settings, ranking second commonest female cancer in Ghana, affecting 26.4/100,000 with mortality rate 22.9/100,000 women. Previous studies focused on adults, females and involved smaller sample sizes. This study assessed CC knowledge among secondary school students in Ghana to generate evidence for implementing school-based educational interventions.

Methods It was a multi-site, cross-sectional study across 14 secondary schools in Greater Accra (GAR) and Central regions(C/R) of Ghana. Self-administered pre-tested questionnaires focused on students' knowledge on causes, risk factors, symptoms, and prevention of CC. Four main domains were covered: general knowledge; cervical cancer features; risk factors; and screening and prevention. Domain scores were categorised into adequate knowledge (>50%) and inadequate knowledge (< 50%). Chi-square was used to test association between knowledge in various domains with participants' gender, school type, and region. P-value below 0.05 was considered statistically significant.

Results A total of 9,767 students from 14 schools, 25.6% (n=2,280) males and 74.4% (n=6,630) females with mean age 16.9+1.2years participated. Overall, 58.4% of students had adequate general knowledge about CC; 61.1% demonstrated adequate knowledge of risk factors; 21.5% adequate knowledge of features, and 51.8% also had adequate knowledge of screening and prevention. Across all domains tested, 60.6%% of students had inadequate knowledge. More female students(60.9%) had adequate general knowledge than males(50.1%) (p< 0.001).

Conclusion Significant knowledge gaps exist on risk factors, features, screening and prevention of cervical cancer among senior high school students in Ghana, necessitating targeted educational interventions based on identified gaps.

Keywords Cervical cancer, Knowledge, School, Students, Risk factors, Prevention

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Background

Cervical cancer remains a major public health concern globally, and one of the most commonly diagnosed gynaecological malignancies in women under 40 years of age. Worldwide, it is estimated that cervical cancer is the fifth most common cancer in women between 30 and 39 years and the sixth most common in those aged 40 to 49 years. Despite the adoption of effective methods to prevent cervical cancer in developed countries, it remains a significant burden in low- and middle-income settings, including sub-Saharan Africa [1, 2]. Despite being one of the few preventable cancers, it remains a leading cause of cancer-related morbidity and mortality among women in these regions. According to the World Health Organization (WHO), cervical cancer ranks as the second most common cancer among women in Ghana, with an estimated incidence rate of 26.4 per 100,000 women and a mortality rate of 22.9 per 100,000 women [1, 3]. Cervical cancer is one of the most common gynaecological malignancies in women under 40 years of age. It is estimated that cervical cancer is the fifth most common cancer in women aged 30 to 39 years and the sixth most common in women aged 40 to 49 years [1]. Despite the adoption of effective methods to prevent cervical cancer in developed countries, it remains a significant burden on health care systems.

These high rates of cervical cancer incidence, morbidity and mortality in low- and middle-income countries continue to reflect major inequities driven largely by low awareness, lack of access to national HPV vaccination, cervical screening and treatment services as well as socioeconomic barriers [4].

In Ghana, awareness of cervical cancer and related issues are generally low. The recently launched STEPS survey reported that only 3.6% adult females 18 years and above, had ever screened for cervical cancer [5]. Approximately 70% of the patients diagnosed with the cancer are seen when their tumors have advanced to late stages [6].

Adolescents and young adults, particularly those in secondary schools, constitute a crucial population for cervical cancer prevention efforts. This age group is at a pivotal stage where education and behavior modification can have long-lasting impacts on their health choices and practices. However, in Ghana, awareness about cervical cancer, its risk factors, and prevention methods among secondary school students appears inadequate.

A study conducted by Asante et al. (2019) [7] revealed that only 36% of secondary school girls in Ghana had ever heard of cervical cancer, and just 15% were aware of the Human Papillomavirus (HPV) vaccine reflecting the low levels of HPV vaccine awareness and its availability and uptake in Ghana [8]. Meanwhile, the main risk factor, which is high-risk sexual behaviour, is reportedly prevalent among these school-aged adolescents [9].

According to Asiedu C. et al. 2019 [10], in Ghana, over 40% of school-age adolescents are sexually active, with 15 years being the median age of first sexual intercourse among high school students [11]. Also, females are five times more likely than males to initiate sex early (Boamah-Kaali, 2016) [11]. Of important concern is the alarming prevalence of other risky behaviours, including unprotected sex (60%) and having multiple sexual partners (>30%) [12, 13]. Despite these, there is no national programme for systematic prevention of cervical cancer in Ghana. Additionally, any education on this preventable cancer is random, mostly private-sector or NGOs-driven and largely uncoordinated. Ghana also currently lacks a national HPV vaccination policy or programme.

To the best of our knowledge, previous studies have been limited to adults, few schools, only females and smaller sample sizes. Knowledge levels must be assessed to inform national policy and direct the development of educational programs. Schools provide excellent access to the nation's youth and an opportunity to educate and empower adolescents with health-seeking behavior before habits are formed. This study set out to define the existing knowledge levels and discover the gaps in knowledge in a large cohort of high school girls and boys in the southern part of Ghana. This will serve as a guide to develop targeted educational interventions for the youth and facilitate the evaluation of a school cancer educational intervention to be implemented in these selected schools - the next phase of this study.

Method and materials

This multi-site cross-sectional study was conducted across 14 Senior High Schools (SHS), 7 in the Greater Accra region and 7 in the Central region of Ghana. Ghana has 16 regions with a total of 704 Senior High Schools (SHS). The Greater Accra region, which has the highest human development index (HDI) in the south and in the country, has 46 SHS. The Central region has the lowest HDI in southern Ghana, has 75 SHS. [14] Both regions are known to have the majority of SHS in the country with most having boarding facilities. The study was conducted in collaboration with the Ghana Education Service (GES) who granted access to the schools and provided a list of 20 schools from each region which were deemed geographically accessible for the study. Cluster sampling method was used to select 7 schools from each of the two regions to participate in the study. Each region was represented by two all-girls schools and 5 co-educational schools. All the schools were public schools. The Headmasters/Headmistresses of schools were contacted ahead to obtain their written informed consent for their schools to participate in the study. In Ghana, the SHS education is a 3-year program which culminates in a West African Senior High School Certificate of Education

(WASSCE) certificate, a requirement for college/university admission. Students are admitted to SHS with a Basic Education Certificate Education (BECE) certificate at an average age of 15 years. Cluster sampling method was used to select seven schools from each of the two regions to participate in the study. In this approach, the individual schools served as the primary sampling units (clusters). From the list of 20 geographically accessible schools provided by the Ghana Education Service (GES) in each region, clusters were stratified by school type (all-girls and co-educational) to ensure adequate representation of different school settings and student demographics. Within each region, two all-girls schools were purposively included to capture perspectives from female-only institutions, which are often prioritized in reproductive health and cervical cancer awareness studies. The remaining five schools were randomly selected from the pool of co-educational schools to reflect broader student diversity and regional distribution. This combination of stratified and random cluster sampling enhanced representativeness while maintaining logistical feasibility for data collection across multiple school sites.

All second-year students across the selected schools, both boys and girls were invited to participate in the study. The study protocol was explained and the option to withdraw given. Students signed written assent forms. A self-administered structured questionnaire was used to collect data focused on assessing the students' knowledge

levels on the causes, risk factors, symptoms, and preventive measures related to cervical cancer. The questions were mostly in the "true or false" format. There were a total of 21 questions with 4 general knowledge questions in (domain I), 5 questions on symptoms of cervical cancer (domain II), 4 questions on risk factors (domain III) and 8 questions on screening and prevention (domain IV). The questionnaire used in this study was adapted from a previously conducted pilot study on cervical cancer awareness among secondary school students in Ghana [Nsaful et al., 2022]. Although the instrument was reviewed for content relevance and contextual appropriateness, it was not formally test-validated for psychometric properties such as reliability or construct validity. However, pre-testing helped ensure clarity, cultural suitability, and comprehension among respondents. On the day of data collection, students were seated at assembly/classrooms and supervised by their teachers during completion of the questionnaires, as is done for class exercises or examinations.

Statistical analysis

Each correctly answered question in domain I, II, III and IV was scored one (1) point and a wrongly answered question was scored zero (0). The total score for each domain was calculated by summing the score of each question in that domain. The domain scores were categorised into adequate knowledge > 50% and inadequate

Table 1 General knowledge on cervical cancer (Domain I-4 questions)

Domain	Characteristic	Correct Answer n, (%) ¹	Incorrect Answer n, (%) ¹	Do not know n, (%) ¹
Domain I: General knowledge on cervical cancer	<i>Cervical cancer is caused by Human papilloma virus (HPV)</i>	3,264 (33.4)	5,398 (55.3)	1,105 (11.3)
	<i>Cervical cancer is curable</i>	5,113 (52.3)	1,208 (12.4)	3,446 (35.3)
	<i>Women less than 30 years can have cervical cancer</i>	5,444 (55.7)	1,232 (12.6)	3,091 (31.7)
	<i>Cervical cancer begins in the cervix</i>	4,766 (48.8)	1,196 (12.2)	3,805 (39.0)
Domain II: Knowledge on symptoms of cervical cancer	<i>Abnormal vaginal bleeding</i>	4,758 (48.7)	1,237 (12.7)	3,772 (38.6)
	<i>Frequent urination</i>	2,311 (23.7)	2,786 (28.5)	4,670 (47.8)
	<i>Offensive vaginal discharge</i>	5,494 (56.2)	799 (8.2)	3,474 (35.6)
	<i>Pain during sexual intercourse</i>	967 (9.9)	4,649 (47.6)	4,151 (42.5)
Domain III: Knowledge on risk factors of cervical cancer	<i>No signs or symptoms at all</i>	1,437 (14.7)	4,458 (45.6)	3,872 (39.6)
	<i>Having sex at a young age</i>	3,536 (36.2)	2,401 (24.6)	3,830 (39.2)
	<i>Having many sexual partners</i>	6,162 (63.1)	847 (8.7)	2,758 (28.2)
	<i>Having a sexual partner who has multiple partners</i>	5,573 (57.1)	937 (9.6)	3,257 (33.3)
Domain IV: Knowledge on cervical cancer screening and prevention	<i>Excessive weight gain</i>	4,204 (43.0)	1,027 (10.5)	4,536 (46.4)
	<i>Cervical cancer be prevented</i>	7,108 (72.8)	578 (5.9)	2,081 (21.3)
	<i>Age a woman should have her first pap smear</i>	1,010 (10.3)	2,713 (27.8)	6,044 (61.9)
	<i>Abstinence from sex can prevent cervical cancer</i>	3,732 (38.2)	1,759 (18.0)	4,276 (43.8)
	<i>Safe sex can prevent cervical cancer</i>	5,088 (52.1)	624 (6.4)	4,055 (41.5)
	<i>Avoid smoking can prevent cervical cancer</i>	2,634 (27.0)	2,132 (21.8)	5,001 (51.2)
	<i>HPV vaccination can prevent cervical cancer</i>	4,418 (45.2)	526 (5.4)	4,823 (49.4)
<i>Regular screening/Pap smear can prevent cervical cancer</i>	5,678 (58.1)	265 (2.7)	3,824 (39.2)	
<i>Regular washing of vagina can prevent cervical cancer</i>	752 (7.7)	4,559 (46.7)	4,456 (45.6)	

¹Row percentages

Table 2 Reasons cervical cancer cannot be prevented

Characteristic	Correct Answer	Incorrect Answer	Do not know
	n, % ¹	n, % ¹	n, % ¹
It is spiritual	345 (59.7)	77 (13.3)	156 (27.0)
Cancer cannot be prevented	148 (25.6)	298 (51.6)	132 (22.8)
It is inherited	202 (35.0)	181 (31.3)	195 (33.7)
The cervix is prone to cancer	119 (20.6)	250 (43.2)	209 (36.2)

¹Row percentages

knowledge < 50%. The overall score was calculated by summing all the scores for domain I-IV. A Chi-square test of proportion was used to test association between knowledge in the various domains with school type, sex and region. $p < 0.05$ was considered statistically significant.

Ethical considerations

Ethical approval was obtained from the Institutional Review Board of Korle Bu Teaching Hospital for Medical Research (KBTH-IRB) (study protocol ID KBTHIRB/00063/2018). Permission was granted by the GES, and Heads of Schools gave written informed consent. Assent was also given by each participant. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Results

A total 9,767 students, made up of 25.6% (2,280) males and 74.4% (6,630) females from 14 schools 7 each from the Greater Accra and Central regions participated in the pre-test. The mean age of participants was 16.9 ± 1.2 years. All students present in school on the day of the survey participated, giving a 100% response rate.

General knowledge of cervical cancer

The pre-test results indicated varying levels of general knowledge among students regarding cervical cancer. Overall, approximately one-third 33.4% ($n = 3,264$) of students correctly identified that cervical cancer is caused by the Human Papillomavirus (HPV); 52.3% ($n = 5,113$) knew that cervical cancer is curable; 55.7% ($n = 5,444$) knew women under 30 years can develop cervical cancer, and

48.8% ($n = 4,766$) correctly identified that cervical cancer begins in the cervix. (Table 1)

For the subset of students who thought cervical cancer cannot be prevented, 59.7% ($n = 345$) respondents the disease is spiritual, 35.0% ($n = 202$) indicated it is inherited and 20.6% ($n = 119$) indicated the cervix is naturally prone to developing the cancer. (Table 2) More female students (60.9%) had adequate general knowledge than males (50.1%) ($p < 0.001$).

Knowledge on symptoms of cervical cancer

Table 1 illustrates students' knowledge of the symptoms associated with cervical cancer. Only 14.7% ($n = 1,437$) of the students knew cervical cancer could be asymptomatic; more than half 56.2%, ($n = 5,494$) correctly knew about offensive vaginal discharge as a symptom while 48.7% (4,758) and 23.7% ($n = 2,311$) knew abnormal vaginal bleeding and frequent urination respectively as symptoms of the disease.

Knowledge of risk factors

Regarding risk factors for cervical cancer (Table 1): 36.2% ($n = 3,536$) correctly identified early coitarche a risk factor, 63.1% ($n = 6,162$) identified having multiple sexual partners, and 57.1% ($n = 5,573$) identified risk of having partners with multiple sexual partners; while less than half (43.0%, $n = 4,204$) correctly noted that being overweight or obese is a risk factor.

Knowledge of Cervical Cancer Screening and Prevention.

The majority 72.8% ($n = 7,108$) of students knew cervical cancer can be prevented, through safe sexual practices 52.1% ($n = 5,088$), regular screening 58.1% ($n = 5,678$) and HPV vaccination 45.2%, (4,418). Less than one-third (27.0%) of participants were aware avoiding smoking was useful for reducing the risk of cervical cancer. (Table 1)

Overall knowledge

The domain analysis (Table 3) provides a comprehensive view of the students' overall knowledge: Overall, 58.4% of students had adequate general knowledge about cervical cancer, 61.1% demonstrated adequate knowledge of risk factors; 21.5% had adequate knowledge of the features, and 51.8% adequate knowledge of screening and prevention. Across all the knowledge domains tested, an overall

Table 3 Domain analysis

Characteristic	Adequate	Inadequate
	n, % ¹	n, % ¹
General knowledge on cervical cancer (4 questions)	5,707 (58.4)	4,060 (41.6)
Knowledge on features of cervical cancer (5 questions)	2,095 (21.5)	7,672 (78.5)
Knowledge on factors increasing risk of getting cervical cancer (4 questions)	6,020 (61.6)	3,747 (38.4)
Knowledge on cervical cancer screening and prevention (8 questions)	5,062 (51.8)	4,705 (48.2)
Overall knowledge (All 21 questions)	3,852 (39.4)	5,915 (60.6)

¹Row percentages

total of 39.4% of students had adequate knowledge, with 60.6% showing inadequate knowledge.

Associations of schools with knowledge

Table 4 compares the adequacy of knowledge among students across school types, boys versus girls and between the two regions. A significantly higher proportion of female students had adequate general knowledge on cervical cancer than male students ($p < 0.001$), while higher proportion of students in the central region had adequate knowledge on the features than students in the Greater Accra region ($p < 0.001$). Furthermore, significantly more students from girls-only schools had adequate knowledge about risk factors ($p < 0.037$), with more girls than boys knowing adequately about these risk factors ($p < 0.001$). Central region students had more knowledge of risk factors than Greater Accra region schools ($p < 0.001$).

Consistently, Girls-only schools ($p < 0.037$), female students ($p < 0.001$) and students from central region ($p < 0.001$) demonstrated statistically significant more knowledge on cervical cancer prevention.

Overall, female students ($p < 0.001$) and students from central region ($p < 0.001$) were more knowledgeable on the whole, on cervical cancer than male students and students from Greater Accra Region and this was statistically significant.

Discussion

This study has investigated the knowledge base of females and males in Ghanaian SHS in southern Ghana regarding cervical cancer and found it to be inadequate. Inadequate knowledge levels were found more among male students, co-educational schools (versus girls-only schools) and Greater Accra region schools (versus Central region schools). Certain gaps in knowledge of cervical cancer were also identified.

While overall adequate general knowledge on cervical cancer appears low at 39% percent among the students from the 14 schools, knowledge across all domains is significantly higher among girls than boys and also higher in the Central Region than the Greater Accra Region. Since cervical cancer is a female condition, it expected

Table 4 Analysis of participants' knowledge across schools, gender and regions

	School type		p-value	Sex		p-value	Region		p-value
	Co-educational n, % ¹	Girl's only n, % ¹		Male n, % ¹	Female n, % ¹		Greater Accra n, % ¹	Central n, % ¹	
General knowledge on cervical cancer			0.068			< 0.001			0.137
Adequate	4,267 (59.0)	1,440 (56.9)		1,183 (51.9)	4,040 (60.9)		2,195 (57.5)	3,512 (59.0)	
Inadequate	2,969 (41.0)	1,091 (43.1)		1,097 (48.1)	2,590 (39.1)		1,622 (42.5)	2,438 (41.0)	
Knowledge on symptoms of cervical cancer			0.175			0.128			0.001
Adequate	1,528 (21.1)	567 (22.4)		463 (20.3)	1,447 (21.8)		753 (19.7)	1,342 (22.5)	
Inadequate	5,708 (78.9)	1,964 (77.6)		1,817 (79.7)	5,183 (78.2)		3,064 (80.3)	4,608 (77.5)	
Knowledge on factors increasing risk of cervical cancer			0.037			< 0.001			< 0.001
Adequate	4,416 (61.0)	1,604 (63.4)		1,260 (55.3)	4,293 (64.7)		2,188 (57.3)	3,832 (64.4)	
Inadequate	2,820 (39.0)	927 (36.6)		1,020 (44.7)	2,337 (35.3)		1,629 (42.7)	2,118 (35.6)	
Knowledge on cervical cancer screening and prevention			0.037			< 0.001			< 0.001
Adequate	3,705 (51.2)	1,357 (53.6)		1,059 (46.5)	3,615 (54.5)		1,881 (49.3)	3,181 (53.5)	
Inadequate	3,531 (48.8)	1,174 (46.4)		1,221 (53.5)	3,015 (45.5)		1,936 (50.7)	2,769 (46.5)	
Overall knowledge			0.121			< 0.001			< 0.001
Adequate	2,821 (39.0)	1,031 (40.7)		780 (34.2)	2,778 (41.9)		1,403 (36.8)	2,449 (41.2)	
Inadequate	4,415 (61.0)	1,500 (59.3)		1,500 (65.8)	3,852 (58.1)		2,414 (63.2)	3,501 (58.8)	

¹ Column percentages

that more females would be naturally interested in the subject and would already have found some information about the disease and hence, their demonstration of better knowledge than boys. While the possible reasons for the inter-regional disparity in overall knowledge remains unclear, it appears consistent with the high levels awareness (61.3%) on cervical cancer also reported in the central region by Sampson Naa et al. This population however, consisted of female adolescents and adult women [15]. The 39% overall general knowledge is not far off from the 42% reported of female high school students in Nigeria by Ifediora CO et al. [16], and also the 42.7% reported by Amorha et al. as having adequate knowledge on cervical cancer in Nigeria [17]. In contrast, a recent study among female high school students in rural Uganda, reported as high as 97% of students having knowledge about cervical cancer [18]. A similar study among high school girls in Zimbabwe also indicated that over 87% of students reported knowing about cervical cancer with mean knowledge score of 89.9% [19]. It is noteworthy that Uganda started HPV vaccination in 2015 and have a high first dose uptake of 74%, it is not surprising then that knowledge levels are high. Reported HPV vaccination coverage in Zimbabwe is also 40% with 67% first dose uptake. This study also included boys who had significantly lower levels of knowledge giving the impression a much lower overall knowledge level [4].

This analysis revealed that a substantial proportion of high school students lack basic specific information about cervical cancer including risk factors and preventive measures. For instance, only 33.4% correctly identified HPV as the cause of cervical cancer, and just about half knew that the disease is curable. This is an indication of a significant fundamental knowledge gap in understanding the etiology and prognosis of cervical cancer, both of which are crucial for effective prevention and early therapeutic interventions. This gap in basic knowledge may be attributable to general low levels of public health-literacy in Ghana as well as gaps in sexual health education and/or community/school education regarding cervical cancer in Ghana. These gaps highlight the need for increased school and public health education on cervical cancer in Ghana.

There were generally low levels of knowledge on HPV as cause of cervical cancer among our SHS students in Ghana. These findings are consistent with previous studies that highlight low awareness levels about HPV and its link to cervical cancer in sub-Saharan Africa [19, 20]. The misperception that cervical cancer is not curable (held by 12.4% of students) and the lack of knowledge about its curability (35.3%) further reflect the low knowledge levels of cervical cancer, and underscores the need for escalated awareness creation. Inaccurate knowledge about causality will be an impediment to prevention, particularly as

behavior change is key to cervical cancer prevention. Education and awareness should also emphasize the place of multiple factors that contribute to the evolution from cervical dysplasia to invasive cervical cancer, including persistent HPV infection, co-factors such as smoking, co-infections, immunosuppression, sexual practices, and other reproductive health variables [21].

Students' awareness of the symptoms of cervical cancer is notably low. For example, while 48.7% identified abnormal vaginal bleeding as a symptom, only 23.7% knew that frequent urination is also a symptom, and merely 9.9% recognized pain during sexual intercourse as a potential sign. These results suggest that while students are somewhat aware of certain symptoms, many still lack comprehensive knowledge about the full spectrum of cervical cancer features. This lack of symptom awareness raises major concerns as that could contribute to late presentation as reported in over 70% of cervical cancer patients in Ghana [1], thereby delaying diagnosis, interventions and negatively impact treatment outcomes.

The study found moderate awareness regarding behavioral risk factors with 63.1% of students aware that having multiple sexual partners increases the risk of cervical cancer, and 57.1% aware that having a partner with multiple partners is a risk factor. However, only approximately a third of students identified early sexual activity as a risk factor, and 43.0% were aware of the link between being overweight or obese and cervical cancer. These levels of risk factor awareness are generally higher than reported by previous studies of 15%, 7%, and 1.4% of students recognized early onset of sexual intercourse, HPV infection, and smoking respectively [18].

This study findings are aligned with existing literature, which suggests that while some risk factors are well known, others are often overlooked [7, 18, 19]. The implication here is that targeted education programs should emphasize coverage of the broad range of risk factors, particularly those less commonly known, to foster a more comprehensive understanding of cervical cancer and its prevention.

Awareness about screening and preventive measures showed mixed results. A high proportion (72.8%) knew that cervical cancer can be prevented, but only 10.3% knew the appropriate age for a first Pap smear while awareness of HPV vaccination for prevention was low (45.2%). In contrast, Oringtho et al, reported from their Ugandan study that over half of the participants (59%) were aware about vaccination to prevent cervical cancer, with a third of their high school girls having received at least one dose of the HPV vaccine [18]. This number of girls already having received the vaccine is a reflection of better public education on cervical cancer and uptake of vaccination. It is not surprising then that consistently, majority (89%) of high school girls in Uganda knew that

cervical cancer could be prevented [18]. Consistently, the majority (89%) of secondary school girls in Uganda knew that cervical cancer could be prevented [18]. While our current study did not explore vaccination status among the female students in Ghana, it had been suggested that less than 10% of pre-adolescent girls in Ghana have been vaccinated against HPV [15, 22]. This is not surprising as HPV vaccination is not part of routine immunization in Ghana. Since nearly all cases of cervical cancer are caused by the human HPV, vaccination against HPV remains the most effective preventive tool to reduce the risk of cervical cancer. However, in Ghana, despite a successful pilot project in 2013 [23], there have not been effective follow-up steps towards national HPV vaccination programme. Presently, HPV vaccines are not covered or reimbursed under Ghana's national health insurance scheme. The vaccines are only available at selected health facilities, costly, and acquired through out-of-pocket payments which all contribute to very low uptake and vaccination coverage in Ghana [15]. As has been done in other African countries, the government of Ghana, through the Ministry of Health and the Ghana Health Service should consider rolling out such a program which will increase awareness and education alongside the primary intention of vaccination. Importantly, since vaccine hesitancy is often linked to concerns about rare adverse events, it would be valuable for such awareness campaigns to emphasize that large-scale evidence supports its safety profile [24].

These results underscore the need for targeted education on the importance of regular screening and the benefits of HPV vaccination. Misconceptions, such as the belief that regular washing of the vagina can prevent cervical cancer, also needs to be addressed in the educational awareness intervention content, while emphasizing the role of HPV vaccination is essential for effective prevention. Advocacy for the political will that favours national HPV vaccination policy and delivery are very crucial potential interventions.

Adolescence presents the best window for tackling the cervical cancer menace as it is a preventable disease, the aetiology of which starts at this phase of life. For most people the first sexual encounter is at adolescence [11] and irresponsible sexual behavior follows soon after. The benefits of the HPV vaccine is maximized if done before first sexual encounter. Knowledgeable adolescents would have higher vaccination uptake, practice safe sex and start cervical cancer screening early. High schools present a golden opportunity to gain access to adolescents.

The findings of this study revealed an urgent need to educate the youth on cervical cancer and the introduction of an educational intervention in high schools would target most adolescents at an age that could empower them with information and lead to prevention and early

detection of cervical cancer. The findings of this study also provides a framework for development of the content of educational interventions and areas for emphasis in awareness creation messages. This study has set the stage for the next phase of this project assessing the impact of a cervical cancer educational intervention designed for Ghanaian high schools, initially piloted in two schools [6]. The authors of this study intend that these findings will inform the Ministry of Education and Ghana Health Service in shaping policy and developing educational interventions and curricula.

The strengths of this study lie in the large sample size and the inclusion of both girls and boys making it representative of the population thereby providing adequate baseline data for implementation of a cervical cancer high school educational intervention and to evaluate its impact.

This main limitation of this study is that it only examined the associations with cervical cancer knowledge levels and participants' sociodemographic characteristics without other potential determinants of knowledge. Lastly, although cluster sampling was used to enhance representativeness, the potential for selection bias cannot be entirely ruled out, as the selected schools and participating students may not fully capture the characteristics of all second-cycle institutions in Ghana.

Conclusion

Significant gaps exist in knowledge regarding cervical cancer risk factors, features, screening and prevention among high school students in Ghana. Although there is appreciable knowledge that it can be prevented, knowledge on preventable measures, such as Pap smear and vaccination is poor.

Ghana needs to intensify public health education in the area of cervical cancer. Awareness campaigns need to emphasize the role of HPV and promote its vaccine. Targeted education in SHS based on identified gaps, covering risk factors, symptoms and prevention holds prospects to inform risk modification and enable early detection for improved prognosis. Targeted educational interventions, integration of HPV vaccination campaigns, and community-based awareness strategies are essential next steps.

Recommendation for future directions

The authors of this study recommend the development and adoption of a cervical cancer (and other cancers) curriculum for Senior High Schools in Ghana. Also, the inclusion of coverage for cervical cancer prevention and awareness in the curriculum for all senior high schools holds key prospects for advancing progress on the prevention of cervical cancer in Ghana and other similar settings.

This study forms the basis for future research for a similar research project to be conducted in the northern part of the country, which is known to have a different socio-cultural setting, with the ultimate aim of developing and implementing a school educational intervention.

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Authors' contributions

J.N., F.D., K.E.B., P.S., and J.N.C.L conceptualized the study and drafted the proposal. Methodology; J.N., F.D., K.E.B., P.S. and J.N.C.L. reviewed and finalized the proposal and study methodology. J.N., F.D., E.B., T.O.M., E.A.A., and E.C. performed the investigations and data curation E.N. and J.N. performed the data analysis; E.N. did the data interpretation; E.N., J.N. drafted manuscript; J.N., F.D. and P.S. Editing of manuscript was done by J.N., P.S., F.D., E.N., E.B., E.A.A., T.O.M., E.C. and K.E.B. Final revision and approval of manuscript was done by J.N., P.S., F.D., E.N., E.B., E.A.A., T.O.M., E.C. and J.N.C. All authors have read and approved the manuscript.

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Data availability

The data and materials for this study are freely available at <https://doi.org/10.6084/m9.figshare.27704829.v1>.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Institutional Review Board of the Korle Bu Teaching Hospital for Medical Research (KBTH-IRB) (ID: KBTHIRB/00063/2018). Permission was granted by the Ghana Education Service and Heads of the participating school. Written informed consent/assent was also given by each participant and we confirm that the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Competing interests

Kirstyn E. Brownson: consultant for ImpediMed Surgeon Advisory Board for Lymph Edema Management. All the other authors have no conflicts of interest to declare.

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References

1. Afriyie J, Essilfie ME. Association between risky sexual behaviour and HIV risk perception among in-school adolescents in a municipality in Ghana. *Ghana Med J*. 2019;53(1):29–36. <https://doi.org/10.4314/gmj.v53i1.5>.
2. Bogani G, Scambia G, Malzoni M, Casarin J, Vizzilli G, et al. Chemo-conization in Early-stage cervical cancer > 2 cm scheduled for fertility-sparing approach: an analysis of the ETERNITY project. *Int J Gynecol Cancer*. 2025;35(4):101643. <https://doi.org/10.1016/j.ijgc.2025.101643>. ISSN 1048-891X.
3. World Health Organization. (2020). Human papillomavirus (HPV) and cervical cancer. Retrieved from [[https://www.who.int/news-room/fact-sheets/detail/human-papillomavirus-\(hpv\)-and-cervical-cancer](https://www.who.int/news-room/fact-sheets/detail/human-papillomavirus-(hpv)-and-cervical-cancer)]([https://www.who.int/news-room/fact-sheets/detail/human-papillomavirus-\(hpv\)-and-cervical-cancer](https://www.who.int/news-room/fact-sheets/detail/human-papillomavirus-(hpv)-and-cervical-cancer))
4. Asante KO, et al. Knowledge and perception of cervical cancer screening among women in Kumasi, Ghana: A Cross-Sectional study. *BMC Public Health*. 2019;19:721. <https://doi.org/10.1186/s12889-019-7076-2>.
5. World Health Organization. (2024). Ghana STEPS Report 2023 - Nationwide Non-Communicable Diseases Risk Factors Assessment Using The World Health Organization's Stepwise Approach In Ghana. September 2024.
6. Asiedu C. Sexual experiences among senior high students at selected schools in Cape Coast metropolis in central region of Ghana. *Nurs Stud Pract Int*. 2019;2(1):1008.
7. Awua AK, Sackey ST, Osei YD, Asmah RH, Wiredu EK. Prevalence of human papillomavirus genotypes among women with cervical cancer in Ghana. *Infect Agents Cancer*. 2016;11(1):1–9.
8. Ferlay JEM, Lam F, Laversanne M, et al. Global cancer observatory: cancer today. Lyon, France: International Agency for Research on Cancer; 2024.
9. Ferlay J, et al. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2018;68(6):394–424. <https://doi.org/10.3322/caac.21492>.
10. GAVI. (2013, 4 November 2013). Ghana to vaccinate girls against HPV with GAVI support. <https://www.gavi.org/news/media-room/ghana-vaccinate-girls-against-hpv-gavi-support>
11. Boamah-Kaali EA, Asante KP, Manu G, Adeniji E, Mahama E, Ayipah EK, et al. Predictors of early sexual debut and its implications among adolescents in Kintampo, Ghana: a cross sectional survey. *Sciencedomain Int*. 2016;4(3):1–11. <https://doi.org/10.9734/ISRR/2016/29513>.
12. ICO/IARC Information Centre on HPV and Cancer. (2019). Ghana: Human Papillomavirus and Related Cancers, Fact Sheet 2019. Retrieved from [https://hpvcentre.net/statistics/reports/GHA_FS.pdf](https://hpvcentre.net/statistics/reports/GHA_FS.pdf).
13. Ifediora Co, Emmanuel C, Azuik. Knowledge and attitudes about cervical cancer and its prevention among female secondary school students in Nigeria. *Trop Med Int Health*. 2018;23(7):714–23. <https://doi.org/10.1111/tmi.13070>.
14. Subnational HDI - Subnational. HDI - Table - Global Data Lab. [cited 2024 Sep 15]. Available from: <https://globaldatalab.org/shdi/table/shdi/GHA/>
15. International Vaccine Access Center (IVAC). HPV Vaccine Progress and Next Steps for Advocacy in Ghana: Findings from Key Informants, IVAC at the Johns Hopkins Bloomberg School of Public Health, Baltimore, June 2023.
16. Kangmennaang J, Mkandawire P, Luginaah I. Determinants of risky sexual behaviours among adolescents in central African Republic, Eswatini and Ghana: evidence from multi-indicator cluster surveys. *Afr J AIDS Res*. 2019;18(1):38–50. <https://doi.org/10.2989/16085906.2018.1552600>.
17. Amorha KC, Ozota GO, Nduwewere M-GO, Ugomma Loveth Anyajii, Ogochukwu Francisca Egbo, Obianuju Anastasia Ogugofor. Knowledge, attitudes, and practices of adolescent girls regarding cervical cancer: a cross-sectional study in Enugu State, Nigeria. *Pan Africa Med Journal*. 2024; 47(17): | <https://doi.org/10.11604/pamj.2024.47.17.41087>
18. Kyei-Arthur F, Agyekum MW, Kyei-Gyamfi S. You cannot stay with one person once you begin having sex at a young age: the prevalence, correlates and effects of early sexual debut among children in Ghana. *Reprod Health*. 2024;21(1):38. <https://doi.org/10.1186/s12978-024-01775-4>. PMID: 38521936; PMCID: PMC10960462.
19. Mapanga Witness, Girdler-Brown B, Singh E. Knowledge, attitudes and practices of young people in Zimbabwe on cervical cancer and HPV, current screening methods and vaccination. *BMC Cancer*. 2019;19(1):1–14. <https://doi.org/10.1186/s12885-019-6060-z>.

20. Oringtho S, Mwaka AD, Garimoi Orach C, Wabinga H. Awareness of cervical cancer risk factors and preventive approaches, and perceived causes of cervical cancer among secondary school girls: a cross-sectional study in Northern Uganda. *Ann Med*. 2024;56(1):2374860. Epub 2024 Jul 8. PMID: 38975806; PMCID: PMC11232641.
21. Ferrari FA, Magni F, Bosco M, Biancotto G, Zorzato PC, Laganà AS, Chiantera V, Raffaelli R, Franchi M, Uccella S, Garzon S. The role of micronutrients in human papillomavirus Infection, cervical Dysplasia, and neoplasm. *Healthc (Basel)*. 2023;11(11):1652. <https://doi.org/10.3390/healthcare11111652>. PMID: 37297793; PMCID: PMC10252691.
22. Sampson CN, Nkpeebo SD, Degley TA. Knowledge, attitude and health beliefs on cervical cancer screening in Ajumako-Eyan-Essiam District, Ghana. *Can Oncol Nurs J*. 2021;31(3):285–90. PMID: 34395831; PMCID: PMC8320792.
23. Stelze D, et al. Estimates of the global burden of cervical cancer associated with HIV. *Lancet*. 2020. [https://doi.org/10.1016/S2214-109X\(20\)30459-9](https://doi.org/10.1016/S2214-109X(20)30459-9).
24. Ferrari FA, Ciminello E, Ceccaroni M, Pavone M, Di Donato V, Perniola G, et al. No increased risk of autoimmune diseases following HPV vaccination: a systematic review and meta-analysis. *Vaccines*. 2025;13(4):391. <https://doi.org/10.3390/vaccines13040391>.

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