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Mass Media Exposure and Cervical Cancer Screening in Rural Sub-Saharan Africa: A Multi-Country Cross-Sectional Analysis

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ABSTRACT

Background and Aims: Cervical cancer is a pressing global public health challenge, with sub-Saharan Africa (SSA) experiencing disproportionately high incidence and mortality rates compared to other regions. Early detection through screening and timely treatment is essential for mitigating the burden of this disease. Evidence suggests that mass media exposure can play a pivotal role in increasing cervical cancer screening uptake. This study aimed to examine the prevalence of cervical cancer screening in SSA and to identify factors associated with screening uptake, with a specific focus on the influence of mass media among rural women.

Methods: The analysis utilized data from the Demographic and Health Surveys (DHS) conducted in 11 SSA countries, encompassing responses from 72,565 rural women of reproductive age (15–49 years). The primary outcome variable was cervical cancer screening status. Descriptive statistics, including frequencies and cross-tabulations, were employed to characterize the sample. Given the skewed distribution of the outcome variable, complementary log-log regression models were applied to estimate adjusted odds ratios (AORs) in both bivariate and multivariable analyses. Robustness of the statistical models and their fitness were rigorously assessed to ensure the validity of the findings.

Results: The overall prevalence of cervical cancer screening among women in the 11 countries was 8.47%. Women with exposure to mass media were significantly more likely to undergo screening. Specifically, women who watched television less than once a week (AOR = 1.22, 95% CI: 1.07–1.38) or at least once a week (AOR = 1.39, 95% CI: 1.26–1.53) had higher odds of being screened compared to those with no exposure to television. Similar positive associations were observed for radio and newspaper/magazine exposure. Women who listened to the radio at least once a week (AOR = 1.59, 95% CI: 1.45–1.74) and those who read newspapers/magazines at least once a week (AOR = 1.68, 95% CI: 1.48–1.90) demonstrated increased odds of undergoing screening. Additional predictors of screening included older age, higher education levels, greater wealth, higher parity, and fewer barriers to accessing healthcare, such as not needing permission or assistance to seek care.

Conclusion: This study highlights the critical role of mass media—television, radio, and newspapers/magazines—in promoting cervical cancer screening among rural women in SSA. Public health stakeholders and governments should prioritize leveraging these platforms to design and disseminate culturally tailored campaigns aimed at overcoming barriers to screening in rural communities. By optimizing the reach and effectiveness of mass media, particularly traditional channels prevalent in rural SSA, cervical cancer screening rates can be significantly improved, thereby reducing the disease burden in the region.

1 | Introduction

In 2018, approximately 570,000 new cases of cervical cancer (CC) were reported globally, with low- and middle-income countries accounting for 80% of these cases [1]. CC is the fourth most frequently diagnosed cancer among women worldwide and the second most common cancer in nearly half (23/46) of the countries in sub-Saharan Africa (SSA) [1]. The global burden of CC is disproportionately distributed, with women in SSA experiencing significantly higher incidence and mortality rates than those in other regions. Southern Africa reports the highest age-standardized incidence rate (ASR) of CC globally, at 43.1 per 100,000 [2]. A recent 11-country study highlighted that survival rates for CC in SSA are particularly low, with only 33% of women surviving 5 years post-diagnosis [3]. In 2018, CC accounted for 21.7% of all cancer-related deaths among women in SSA, making it the leading cause of cancer mortality in the region [2].

Numerous studies have investigated the factors contributing to low participation rates in CC screening programs among women in SSA. The most frequently cited barriers include a lack of knowledge and awareness about CC [4], limited financial resources, long distances to healthcare facilities [5], and extended waiting times for Pap test appointments [6, 7]. Conversely, higher education levels and white-collar occupations are positively associated with cervical cancer screening uptake [8, 9]. Education equips women with a better understanding of the disease, thereby enhancing acceptance of screening programs [10]. Moreover, health insurance coverage and access to health information through education and media are strongly linked to improved screening rates [11–13].

Other sociodemographic factors, such as age [14], marital status [15], parity [16], and religion [17], also significantly influence women's likelihood of undergoing CC screening. For instance, women in different age groups may exhibit varying levels of awareness or perceived risk of cervical cancer, impacting their participation in screening programs [14]. Similarly, marital status and parity affect healthcare access and utilization, as married women or those with children may be more likely to engage with reproductive health services, including CC screening [15]. Additionally, religious beliefs and practices can shape attitudes toward healthcare, influencing decisions to undergo screening [18].

Mass media exposure is a crucial strategy for promoting early CC screening, detection, and treatment by raising awareness about health issues and encouraging positive health behaviors [19]. Mass media platforms, including television, radio, and newspapers or magazines, serve as primary sources of health information, particularly in rural areas where access to healthcare professionals may be limited. The influence of media on health behaviors, including cancer screening, is well-documented. Research indicates that exposure to health information via television, radio, and newspapers significantly affects individuals' knowledge, attitudes, and practices related to various health issues [20]. For example, media campaigns have proven effective in promoting screening behaviors for breast cancer through mammography [21] and colorectal cancer screening [22]. Media exposure has also been associated with increased use of preventive services, such as HPV vaccination for cervical cancer prevention and prostate cancer screening [23, 24].

In rural SSA, mass media—particularly radio and television—play a pivotal role in shaping health-seeking behaviors. These mediums address barriers such as high illiteracy rates and limited healthcare access by delivering health messages in local languages. For instance, radio programs often feature interactive segments where listeners can ask health-related questions, fostering trust and engagement. Television, on the other hand, leverages visuals to present complex health topics in simple, relatable ways, catering to audiences with diverse literacy levels. These attributes enable mass media to increase awareness about preventive care and motivate individuals to participate in health interventions, including CC screening. However, some studies suggest that media campaigns alone may not be sufficient to enhance screening rates, as barriers such as distrust in healthcare systems and financial constraints persist. Furthermore, in some contexts, misinformation disseminated through media channels has been associated with negative outcomes.

Among mass media platforms, television serves as a particularly influential source of health information, playing a crucial role in enhancing health knowledge, raising awareness, and driving behavior change, including CC screening [25]. Television simplifies complex health information, making it accessible to individuals with varying literacy levels [26]. According to the Health Belief Model (HBM), health behaviors, including cervical cancer screening, are influenced by perceived susceptibility, severity, benefits, and barriers. Although the HBM does not explicitly address media exposure or knowledge acquisition, these elements can serve as external 'cues to action' that trigger behavior change. Exposure to health-related messages through mass media can heighten perceived susceptibility and benefits, thereby increasing screening intentions [27]. For instance, Saaka and Hambali [28] demonstrated the role of media in triggering cervical cancer screening behaviors within the HBM framework.

Furthermore, television can shape social norms and beliefs, motivating viewers to adopt positive health behaviours, such as participating in CC screening, as suggested by social cognitive theory [29]. In the context of cancer, television provides opportunities for viewers to mentally and emotionally prepare for difficult decisions related to CC screening [26]. Additionally, in today's high-choice media environment, viewers selectively expose themselves to content that fulfills their needs and goals, leading to increased engagement and attentiveness [30]. This content attention predicts knowledge acquisition and subsequent changes in attitudes or behaviours, ultimately promoting CC screening uptake.

Radio has long been recognized as an influential medium for disseminating health information to the public, and it holds great potential for promoting CC screening. As an accessible and widespread source of information, radio can reach diverse audiences, including those in remote and underserved areas [31]. By featuring testimonials, expert interviews, and public service announcements, radio programs can help address

common misconceptions, alleviate fears, and encourage women to participate in CC screening [32]. Furthermore, radio can provide culturally sensitive and locally relevant information, which can be crucial for overcoming barriers and promoting the uptake of CC screening services among diverse populations [32].

Printing media, such as newspapers, play a vital role in disseminating health information and can significantly contribute to increasing cervical cancer screening uptake [33]. As a trusted source of news and information, newspapers can provide in-depth coverage of CC-related issues, including the latest research findings, screening guidelines, and available services [34]. Through articles, editorials, and opinion pieces, newspapers can raise public awareness about CC, emphasize the importance of early detection, and encourage women to take charge of their health by participating in regular screening [33]. Additionally, newspapers can highlight success stories and feature local initiatives that promote CC screening, fostering a sense of community engagement and support. By targeting different age groups, literacy levels, and cultural backgrounds, newspapers can tailor their content to appeal to a wide range of readers, ultimately increasing the reach and impact of CC screening campaigns [35].

While television, radio, and newspapers have been identified as promising platforms for promoting CC screening, there is a need for more empirical studies to examine the associations between these three types of mass media and CC screening rates. Despite extensive research on barriers to cervical cancer screening, few studies examine the role of mass media in rural SSA. This study addresses this gap through a multi-country analysis, informed by the Health Belief Model, which posits that health behaviors are influenced by perceived susceptibility, benefits, and self-efficacy

The Health Belief Model (HBM) serves as the guiding theoretical framework for this study, explaining how women's perceptions of susceptibility, severity, benefits, and barriers influence their decision to undergo cervical cancer screening. The model, first introduced by Hochbaum [36], suggests that individuals take preventive health actions when they perceive themselves to be at risk (perceived susceptibility), recognize the potential seriousness of a condition (perceived severity), believe in the effectiveness of the intervention (perceived benefits), and anticipate minimal obstacles to accessing care (perceived barriers).

In the context of this study, mass media exposure is conceptualized as a 'cue to action' within the HBM framework. Media messages about cervical cancer screening can heighten perceived susceptibility by increasing awareness of the disease and emphasizing individual risk factors. These messages can also reinforce perceived benefits by providing information on early detection and treatment options. Janz and Becker [37] further expanded on the HBM's application in preventive health, and empirical research by Saaka and Hambali [28] demonstrated the relevance of HBM in explaining cervical cancer screening uptake among Ghanaian women. Given the similar sociocultural context across many rural SSA communities, this study applies the HBM to assess how media-driven health communication influences screening behaviors.

The HBM is particularly relevant for understanding health-related behaviors, such as cervical cancer screening, by focusing on key psychological constructs that influence individual decision-making. These constructs include perceived susceptibility (belief about the likelihood of developing cervical cancer), perceived severity (belief about the seriousness of the disease), perceived benefits (belief in the effectiveness of screening to reduce the risk of cervical cancer), perceived barriers (challenges or obstacles to accessing screening services), cues to action (triggers that motivate behavior, such as media messages), and self-efficacy (confidence in the ability to undertake the recommended action). This theoretical lens helps to explain how mass media exposure can influence women's decisions to seek cervical cancer screening. For instance, media campaigns may heighten perceived susceptibility by educating women about their risk of cervical cancer or address perceived barriers by showcasing accessible screening options. By reinforcing the benefits of early detection and treatment, media messaging can positively shift attitudes and motivate behavior change.

2 | Methodology

2.1 | Data Source

The study used data from the Demographic and Health Surveys (DHS) of 11 countries in the SSA: Benin, Burkina Faso, Cameroon, Gabon, Ghana, Kenya, Madagascar, Mozambique, Namibia, Tanzania and Zimbabwe. These countries were selected because their DHS data had information on CC screening.

The DHS is a nationwide survey that is conducted in over 85 low- and middle-income countries worldwide and follows a consistent protocol and terminology across all countries [38]. It employs a structured questionnaire to gather information on various indicators of health including maternal and child health, fertility, family planning utilization, morbidity, and mortality [38]. The DHS uses a two-stage sampling technique to collect data, starting with the selection of enumeration areas based on each country's sampling frame, followed by the selection of households from each enumeration area. Detailed information on the sampling and data collection methods can be found in the work of Aliaga and Ren [39].

This study focused on rural women aged 15 to 49 years, a subset extracted from the DHS database. Women aged 15–49 years were included as this range aligns with the DHS's definition of reproductive age. While younger women may be less likely to screen, their inclusion allows for a broader understanding of demographic disparities.

The inclusion was also based on respondents indicating rural residency in their household demographic data. The total sample from the pooled sample was 190,658 women. After cleaning the data, and dropping all missing observations, we ended up with a sample size of 72,565 women in rural areas. Missingness was addressed through Complete Case Analysis (CCA). While acknowledging that CCA may lead to a loss of information due to missing data points, it was employed to preserve the original relationships between variables in the data set. This approach ensures robust and interpretable results

without introducing potential bias from imputation methods. Sensitivity analyses comparing results from CCA and multiple imputation methods showed no significant differences, validating the robustness of our findings. Similar approaches have been applied in prior studies [40].

The exclusion of missing observations could introduce selection bias if the missing data are not random. For example, women who did not respond to questions about cervical cancer screening or media exposure may belong to marginalized groups with distinct barriers to healthcare access. Their exclusion might, theoretically, result in overestimating the prevalence of screening or the strength of associations between explanatory variables and the outcome. However, in our study, sensitivity analyses were conducted by comparing results from the complete case analysis with those obtained using multiple imputation methods. These analyses demonstrated no significant differences in the direction, magnitude, or significance of the findings, confirming the robustness of the results despite the exclusion of missing observations. This ensures that our findings remain reliable and generalizable.

2.2 | Variables

Cervical cancer screening was used as the outcome of the study. In the survey, the respondents were asked "Have you ever been tested or examined for cervical cancer?". The responses were "no=0, yes=1, and don't know=8". Responses marked as "don't know" were excluded from the analysis as they did not provide meaningful information on cervical cancer screening.

The study used three key explanatory variables: frequency of watching television, frequency of listening to radio, and frequency of reading newspapers/magazines. We further account for the following variables: age, education, marital status, employment status, wealth, parity, religion, getting medical help for self: permission to go, getting medical help for self: distance to health facility, getting medical help for self: getting money for treatment, and getting medical help for self: not wanting to go alone. These covariates were selected based on their significant correlation with the outcome variable [41, 42] as well as their availability in the DHS data set. These covariates—age, education level, wealth quintile, marital status, parity, employment status, and access-related variables—are justified based on their established association with cervical cancer screening in previous research. For instance, studies have shown that older women and those with higher levels of education are more likely to undergo screening due to greater health awareness. Wealth is another critical determinant, with poorer women often facing financial and systemic barriers to accessing healthcare. Variables related to access, such as distance to healthcare facilities and needing permission to seek care, are particularly relevant in rural SSA, where gender norms and infrastructure challenges frequently limit healthcare utilization. Including these covariates ensures a comprehensive analysis and adjusts for potential confounding variables.

The names and definitions of all variables for the study are listed in Table 1.

2.3 | Data Analysis

The data were analysed with STATA version 18. Frequency, percentages, and cross-tabulation were used to describe the sample (Table 2). Given the binary nature of the outcome variable, using a probit or logistic regressions would be appropriate to execute the study's objective [43, 44]. However, from the descriptive statistics, we found that the outcome variable is not symmetrically distributed and skewed to one side (see Figure 1). In these instances, a complementary log-log regression model is deemed appropriate [43–45]. Thus, we applied complementary log-log regression models to evaluate the correlation between mass media and CC testing/screening. At first, a bivariate regression analysis was conducted to estimate the unadjusted odds ratios (UOR). Afterward, a multivariable regression was performed to estimate the adjusted odds ratios (AOR). An AOR below 1 indicates lower odds of cervical cancer screening associated with the variable, while an AOR above 1 signifies higher odds. Furthermore, given that we have three different explanatory variables, we estimated separate models for each of the explanatory variable in the multivariable regression. Results from both the bivariate and multivariable regression estimates are presented in Table 4. Appropriate weighting and clustering adjustments were applied during the analysis to account for the complex survey design. The statistical robustness and model fitness of the study were assessed using multiple approaches to ensure the validity and reliability of the findings.

2.4 | Ethical Considerations

We used a secondary data set that is freely available to the public from the DHS Programme, therefore no ethical approval was requested. The data set is anonymised and more details regarding its ethical standards are available at http://goo.gl/ny8T6X.

3 | Results

3.1 | Prevalence of CC Screening/Testing

The overall prevalence of CC screening/testing across the eleven countries was 8.47% (Figure 1). Namibia had the highest prevalence of CC screening/testing (33.47%), whereas Benin reported the lowest prevalence (0.28%) of CC screening/testing (Table 2).

3.2 | Sample Characteristics

Table 3 presents the results of the descriptive summary of the sample. A higher proportion of the women did not watch television (63.77%), listen to the radio (45%) nor read the newspaper/magazine (87.54%). Furthermore, a higher proportion of the women are aged between 15 and 19 (21.30%). Additionally, most of the respondents are married (49.93%), have primary education (32.93%), unemployed (56.05%), are in the poorest wealth category (30.26%), have had four or more births (35.96) and are African traditionalist (49.08%). Moreover, most of the women reported that getting permission (85.41%), distance to a healthcare facility

TABLE 1 | Names and definitions of variables used in the study.

Variable name	Description
Outcome Variable	
Respondent has ever been tested or examined for cervical cancer.	Respondent has ever been tested or examined for cervical cancer 0 = No, 1 = Yes
Explanatory Variable	
How often respondent watches television (Not at all, Less than once a week, At least once a week)	How frequently respondent watches television: 1 = Not at all, 2 = Less than once a week, 3 = At least once a week
How often respondent listens to the radio (Not at all, Less than once a week, At least once a week)	How frequently respondent listens to radio: 1 = Not at all, 2 = Less than once a week, 3 = At least once a week
How often respondent reads newspapers or magazines (Not at all, Less than once a week, At least once a week).	How frequently respondent reads newspapers or magazines: 1 = Not at all, 2 = Less than once a week, 3 = At least once a week
Covariates	
Respondent's age (15–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49).	Respondent's age: 1 = 15–19, 2 = 20–24, 3 = 25–29, 4 = 30–34, 5 = 35–39, 6 = 40—44, 7 = 45—49
Respondent's current marital status (Never in union, Married, Living with partner, Widowed, Divorced, Separated)	Respondent's current marital status: 1 = Never in union, 2 = Married, 3 = Living with partner, 4 = Widowed, 5 = divorced, 6 = Separated
Respondent's level of education (No education, Primary, Secondary, Higher)	Respondent's level of education: None = 1, Primary = 2, Secondary = 3, Higher = 4
Respondent's household wealth quintile (Poorest, Poorer, Middle, Richer, Richest)	Respondent's household wealth quintile: Lowest = 1, Second = 2, Middle = 3, Fourth = 4, Highest = 5
Total number of live births given by the respondent (No births, 1 birth, 2 births, 3 births, 4 or more births)	Total number of births by the respondents: 0 = No births, 1 = one birth, 2 = two births, 3 = three births, 4 = four or more births
Respondent is currently working (Yes, No)	Respondent is currently working: 0 = No, 1 = Yes
Respondent's religion (Christianity, Islam, African Traditional, No Religion, Other)	Respondent's religion: 1 = Christianity, 2 = Islamic, 3 = African Traditional, 3 = No religion, 5 = others
Getting permission to go to the doctor (Big problem, Not a big problem)	Getting medical help for self: getting permission to go 1 = Big problem, 2 = Not a big problem
Getting money needed for advice or treatment (Big problem, Not a big problem)	Getting medical help for self: getting money for treatment 1 = Big problem, 2 = Not a big problem
Distance to health facility is a problem (Big problem, Not a big problem).	Getting medical help for self: distance to health facility 1 = Big problem, 2 = Not a big problem
Not wanting to go alone is a problem when seeking medical help (Big problem, Not a big problem).	Getting medical help for self: not wanting to go alone 1 = Big problem, 2 = Not a big problem

(58.13%), and not wanting to go alone (79.93%) are not big problems for them when seeking medical help. However, 57.22%, getting money for medical treatment is a big problem.

The data further revealed that a higher proportion of those who have tested for CC do not watch television (49.36%) nor read newspapers/magazines (75.96%). However, most of them reported that they listen to radio at least once a week (52.11%). Furthermore, the majority of those who have tested for CC are between 35 and 39 years of age (19.63%), whereas the majority of those who have not tested are between 15 and 19 years (22.89%). Similarly, most of those who have tested for CC have a secondary level of education (35.45%), whereas most of those who have not tested have primary education (33.01%). Likewise, a higher proportion of the women who have been tested for CC are from the middle wealth category (27.76%), whereas most of those who have not tested are from the poorest wealth category (31.40%). Figure 1 illustrates the skewed distribution of cervical cancer screening rates, highlighting the overall low uptake and significant disparities between subpopulations. The skewness underscores the need for targeted interventions to improve screening equity in rural areas.

3.3 | Association between Mass Media and CC Testing

Table 4 presents the findings from the bivariate and multivariable regression analyses of the association between mass media and CC testing in rural sub-Sahara Africa. Separate

TABLE 2 | Prevalence of CC screening.

Country	Year of survey	Sample size	% screened/tested for CC	CI lower bound (%)	CI upper bound (%)
Benin	2017-2018	4,271	0.28	0.12	0.28
Burkina Faso	2021	11,406	12.68	12.07	12.68
Cameroon	2018	6,171	1.44	1.14	1.44
Gabon	2019-2021	1,745	10.03	8.62	10.03
Ghana	2022	7,632	2.96	2.58	2.96
Kenya	2022	10,327	12.43	11.79	12.43
Madagascar	2021	6,979	0.57	0.39	0.57
Mozambique	2022-2023	7,369	4.90	4.41	4.90
Namibia	2013	2,411	33.47	31.59	33.47
Tanzania	2015-2016	10,327	12.43	11.79	12.43
Zimbabwe	2015	3,927	10.82	10.82	10.82

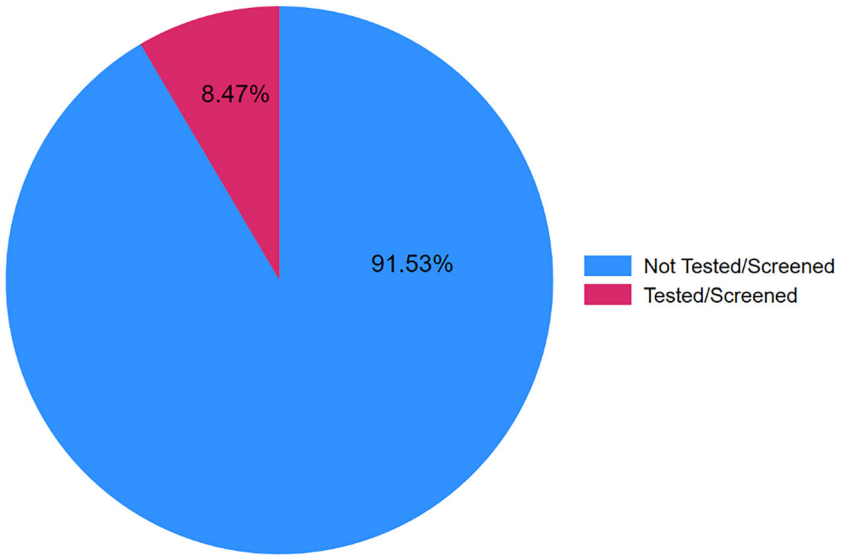

FIGURE 1 | Cervical cancer testing among women.

regressions were conducted for each media type to assess its distinct association with screening, allowing for focused intervention strategies. Multivariable models combining all predictors were also run for comprehensive analysis.

The results in the first model (Model 1) are the unadjusted odds ratios for bivariate analysis. Models 2, 3, and 4 are the multivariable regression results (AOR results). Model 2 presents findings derived when the frequency of watching television is used as the explanatory variable, whereas Model 3 and Model 4 present findings obtained when the frequency of listening to radio and frequency of reading newspapers or magazines are the explanatory variables, respectively.

The result from the adjusted model shows that women who watch television less than once a week (AOR = 1.22, 95% CI = 1.07, 1.38) and those who watch television at least once a week (AOR = 1.39, 95% CI = 1.26, 1.53) are more likely to test for CC, compared to those who do not watch television at all. Similarly, women who listen to radio less than once a week (AOR = 1.40, 95% CI = 1.23, 1.60) and those who listen to radio at least once a week (AOR = 1.59, 95% CI = 1.45, 1.74) are more likely to test for CC, than those who do not listen to radio at all. Likewise, women who read newspapers/magazines less than once a week (AOR = 1.59, 95% CI = 1.41, 1.78) and those who read newspapers/magazines at least once a week (AOR = 1.58, 95% CI = 1.36, 1.83) are more likely to test for CC, compared to those who do not read newspapers/magazines at all.

The results further revealed that age, education, wealth, parity, getting permission to seek medical help, and not wanting to seek medical help alone are significant predictors of CC testing across all three models. We found that the probability of CC testing increased with age, with those aged between 40 and 44 years being most likely to get tested (Model 2: AOR = 6.49, 95% CI = 4.99, 8.45, Model 3: AOR = 6.19, 95% CI = 4.75, 8.06, Model 4: AOR = 6.29, 95% CI = 4.84, 8.18) compared to those aged between 15 and 19 years. The likelihood of testing for CC

TABLE 3 | Descriptive statistics of the sample.

Variables	Pooled sample Frequency (%)	Tested Frequency (%)	Not tested Frequency (%)	χ^2
Frequency of watching television				
Not at all	46274 (63.77)	3035 (49.36)	43239 (65.10)	< 0.001
Less than once a week	8706 (12.00)	818 (13.30)	7888 (11.88)	
At least once a week	17585 (24.23)	2296 (37.34)	15289 (23.02)	
Frequency of listening to radio				
Not at all	32655 (45.00)	1745 (28.38)	30910 (46.54)	< 0.001
Less than once a week	13259 (18.27)	1200 (19.52)	12059 (18.16)	
At least once a week	26651 (36.73)	3204 (52.11)	23447 (35.30)	
Frequency of reading newspaper or magazine				
Not at all	63521 (87.54)	4671 (75.96)	58850 (88.61)	< 0.001
Less than once a week	6077 (8.37)	942 (15.32)	5135 (7.73)	
At least once a week	2967 (4.09)	536 (8.72)	2431 (3.66)	
Age				
15-19	15459 (21.30)	255 (4.15)	15204 (22.89)	< 0.001
20-24	12694 (17.49)	693 (11.27)	12001 (18.07)	
25-29	11235 (15.48)	955 (15.53)	10280 (15.48)	
30-34	10186 (14.04)	1151 (18.72)	9035 (13.60)	
35-39	9351 (12.89)	1207 (19.63)	8144 (12.26)	
40-44	7500 (10.34)	1036 (16.85)	6464 (9.73)	
45-49	6140 (8.46)	852 (13.86)	5288 (7.96)	
Marital status				
Never in union	18318 (25.24)	836 (13.6)	17482 (26.32)	< 0.001
Married	36229 (49.93)	3531 (57.42)	32698 (49.23)	
Living with partner	11474 (15.81)	1044 (16.98)	10430 (15.70)	
Widowed	1999 (2.75)	262 (4.26)	1737 (2.62)	
Divorced	1115 (1.54)	85 (1.38)	1030 (1.55)	
Separated	3430 (4.73)	391 (6.36)	3039 (4.58)	
Education level				
No education	22175 (30.56)	1336 (21.73)	20839 (31.38)	< 0.001
Primary	23894 (32.93)	1970 (32.04)	21924 (33.01)	
Secondary	23798 (32.80)	2180 (35.45)	21618 (32.55)	
Higher	2698 (3.72)	663 (10.78)	2035 (3.06)	
Wealth				
Poorest	21957 (30.26)	1102 (17.92)	20855 (31.40)	< 0.001
Poorer	19261 (26.54)	1417 (23.04)	17844 (26.87)	
Middle	17320 (23.87)	1707 (27.76)	15613 (23.51)	
Richer	10745 (14.81)	1405 (22.85)	9340 (14.06)	
Richest	3282 (4.52)	518 (8.42)	2764 (4.16)	
Parity				
No births	16830 (23.19)	410 (6.67)	16420 (24.72)	< 0.001
One birth	10343 (14.25)	846 (13.76)	9497 (14.3)	
Two births	9906 (13.65)	1082 (17.6)	8824 (13.29)	

(Continues)

TABLE 3 | (Continued)

Variables	Pooled sample Frequency (%)	Tested Frequency (%)	Not tested Frequency (%)	χ^2
Three births	9393 (12.94)	1167 (18.98)	8226 (12.39)	
Four or more births	26093 (35.96)	2644 (43.00)	23449 (35.31)	
Currently working				
No	31890 (43.95)	2128 (34.61)	29762 (44.81)	< 0.001
Yes	40675 (56.05)	4021 (65.39)	36654 (55.19)	
Religion				
Christianity	24306 (33.50)	1107 (18.00)	23199 (34.93)	< 0.001
Islamic	11174 (15.40)	1453 (23.63)	9721 (14.64)	
African tradition	35616 (49.08)	3499 (56.90)	32117 (48.36)	
No religion	515 (0.71)	22 (0.36)	493 (0.74)	
Others	954 (1.31)	68 (1.11)	886 (1.33)	
Getting permission to go				
Big problem	10588 (14.59)	629 (10.23)	9959 (14.99)	< 0.001
Not a big problem	61977 (85.41)	5520 (89.77)	56457 (85.01)	
Getting money for treatment				
Big problem	41524 (57.22)	3151 (51.24)	38373 (57.78)	< 0.001
Not a big problem	31041 (42.78)	2998 (48.76)	28043 (42.22)	
Distance to health facility				
Big problem	30384 (41.87)	2264 (36.82)	28120 (42.34)	< 0.001
Not a big problem	42181 (58.13)	3885 (63.18)	38296 (57.66)	
Not wanting to go alone				
Big problem	14563 (20.07)	866 (14.08)	13697 (20.62)	< 0.001
Not a big problem	58002 (79.93)	5283 (85.92)	52719 (79.38)	

increases with the level of education, and this was phenomenal among those higher level of education (Model 2: AOR = 2.73, 95% CI = 2.27, 3.28, Model 3: AOR = 2.71, 95% CI = 2.26, 3.26, Model 4: AOR = 2.53, 95% CI = 2.09, 3.07), compared to those with no education.

Relative to the poorest women, the odds of testing for CC were higher for women in all wealth categories, particularly for those in the richest category (Model 2: AOR = 1.52, 95% CI = 1.23, 1.87, Model 3: AOR = 1.71, 95% CI = 1.40, 2.10, Model 4: AOR = 1.70, 95% CI = 1.38, 2.09). Also, the odds of CC testing increase with parity with those with three births being more likely to get tested (Model 2 & Model 3: AOR = 2.60, 95% CI = 2.04, 3.32, Model 4: AOR = 2.54, 95% CI = 1.99, 3.23) compared to those with no births. Women who reported that getting permission to seek medical help is not a big problem are more likely to test for CC (Model 2: AOR = 1.21, 95% CI = 1.02, 1.42, Model 3: AOR = 1.15, 95% CI = 0.98, 1.36, Model 4: AOR = 1.20, 95% CI = 1.02, 1.42). Similarly, those who reported that not wanting to seek medical help alone is not a big problem are more likely to test for CC (Model 2: AOR = 1.13, 95% CI = 0.99,1.29, Model 3: AOR = 1.14, 95% CI = 1.00,1.29, Model 4: AOR = 1.16, 95% CI = 1.01,1.32).

The observed log pseudolikelihood values (see Table 4) are consistent with the characteristics of the data set and the applied statistical techniques. The models demonstrate strong explanatory power, as evidenced by significant chi-square statistics, minimal differences in log pseudolikelihoods between nested models, and validation through sensitivity analyses. The data set is representative of rural women, and the complete case analysis approach has been rigorously evaluated to confirm the robustness of the results. These considerations collectively affirm the statistical soundness and fitness of the models used in this study.

4 | Discussion

Our study identifies key factors influencing cervical cancer (CC) screening among women in rural SSA, highlighting the role of socioeconomic, cultural, and demographic characteristics. Education, wealth, and employment status emerge as strong determinants of screening uptake, alongside marital status and religious affiliation, which shape attitudes toward preventive healthcare [17, 18, 46].

Religious beliefs influence health-seeking behavior, including participation in CC screening. The predominance of African traditionalist affiliation in our sample suggests that cultural factors must be considered when designing interventions. A

TABLE 4 | Association between mass media and CC testing in rural sub-Sahara Africa.

Variables	Model 1 UOR (95%CI)	Model 2 AOR (95%CI)	Model 3 AOR (95%CI)	Model 4 AOR (95%CI)
Frequency of watching television				
Not at all (Ref)				
Less than once a week	1.43 (1.26,1.62)***	1.22 (1.07,1.38)***		
At least once a week	2.03 (1.85,2.24)***	1.39 (1.26,1.53)***		
Frequency of listening to radio				
Not at all (Ref)				
Less than once a week	1.75 (1.54,1.98)***		1.40 (1.23,1.60)***	
At least once a week	2.35 (2.15,2.56)***		1.59 (1.45,1.74)***	
Frequency of reading newspaper/magazine				
Not at all (Ref)				
Less than once a week	2.15 (1.93,2.40)***			1.59 (1.41,1.78)***
At least once a week	2.38 (2.08,2.72)***			1.58 (1.36,1.83)***
Age				
15-19 (Ref)				
20-24	3.34 (2.76,4.03)***	2.21 (1.76,2.77)***	2.18 (1.74,2.73)***	2.20 (1.76,2.76)***
25-29	5.50 (4.59,6.60)***	3.41 (2.67,4.35)***	3.35 (2.62,4.27)***	3.39 (2.66,4.33)***
30-34	7.38 (6.14,8.86)***	4.86 (3.75,6.30)***	4.74 (3.66,6.14)***	4.78 (3.69,6.18)***
35-39	8.49 (7.04,10.24)***	5.80 (4.46,7.55)***	5.60 (4.30,7.30)***	5.67 (4.36,7.37)***
40-44	9.29 (7.71,11.19)***	6.49 (4.99,8.45)***	6.19 (4.75,8.06)***	6.29 (4.84,8.18)***
45-49	8.81 (7.24,10.72)***	6.19 (4.71,8.14)***	5.88 (4.47,7.74)***	5.93 (4.52,7.80)***
Marital status				
Married (Ref)				
Never in union	0.44 (0.39,0.50)***	1.25 (1.07,1.45)***	1.25 (1.08,1.46)***	1.18 (1.02,1.37)**
Living with partner	0.87 (0.76,0.98)**	1.04 (0.93,1.18)	1.07 (0.95,1.21)	1.05 (0.93,1.18)
Widowed	1.33 (1.11,1.59)***	1.12 (0.93,1.34)	1.15 (0.96,1.38)	1.11 (0.93,1.33)
Divorced	0.76 (0.56,1.03)*	0.79 (0.58,1.07)	0.82 (0.61,1.10)	0.78 (0.58,1.05)
Separated	1.14 (0.97,1.33)	1.04 (0.89,1.21)	1.07 (0.92,1.25)	1.05 (0.90,1.22)
Education level				
No education (Ref)				
Primary	1.34 (1.17,1.53)***	1.30 (1.15,1.48)***	1.27 (1.12,1.45)***	1.30 (1.14,1.48)***
Secondary	1.44 (1.27,1.64)***	1.73 (1.51,1.97)***	1.69 (1.48,1.92)***	1.64 (1.43,1.88)***
Higher	4.13 (3.48,4.90)***	2.73 (2.27,3.28)***	2.71 (2.26,3.26)***	2.53 (2.09,3.07)***
Wealth				
Poorest (Ref)				
Poorer	1.41 (1.24,1.59)***	1.21 (1.07,1.37)***	1.19 (1.05,1.34)***	1.24 (1.10,1.40)***
Middle	1.80 (1.58,2.04)***	1.30 (1.14,1.48)***	1.31 (1.15,1.49)***	1.39 (1.22,1.59)***
Richer	2.37 (2.07,2.73)***	1.43 (1.23,1.66)***	1.50 (1.30,1.74)***	1.59 (1.38,1.85)***
Richest	2.95 (2.44,3.56)***	1.52 (1.23,1.87)***	1.71 (1.40,2.10)***	1.70 (1.38,2.09)***
Parity				
No births (Ref)				
One birth	3.66 (3.12,4.30)***	2.43 (1.96,3.01)***	2.42 (1.95,3.00)***	2.37 (1.92,2.93)***
Two births	4.90 (4.20,5.71)***	2.52 (2.00,3.18)***	2.51 (1.99,3.17)***	2.41 (1.92,3.04)***

(Continues)

TABLE 4 | (Continued)

Variables	Model 1 UOR (95%CI)	Model 2 AOR (95%CI)	Model 3 AOR (95%CI)	Model 4 AOR (95%CI)
Three births	5.59 (4.78,6.53)***	2.60 (2.04,3.32)***	2.60 (2.04,3.32)***	2.54 (1.99,3.23)***
Four or more births	4.69 (4.06,5.42)***	2.26 (1.76,2.89)***	2.26 (1.76,2.89)***	2.20 (1.72,2.81)***
Currently working				
No (Ref)				
Yes	1.48 (1.35,1.62)***	0.99 (0.91,1.09)	0.98 (0.89,1.08)	1.01 (0.92,1.11)
Religion				
Christianity (Ref)				
Islamic	3.11 (2.75,3.52)***	2.75 (2.43,3.10)***	2.65 (2.35,3.00)***	2.68 (2.38,3.03)***
African tradition	2.20 (1.97,2.46)***	2.09 (1.88,2.33)***	2.02 (1.81,2.25)***	2.09 (1.88,2.33)***
No religion	1.00 (0.53,1.89)	1.15 (0.61,2.16)	1.11 (0.59,2.09)	1.17 (0.62,2.20)
Others	1.38 (0.94,2.01)*	1.38 (0.96,1.98)*	1.34 (0.93,1.92)	1.42 (0.99,2.04)*
Getting permission				
Big problem (Ref)				
Not a big problem	1.56 (1.35,1.81)***	1.21 (1.02,1.42)**	1.15 (0.98,1.36)*	1.20 (1.02,1.42)**
Getting money for treatment				
Big problem (Ref)				
Not a big problem	1.24 (1.14,1.35)***	0.99 (0.91,1.09)	1.00 (0.91,1.09)	0.98 (0.89,1.07)
Distance to health facility				
Big problem (Ref)				
Not a big problem	1.24 (1.13,1.36)***	0.94 (0.85,1.04)	0.95 (0.86,1.05)	0.96 (0.87,1.06)
Not wanting to go alone				
Big problem (Ref)				
Not a big problem	1.56 (1.38,1.76)***	1.13 (0.99,1.29)*	1.14 (1.00,1.29)*	1.16 (1.01,1.32)**
Log pseudolikelihood		−1.872e + 10	−1.866e + 10	−1.868e + 10
Wald chi2(33)		1830.44	1861.77	1939.48
Prob > chi2		0.00	0.00	0.00
Observations	72,565	72,565	72,565	72,565

Note: An AOR below 1 indicates lower odds of cervical cancer screening associated with the variable, while an AOR above 1 signifies higher odds. 95% confidence interval (CI) in parentheses. Ref = Reference group. Sampling weights and clustering were accounted for in all estimations.
Abbreviations: AOR, Adjusted Odds Ratio; UOR, Unadjusted Odds Ratio.
***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

deeper understanding of the intersection between religion, culture, and healthcare utilization is essential for developing culturally tailored strategies that promote CC screening and address disparities in uptake.

Age also plays a crucial role. Unlike studies in Nepal and the Lao People's Democratic Republic, where most participants were over 30 years old, our study includes a large proportion of younger women aged 15–19 [47, 48]. However, as seen in research from Malawi, Ethiopia, and India, screening rates increase with age [49–52]. While older women are more likely to participate, younger women should not be overlooked. This highlights the need for targeted interventions that encourage early screening initiation while maintaining efforts for older women at higher risk.

Education significantly increases the likelihood of CC screening. Women with higher levels of education exhibit greater screening uptake, consistent with findings that link educational attainment to improved health literacy and preventive care participation [53–55]. Enhancing health literacy through culturally appropriate educational campaigns can further encourage screening.

Similarly, wealth is a major determinant. Women from wealthier households are significantly more likely to undergo screening compared to those from the poorest backgrounds, aligning with global trends in both low- and middle-income countries and the United States [54, 56, 57]. Economic barriers, limited healthcare access, and sociocultural norms often discourage preventive care among poorer women. Addressing these socioeconomic disparities through subsidized screening programs and community outreach is essential for reducing CC burden and promoting health equity.

Our findings also reveal that higher parity is associated with increased screening uptake, corroborating previous research [58, 59]. Frequent healthcare interactions during pregnancy and childbirth may facilitate screening recommendations from providers, enhancing awareness of reproductive health needs. However, high parity is also a risk factor for CC, reinforcing the need for comprehensive screening strategies across all parity groups.

Media exposure plays a critical role in shaping health behaviors. Television, in particular, has proven to be a powerful platform for disseminating health information, reinforcing awareness about CC screening [60–62]. Our findings suggest that even infrequent television exposure correlates with increased screening uptake. However, causality cannot be established, as factors such as socioeconomic status, education, and healthcare access also influence screening rates. Ensuring the accuracy of televised health information is crucial to maximizing its potential while mitigating misinformation.

Insights from India, Nepal, and Bangladesh reveal similar screening challenges and innovative strategies. In India, stigma, low literacy, and socio-cultural barriers hinder screening despite national initiatives like the National Cancer Control Programme [63, 64]. While mass media has been used to promote screening, persistent structural barriers limit its impact [65].

In contrast, Nepal has successfully improved screening uptake through community-based interventions. Local radio programs, mobile text messaging campaigns, and community health volunteers have enhanced awareness and trust in screening services [66–68]. Bangladesh has also demonstrated the effectiveness of integrating mass media with grassroots health worker programs [69]. Campaigns using local languages, visual storytelling, and endorsements from trusted community leaders have helped reduce stigma and improve participation in CC screening [70, 71].

These examples underscore the importance of combining mass media with community-level engagement to address both informational and logistical barriers. Tailoring these successful models to the local cultural and socioeconomic context in rural SSA could significantly enhance screening uptake and improve women's health outcomes [72].

Women's autonomy in healthcare decision-making is a crucial determinant of CC screening participation. A lack of male partner support and childcare responsibilities has been identified as a major barrier to uptake [73]. The availability of transportation and financial independence also influences access [74]. Addressing gender norms and socio-cultural restrictions that limit women's healthcare autonomy is essential for equitable access to CC screening.

Our findings align with the Health Belief Model (HBM), highlighting mass media exposure as a key driver of behavioral change in cervical cancer screening among rural women in SSA. Women who regularly consume media, whether through television, radio, or newspapers/magazines, exhibit higher screening uptake compared to those with no exposure.

This relationship is best understood through HBM constructs. Media exposure increases perceived susceptibility, raising awareness about personal risk and the consequences of delayed detection. It reinforces perceived benefits by promoting early diagnosis and treatment efficacy. Additionally, mass media campaigns help address perceived barriers by providing information on accessible screening services and dispelling common misconceptions.

By situating mass media exposure within the HBM framework, this study underscores the pivotal role of health communication in influencing preventive behaviors. Prior research has demonstrated that media-driven health messaging is particularly effective in settings where healthcare access is constrained. Our findings emphasize the need for more strategic media campaigns that not only raise awareness but also tackle psychological and structural obstacles to screening uptake. Future interventions should optimize mass media platforms to deliver accurate, culturally relevant health messaging that encourages preventive healthcare engagement in rural SSA.

The substantial variation in CC screening rates across the studied countries reflects differences in healthcare infrastructure, economic conditions, and cultural factors. Namibia's high screening rate (33.47%) highlights the benefits of strong public health initiatives, including mobile clinics and NGO partnerships that have expanded access to preventive care [75]. Additionally, integrating cervical cancer screening into reproductive health programs has increased participation [76].

In contrast, Kenya and Tanzania's moderate screening rates (12%) are linked to government-led initiatives such as HPV vaccination programs and pilot screening projects [77, 78]. However, Benin's alarmingly low rate (0.28%) reflects severe healthcare access limitations, lack of awareness, and socio-cultural barriers [79]. In Benin, cultural stigma surrounding gynecological exams and the absence of targeted awareness campaigns further exacerbate the low uptake [80].

Gabon, with a screening rate of 10.03%, illustrates the impact of urban-rural disparities. Urban areas benefit from better-equipped facilities and outreach programs, whereas rural regions face limited accessibility and lower awareness [81].

These country-specific insights highlight structural, cultural, and economic factors shaping CC screening behaviors. Bridging these gaps requires tailored interventions, including greater government investment in healthcare, engagement with community leaders to shift cultural norms, and leveraging grassroots initiatives to overcome geographic and financial barriers. A multifaceted approach can significantly increase screening uptake and improve cervical cancer prevention efforts across SSA.

4.1 | Strengths and Limitations

This study provides novel insights into the impact of mass media on cervical cancer screening in rural sub-Saharan Africa (SSA), emphasizing the importance of culturally sensitive health messaging. One of its primary strengths is its use of a large, multi-country data set derived from the Demographic and Health Surveys (DHS). This comprehensive data set ensures

robust and generalizable findings by including a wide spectrum of socio-demographic, cultural, and geographic contexts within rural SSA. Additionally, the study incorporates an established theoretical framework—the Health Belief Model (HBM)—to guide the interpretation of results, adding depth to the understanding of how mass media influences health behaviors.

The multi-country approach is particularly advantageous as it allows for cross-national comparisons, providing valuable insights into the disparities in screening rates and their potential drivers. This comparative perspective enhances the policy relevance of the findings, enabling governments and stakeholders to tailor interventions based on both shared and country-specific challenges. Furthermore, the use of advanced statistical methods, including multivariable regression models adjusted for a range of confounders, strengthens the validity of the conclusions.

Despite its strengths, the study has some limitations that warrant consideration. First, the cross-sectional design precludes establishing causal relationships between mass media exposure and cervical cancer screening. While the associations observed are compelling, longitudinal studies are needed to confirm causality. Second, reliance on self-reported data introduces the possibility of recall and reporting biases, particularly regarding sensitive topics like cervical cancer screening. Women may underreport or overreport their screening status due to stigma or social desirability.

Third, while the complete case analysis ensured the robustness of findings, missing data may still have introduced some degree of selection bias, even if sensitivity analyses showed no significant differences. Additionally, the DHS data do not capture granular details about the quality, frequency, or content of media exposure, which limits the ability to assess the nuances of how media messaging influences health behaviors.

Lastly, the study focuses exclusively on rural populations, which are often underrepresented in health research, but this focus may limit the applicability of findings to urban contexts, where access to resources and media consumption patterns differ significantly. Future research could expand on these findings by exploring how the interaction of mass media and community-level interventions influences cervical cancer screening in diverse settings.

By addressing these limitations and building on its strengths, this study lays a strong foundation for further research and the development of targeted, culturally relevant interventions to promote cervical cancer screening in underserved regions of SSA.

This study provides novel insights into the impact of mass media on cervical cancer screening in rural SSA, highlighting the importance of culturally sensitive health messaging. Unlike prior studies, it employs a multi-country data set, offering robust and generalizable findings.

5 | Conclusion

The study has highlighted the importance of mass media (television, radio and newspaper/magazine) in enhancing the uptake of CC screening among rural women in SSA. Consequently, governments of the included countries ought to maximize these mass media platforms to advocate the importance of CC screening among the rural populations, especially considering the dominance of these traditional media in rural SSA. Addressing socioeconomic disparities, promoting awareness through multiple channels, and developing comprehensive strategies considering parity and age are crucial steps to improving CC screening uptake. By tackling these issues, healthcare systems can reduce the burden of CC and promote health equity among women from diverse socioeconomic backgrounds.

Author Contributions

Alex Bawuah: formal analysis, writing – review and editing, writing – original draft. **Vicky Q Wang:** formal analysis, writing – original draft, writing – review and editing. **Khadijat Adeleye:** formal analysis, writing – review and editing, writing – original draft. **Edward Kwabena Ameyaw:** formal analysis, writing – review and editing, writing – original draft. **Sanni Yaya:** conceptualization, methodology, validation, writing – original draft, writing – review and editing, formal analysis, project administration, supervision.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are openly available in DHS at https://dhsprogram.com/data/available-datasets.cfm. The data set used for this study is available in a public, open access repository. The data set can be accessed via https://dhsprogram.com/data/available-datasets.cfm.

Transparency Statement

The lead author Sanni Yaya affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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