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ORIGINAL RESEARCH

Comparative Study of Modifiable Risk Factors for Cervical Cancer Among Female In-School Adolescents in Osun State

Adeniran Elizabeth F¹, Olagunoye Ajibola O¹, Adejimi Adebola A²,
Salami Sarafudeen K¹, Bamidele Olayinka O¹, Asekun-Olarinmoye
Esther O^{1,3}

¹Department of Community Medicine, UNIOSUN Teaching Hospital, Osogbo, Osun State

²Department of Community Health and Primary Care, College of Medicine, University of Lagos, Lagos

³Department of Community Medicine, College of Health Sciences, Osun State University, Osogbo, Osun State

*Correspondence: Dr. Adeniran Elizabeth F. P. M. B 5000, Osogbo, Osun State. E-mail: adeno2613@yahoo.com;
ORCID - <https://orcid.org/0009-0006-8978-8886>.

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Abstract

Background: Adolescents make up about one-fourth of Nigeria's population, and most are engaged in risky sexual activities that have serious health consequences later in life. Understanding the risk factors for the development of cervical cancer is essential for promoting health-related behaviours. Therefore, it is a public health priority as cervical cancer presents a significant public health challenge in Nigeria.

Objectives: To assess and compare awareness and knowledge of modifiable risk factors (MRF) of cervical cancer among in-school female adolescents in secondary schools in both rural and urban areas of Osun State.

Method: A comparative, cross-sectional study was conducted among 400 adolescents in rural and urban areas (200 per group) of Osun State, Nigeria, who were recruited using the multistage sampling technique. Quantitative data were collected using a semi-structured questionnaire.

Results: Most respondents from both rural and urban areas had not heard of human papillomavirus (77%), cervical cancer (67%), and MRF for cervical cancer (64.5%). However, awareness of these topics was slightly higher among urban dwellers compared to rural dwellers. Additionally, most respondents from both metropolitan areas (114, 57.0%) and rural areas (132, 66.0%) had poor knowledge, with a statistically significant difference ($p = 0.04$).

Conclusion: This study revealed that residence in rural and urban locations significantly influenced awareness and knowledge about the human papillomavirus, cervical cancer, and related MRF. Culturally appropriate communication programs and targeted educational interventions for cervical cancer are therefore recommended.

Keywords: Adolescence, Cervical cancer, Secondary school, Human Papillomavirus, Risky behaviour.

Introduction

An adolescent, as defined by the World Health Organisation, refers to an individual between the ages of 10 and 19 years. There are approximately 1.2 billion adolescents worldwide, with about 90% living in developing countries; these adolescents make up 18% of the global population^[1] By 2050, sub-Saharan Africa is expected to have more adolescents than any other region in the world. It is a transition period marked by rapid physical, psychological, and social changes, which increase exposure to various new health risks.^[2] Awareness and knowledge of modifiable lifestyle factors among adolescents can influence lifelong patterns of healthy behaviour. Environmental factors and behaviours adopted during adolescence and young adulthood—such as risky sexual behaviour, alcohol and drug abuse, poor diet, and lack of physical activity—are believed to impact cancer risk later in life.^[30]

Cervical cancer remains a significant burden on women's reproductive health worldwide. However, the disease is preventable and, in many cases, curable if detected early.^[4] Although cervical cancer is preventable, its incidence is expected to double by 2025, while it continues to cause the deaths of approximately 270,000 women globally each year.^[5] The burden of cervical cancer in Nigeria is significant, as over 40 million women aged 15 and above are at risk. Recent estimates indicate that each year, 14,550 women are diagnosed with cervical cancer, and 9,659 die from the same disease. It is projected that in 2025, Nigeria will record 22,914 new cases and 15,251 deaths.^[6]

The Human Papillomavirus (HPV) infection, which is sexually transmitted, is a necessary but not sufficient cause of cervical cancer.^[7] The perceived risk among adolescents of acquiring

genital HPV infection ranges from 12.7% to 42%, and the risk of developing cervical cancer from HPV infection also ranges from 19.9% to 68%.^[6] HPV infection is considered the most significant modifiable risk factor for developing cervical cancer.^[8] It accounts for 63% of genital cancers. Every year, approximately 14,550 women are diagnosed with cervical cancer, and about 9,659 die from the disease. By 2025, there will be an estimated 22,914 new cases of cervical cancer and 15,251 deaths from it in Nigeria.^[6]

Awareness of modifiable risk factors for cervical cancer is a prerequisite for promoting health-related behaviours and is, therefore, a public health priority.^[8] The risk factors for cervical cancer, including HPV infection, are early sexual intercourse, multiple sexual partners, smoking, a weakened immune system, use of birth control pills, lifestyle, and lack of exercise, and appear to be involved in the development of more than 90% of cases.^[9] Additionally, the lack of accurate and adequate information on modifiable risk factors for reproductive health issues, along with limited access to reproductive health care, has exposed many adolescents to the risk of non-communicable diseases associated with reproductive health.^[10] Although many hospital-based or community-based studies have been conducted on the knowledge and awareness of modifiable risk factors among women, studies involving adolescents in rural and urban settings are limited. The knowledge of cervical cancer and its associated risk factors is generally low worldwide. At the same time, this situation is worse in developing countries despite the increasing prevalence of the disease in these regions.

This study aimed to examine the awareness and knowledge of modifiable risk factors for cervical cancer among adolescents. The findings may help policymakers and program developers in the healthcare sector identify areas for improvement in adolescent health programs.

Methods

Study area

The study area is Osun State in the southwestern part of Nigeria, which is divided into three senatorial districts with 30 Local Government Areas (LGAs). These LGAs are grouped into 18 rural LGAs and 12 urban LGAs. [12] It has a projected population of 6,846,768 residents in 2024, with adolescents making up 2,657,522 based on the 2006 population census. [13] About 55% of the population lives in urban areas, while the rest reside in rural areas. [13] The people are predominantly Yoruba, and the main religions practised in Osun State include Christianity, Islam, and traditional religions.

The reproductive health services available in the state include immunisation against vaccine-preventable diseases; however, the HPV vaccine is only available at the tertiary hospital and is procured out-of-pocket. These services also include family planning information and counselling, prevention and management of abortion and its complications. Other services include treatment of reproductive tract infections, HIV counselling and testing (HCT), and treatment of sexually transmitted diseases and other reproductive health conditions. The state has two youth and adolescent-friendly centres in urban areas—one operated by a non-governmental organisation and the other by the state government—while there are none in the rural areas. In all, the state has 136 public nursery schools, 1,460 public primary schools, 570 private secondary schools, and 244 public secondary schools. [14] Additionally, there are numerous private nursery, primary, and secondary schools in the state.

Study design

This was a comparative, cross-sectional study using quantitative methods of data collection.

Inclusion criteria: Female students aged 10-19 years at their last birthday, who were in public senior secondary schools in selected rural and urban areas in Osun State, and whose assent or consent of their parents/guardians was obtained to participate.

Sample size determination

A minimum sample size of 194 was obtained for each group (rural and urban) using the formula for comparing two independent proportions, utilising 55% based on a previous study for urban and 40% assumed for rural. A correction for non-response was applied, and 200 participants were enrolled per group. Therefore, a total of 400 participants were included in the study.

Ethical consideration

Ethical clearance for the study was obtained from the Osun State Health Research Ethics Committee in Osogbo, Osun State, with approval number OSHREC/PRS/569T/156. Participants under 18 years old were given consent forms to be filled out by their parents or guardians, and verbal assent was obtained from them. Respondents aged 18 and above were given the consent form to sign.

Sampling technique

A multistage sampling technique was adopted as follows: Osun State is administratively divided into three senatorial districts, with each comprising ten (10) Local Government areas and one area office.

First stage (selection of LGAs): From each of the three senatorial districts, one LGA was selected using a simple random sampling technique by balloting method, giving a total of three LGAs (Egbedore, Osogbo, and Ife Central LGAs).

Second stage (selection of schools): The lists of all public secondary schools in the selected three LGAs were obtained from the State Ministry of Education. The schools in each of the LGAs were pre-stratified into rural and urban areas, and from this, two secondary schools (one rural, one

urban) were selected in each of the three LGAs by a simple random sampling technique using a balloting method, making a total of 6 schools (Ido Osun High School, Ido-Osun; Alawo Grammar School, Awo; St Mark's Anglican High School II, Ayetoro; AUD High School, Ile-Ife; City College High School, and Aderemi High School, Aye Oba).

Third stage (selection of classes): from each of the selected schools, the researchers obtained the total numbers of all female students from SS1-SS3 classes. Simple random sampling was used to choose one class in each of the arms, SS1-SS3, in the selected schools. Proportional allocation was used to determine the number of students that were interviewed in the selected classes in each of the six schools, using the number of eligible students in each class.

Fourth stage (selection of female students): The systematic sampling technique was used to select female students who were interviewed in each class using the class register. After calculating the sampling interval, the first participant was selected from the first kth person on the list by simple random sampling using the balloting method. Subsequent participants were selected based on the sampling interval in each class until the sample size was achieved.

Data collection

A semi-structured, closed-ended questionnaire was designed to gather information about the adolescents' socio-demographic characteristics, awareness, and knowledge of cervical cancer, HPV, and other modifiable risk factors among in-school female adolescents. Ten per cent of the questionnaires from the calculated minimum sample size were pretested among in-school female adolescents in one urban and one rural secondary school in a Local Government Area (Ejigbo LGA) that was not part of the selected schools in the study area in Osun State but shares similar characteristics with the study area.

The questionnaires were analysed using the Statistical Package for the Social Sciences (SPSS) software version 25. The pretested copies of the questionnaire were assessed for internal consistency using Cronbach's Alpha coefficient analysis to determine their reliability. This study found a reliability coefficient of 0.98, indicating a high level of reliability. The questionnaires were administered to both rural and urban eligible respondents.

Data management

Measurement of variables

There were 11 questions on modifiable risk factors. Each correct answer earned 1 point, and each incorrect answer earned 0 points. We considered a mean knowledge score for modifiable risk factors with a standard deviation (SD) of 5.5 or less to be poor, and a score with an SD greater than 5.5 to be good. Univariate analyses included the determination of means and proportions for age and other socio-demographic factors. Chi-square analysis was used to compare good versus poor knowledge of modifiable risk factors. Variables that were statistically significant in the Chi-square analysis were further examined using multivariate analysis with binary logistic regression. Determinants of knowledge regarding modifiable risk factors for cervical cancer, including odds ratios and confidence intervals, were calculated. All analyses were conducted with a 95% confidence interval, and a p-value of less than or equal to 0.05 was considered statistically significant.

Results

Socio-demographic characteristics

Table I shows that the majority of respondents were aged 15-19 years, with a mean age of 15.8 ± 1.49 years for rural adolescents and 15.93 ± 1.40 years for urban adolescents. A larger proportion of rural respondents (46.5%) were in

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SSI, while the most significant proportion was in SSIII (44.5%) in urban areas. More adolescents in the urban regions lived with their parents (71.0%) compared to those in rural areas (54.0%). There was a statistically significant difference in the age

group distribution between the two groups. A greater proportion of rural respondents (31.0%) were in the second birth order, while urban respondents (28.5%) were in the third birth order ($p = 0.002$).

Table I: Socio-demographic characteristics of respondents according to their place of residence

Variables	Urban n (%)	Rural n (%)	Total	χ^2	df	p-value
Age(years)						
<14	36 (18.0)	25 (12.5)	61 (15.3)			
15-19	164 (82.0)	175 (87.5)	339 (84.7)	2.34	1	0.13
Mean value	15.8±1.49	15.93±1.40				
Class						
SSI	58 (29.0)	93 (46.5)	151 (37.7)	34.52	3	<0.001
SSII	53 (26.5)	72 (36.0)	125 (31.3)			
SSIII	89 (44.5)	35 (17.5)	124 (31.0)			
Ethnicity						
Yoruba	185 (92.5)	189 (94.5)	374 (93.5)	0.66	1	0.42
Others	15 (7.5)	11 (5.5)	26 (6.5)			
Family type						
Monogamous	162 (81.0)	118 (59.0)	280 (70.0)	23.05	1	<0.001
Polygamous	38 (19.0)	82 (41.0)	120 (30.0)			
Birth order						
First	53 (26.5)	53 (26.5)	106 (26.5)			
Second	48 (24.0)	62 (31.0)	110 (27.5)	16.95	4	0.002
Third	57 (28.5)	34 (17.0)	91 (22.7)			
Fourth	25 (12.5)	44 (22.0)	69 (17.3)			
Fifth	17 (8.5)	7 (3.5)	24 (6.0)			
Respondent lives with						
Father only	5 (2.5)	23 (11.5)	28 (7.0)	18.91	3	<0.001
Mother only	43 (21.5)	58 (29.0)	101 (25.2)			
Both parent	142 (71.0)	108 (54.0)	250 (62.5)			
Others	10 (5.0)	7 (3.5)	17 (0.8)			

Knowledge about modifiable risk factors

Table II shows respondents' awareness of cervical cancer, HPV, and knowledge about modifiable risk factors among adolescents in rural and urban areas. Overall, 268 respondents (67%) have heard about cervical cancer, 77% have not heard about HPV, and 64% have not heard about modifiable risk factors for cervical cancer. Less than two-fifths, (30; 15.0%), of urban respondents have heard about modifiable risk

factors of cervical cancer, while slightly more than two-fifths, (45; 22.5%), of rural respondents have heard about these risk factors with statistical significance. The rates of awareness of modifiable risk factors such as infection with HPV [44 (22%) *vs.* 67 (33.5%)], cigarette smoking [46 (23%) *vs.* 70 (35%)], STIs [63 (31.5%) *vs.* 82 (41.0%)], early sexual debut [34 (17%) *vs.* 50 (25%)], and having multiple sexual partners [44 (22%) *vs.* 60 (30%)] were observed in urban and

rural areas, respectively with statistical significance.

Table III displays the distribution of respondents based on their understanding of modifiable risk

factors for cervical cancer. Most respondents from both urban (114, 57.0%) and rural (132, 66.0%) areas had poor knowledge of these risk factors. This difference was statistically significant ($p = 0.04$).

Table II: Comparison of the awareness of cervical cancer, HPV and knowledge about modifiable risk factors for cervical cancer among rural – urban dwellers

Variable	Urban n (%)	Rural n (%)	Total	X ²	p-value
Heard about of cervical cancer					
Yes	56 (28.0)	60 (30.0)	116 (29.0)	0.2	0.91
No	136 (68.0)	132 (66.0)	268 (67.0)		
Indifferent	8 (4.0)	8 (4.0)	16 (8.0)		
Heard about modifiable risk factors of cervical cancer					
Yes	30 (15.0)	45 (22.5)	75 (18.7)	4.92	0.09
No	139 (69.5)	119 (59.5)	258 (64.5)		
Indifferent	31 (15.5)	36 (18.0)	67 (16.8)		
Heard about Human papilloma virus					
Yes	34 (17.0)	42 (21.0)	76 (19.0)	1.21	0.55
No	157 (78.5)	151 (75.5)	308 (77.0)		
Indifferent	9 (4.5)	7 (3.5)	16 (4.0)		
Knowledge about various modifiable risk factors of cervical cancer					
Infection with HPV	44 (22.0)	67 (33.5)	111 (27.8)	9.43	0.01
Smoking cigarettes	46 (23.0)	70 (35.0)	116 (29.0)	10.21	0.01
Having weakened immune system	52 (26.0)	58 (29.0)	110 (27.5)	4.05	0.43
Long term used of contraceptive pill	33 (16.5)	41 (20.5)	74 (18.5)	1.08	0.58
Infection with sexually transmitted infections	63 (31.5)	82 (41.0)	145 (36.5)	7.06	0.03
Having sexual partner who is circumcised	31 (16.5)	47 (23.5)	78 (19.5)	5.22	0.07
Starting to have sex at early age	34 (17.0)	50 (25.0)	84 (21.0)	11.75	0.00
Having many sexual partners	44 (22.0)	60 (30.0)	104 (26.0)	6.74	0.03
Having sexual partners with many previous sexual partners	42 (21.0)	60 (30.0)	102 (25.5)	9.99	0.01

Figure 1 displays the sources of information about modifiable risk factors for respondents in rural and urban areas. Radio/TV was the top source of information in both study areas, with a higher proportion of urban respondents (73%) receiving more details compared to their rural (56.5%) counterparts. The least common source for urban respondents was church/mosque (53%), while for rural respondents, it was health workers (42.5%).

Discussion

This study compared the awareness and knowledge of modifiable risk factors for cervical cancer among female adolescents in secondary schools in urban and rural areas of Osun State. Most respondents were late adolescents, with mean ages of 15.8 ± 1.49 and 15.93 ± 1.40 years for those in rural and urban groups, respectively. In this study, more respondents' parents (41.0%) from rural areas practised polygamy compared to their urban counterparts (19.0%).

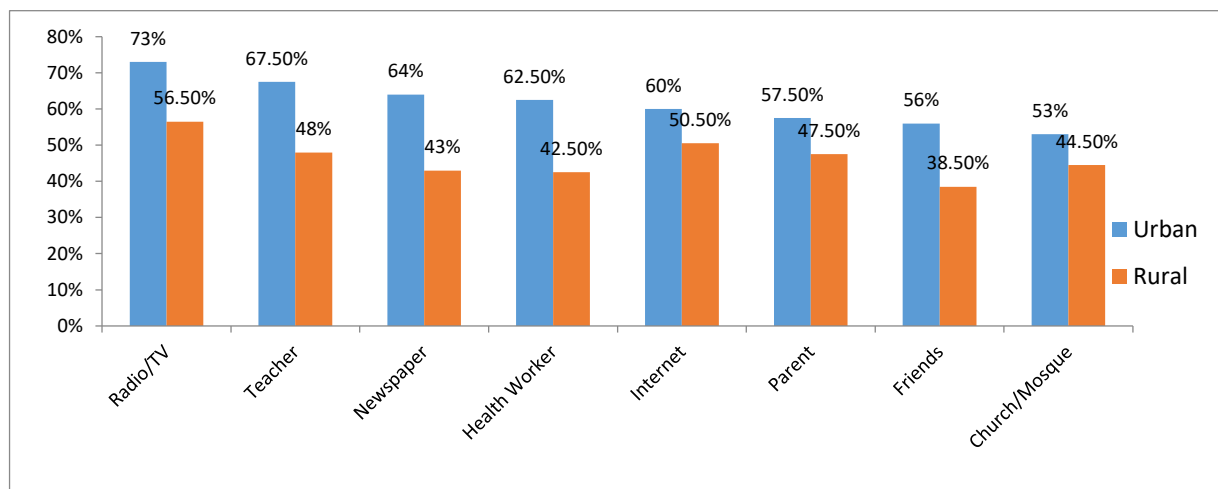


Figure 1: Source of information on modifiable risk factors

Table III: Relationship between category of residence and category of knowledge about modifiable risk factors of cervical cancer

Variables	Residence n (%)		Total	χ^2	df	p-value
	Urban	Rural	n = 400			
	n = 200	n = 200				
Good knowledge	86 (43.0)	68 (34.0)	154 (38.5)	3.42	1	0.04
Poor knowledge	114 (57.0)	132 (66.0)	246 (61.5)			
Mean knowledge on MR factors of HPV score =5.5±3.9						

The high practice of polygamy in rural areas could be due to economic incentives, as men's ability to support large families is declining amid increasing costs for shelter, food, education, clothing, and health services, along with intermittent food purchases due to decreasing local food production and the country's economic situation. A study in Bangladesh on cervical cancer in adults identified polygamy as a risk factor for the disease. ^[15]

About two-thirds of the respondents have not heard of cervical cancer. This lack of awareness raises concern, given that the incidence of cervical cancer in Nigeria reported in 2021 was

about 12%, with approximately 11,000 deaths recorded that year. ^[16] Furthermore, cervical cancer is the second leading cause of cancer deaths among women worldwide. ^[17] The level of awareness of Human Papillomavirus (HPV) infection among adolescents was also very low in this study, with about four-fifths of the respondents reporting that they had not heard of HPV. Persistent infection with high-risk HPV is a necessary cause of cervical cancer; therefore, adolescents need to be educated about its associated risks and modes of transmission. This finding is similar to the study in Benin, Nigeria, which reported that almost all respondents (97%) had not heard of HPV, and another study on

HIV-infected women in Lagos, Nigeria, found that an even higher proportion (90%) had not heard of HPV. [18,19]

This study further revealed that only about two-fifths (18.7%) of adolescents had knowledge of the modifiable risk factors for cervical cancer, with a significant difference in the proportion of rural and urban dwellers' knowledge. Less than two-fifths (15.0%) of respondents from urban areas were aware of the modifiable risk factors for cervical cancer. In comparison, slightly above two-fifths (22.5%) of people from rural areas had the same knowledge. Several studies have indicated that over half of all cancers in developed countries could be prevented if population-wide measures promoting behavioural and lifestyle changes were implemented. These include reductions in smoking and tobacco use, increased physical activity, weight management, healthier diets, limiting alcohol consumption, practising safer sex, and routine cancer screening tests. [20] This study found a significant difference in the awareness of modifiable risk factors between rural and urban dwellers. The identified modifiable risk factors included: HPV infection, cigarette smoking, STIs, early sexual debut, and having multiple sexual partners. Awareness of these risk factors was higher among urban residents compared to rural ones. Similar studies reported comparable levels of awareness but did not compare urban and rural populations. [18,21] Therefore, efforts should focus on increasing awareness among adolescents, especially those in rural communities.

In this study, about 62% of adolescents had poor knowledge of cervical cancer. Only about one-fifth of respondents from both urban and rural areas knew that the HPV virus is a risk factor for cervical cancer. This contrasts with a similar study in a part of Ekiti State, Nigeria, which reported that most adolescents had a good understanding of cervical cancer. However, that

study was conducted among urban students and did not include their rural counterparts. [22] In the present study, knowledge about modifiable risk factors for cervical cancer was higher among urban residents than rural residents. Urban respondents were more aware of factors such as HPV infection, cigarette smoking, STIs, early sexual debut, and multiple sexual partners compared to their rural counterparts.

Limitations

Given the sensitivity and social disapproval associated with issues of sexuality in the setting of the study, there was a risk of under-reporting. However, the respondents were encouraged to answer honestly, assured that their responses would remain confidential.

Conclusion

This study found that most in-school female adolescents in Osun State, Nigeria, both in urban and rural areas, have limited awareness and knowledge of modifiable risk factors for cervical cancer. Notably, rural respondents demonstrated a lower level of understanding of cervical cancer, HPV, and other modifiable risk factors compared to their urban counterparts. The findings offer valuable insights for policymakers, program developers, and healthcare providers, guiding the development of effective strategies to improve awareness and understanding of cervical cancer risk factors among female adolescents. Addressing this knowledge gap could help reduce the future burden of cervical cancer among women.

Authors' Contributions: AEF, AAA and AEO conceived and designed the research. AEF, OAO, AAA and BOO analysed and interpreted the data. AEF, BOO, and SSK drafted the manuscript, while OAO and SSK revised it for sound intellectual content. All the authors approved the final version of the manuscript.

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