RESEARCH ARTICLE

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Effect of a Nurse-Led Educational Intervention on the Knowledge, Perceptions and Uptake of Cervical Cancer Screening among HIV-Infected Women in Kenya

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Abstract

Background: Health education influences the sociocultural health beliefs and enhances the decision making of women resulting in a change in their screening behavior. This study evaluated the impact of a nurse-led health education based on the Health Belief Model constructs on improving the knowledge, perceptions and the uptake of cervical cancer screening among HIV-infected women in Kisii County, Kenya. **Methods:** A 2-arm quasi-experimental design was employed in the HIV care clinics at Keumbu and Gucha sub-County hospitals in Kisii County, Kenya. The study population comprised of HIV-infected women aged between 15 and 49 years attending the two HIV care clinics. A sample size of 306 for each arm of the study was used. Systematic random sampling was used to select the 306 participants enrolled in each of the study arms. Socio-demographic and clinical characteristics, knowledge, perceptions and uptake of cervical cancer screening data among the HIV-infected women was collected at pre-test and post-test surveys. **Results:** We analyzed 566 participants (response rate 566/612, 92%) with 287 participants in the control arm and 279 participants in the intervention arm. There was a statistically significant difference in the mean scores of knowledge (p=0.001), perceived susceptibility (p=0.003), perceived severity (p=0.001), perceived barriers (p=0.001) and perceived self-efficacy (p=0.001) in the intervention arm compared to the control arm after the intervention. The proportion of participants screened significantly (p<0.001) increased from 16% to 57% in the intervention arm versus 7% to 9% in the control arm after the intervention. **Conclusion:** A nurse-led educational intervention in a hospital setting was effective in improving the knowledge and uptake of cervical cancer screening among HIV-infected women. The intervention partially improved their perceptions of cervical cancer and screening. Targeted health education can influence the uptake of cervical cancer screening among HIV-infected women.

Keywords: Cervical cancer- health education- screening- perceptions- knowledge

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Introduction

Cervical cancer is a global health problem and a leading cause of cancer mortality among women. A high burden of the disease afflicts women in the developing countries. In 2020, the Eastern Africa region had the highest age-standardized incidence rate of 40 cases per 100,000 women-years in the world. Similarly, the region also had the highest mortality rate of 28.6 deaths per 100,000 women-years in the world [1]. In Kenya, cervical cancer is the second most common type of cancer among women. It is among the countries that are witnessing a uniform rise in the incidences of cervical cancer [2]. An estimated 5236 new cases and 3211 deaths due to cervical cancer were witnessed in Kenya in 2020 [1].

Kenya is among the sub-Saharan countries with a high prevalence of HIV (Human Immunodeficiency Virus) infections. In 2019, it was estimated that 1,508,405 people were living with HIV in Kenya, among whom 890,000 were females [3]. Cervical cancer is mainly caused by HPV (Human Papillomavirus) infection. There exists a direct association between HPV infection and HIV infection. HIV increases the risk of acquisition, persistence and progression of high risk HPV to cervical cancer [4]. The high risk population including HIV-infected women require regular cervical cancer screening to prevent the disease. However, developing countries have been associated with low screening rates for HIV-infected women compared to the developed countries. The lifetime prevalence of cervical cancer screening among HIV-

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infected women in low and middle income countries is 30.2% compared to 92.4% in high income countries [5]. The low screening rates have resulted in late diagnosis and treatment of cervical cancer cases leading to high mortalities. In Kenya, only 19% of HIV-infected women had been screened for the disease in the past three years in 2020 [6].

To mitigate the mortality and morbidity associated with the disease, the WHO initiated a global strategy targeting to screen 70% of women at least two times with a high performance test by the age of 45 years by the year 2030 [7]. The said targets may not be achieved without tailored interventions to improve utilization of cervical cancer screening services in the health facilities. In a systematic review involving low and middle income countries, a number of sociocultural barriers within the communities and lack of knowledge about cervical cancer and screening hindered uptake of screening [8]. The sociocultural barriers in this context related to their health beliefs or perceptions about cervical cancer and screening. The health belief model established that individual health beliefs or perceptions about a given disease and the strategies to decrease the occurrence of the disease determined health behaviors [9]. Changes in health behavior can be achieved by modification of the health beliefs through health education. The main constructs of the model included the perceived susceptibility to the health problem; the anticipated severity of the consequences of the health problem; the benefits of the recommended health behavior and the barriers to enacting the recommended health behavior [9].

The constructs of the health belief model provided a framework for understanding differences in the health behaviors among the HIV-infected women and was employed in the design of the educational intervention in this study. The intervention focused on increasing perceived severity and susceptibility of cervical cancer; increasing perceived benefits and self-efficacy to cervical cancer screening while decreasing the perceived barriers to cervical cancer screening among the HIV-infected women. The modification of these perceptions was anticipated to positively influence the screening behavior of the HIV-infected women. Thus, this study aimed to evaluate the effectiveness of a nurse-led interactive and theory-based educational intervention on the knowledge, perceptions and uptake of cervical cancer screening among HIV-infected women in one of the Counties in Kenya.

Materials and Methods

The study employed a two-arm pre-test, post-test quasi-experimental design. It was conducted in the period from June 2020 to February 2021 in Kisii County, South Western region of Kenya. The County lies on an area of approximately 1,333 km2 with an estimated population of 1,267,000. It has a highland equatorial climate with a bimodal rainfall pattern with a hilly topography and several valleys. The Kenyan health care system is organized into six levels. Level one comprises community health services; level two forms the interface between the community and health facilities, it comprises of dispensaries; level three provides primary health care services, comprising of health centers, maternity and nursing homes; level four are the first level hospitals whose services support the primary care level. They offer both in-patient and out-patient health care services. They include the sub-county and county hospitals. This study was conducted in two sub-County hospitals that were more than 35 kilometers apart to eliminate contamination among the study participants in the two groups. The two hospitals also had the highest enrolment of HIV-infected women under HIV care at the time. Gucha sub-County hospital served as the intervention site while Keumbu sub-County hospital was the control site. The setting was predominantly rural comprising of the Abagusii community.

The target population included HIV-infected women aged 15-49 years attending the health facilities based on the national guidelines for cervical cancer screening [10]. Study participants in the two sites were selected using systematic random sampling. All HIV-infected women aged 15-49 years attending their routine medical appointments at the HIV care clinics of the two sub-County hospitals were recruited during the study period. The inclusion criteria for eligibility included being a woman living with HIV; aged 15 to 49 years; actively under follow up in the two HIV care clinics; intending to continue with follow up in the same hospital for the next 12 months; had not undergone treatment for cervical cancer or precancerous lesions; had their last cervical cancer screening more than 6 months ago and voluntarily consented to participate in the study. The eligible HIV-infected women on the daily clinic attendance register were listed in each of the hospitals. The first study participants in the study sites were randomly selected on the clinic days. Subsequently, every 3rd and 2nd HIV-infected woman on the comprehensive HIV care clinic attendance list at Gucha and Keumbu sub-County hospitals respectively were recruited until the sample size of 306 for each arm was reached. The sample size was determined using the formula by Casegrand for comparing two independent groups powered at 90%. Before the intervention was given, a baseline survey was conducted in both the intervention and control arms.

Intervention

This was an interactive and theory-based health education delivered by nurses in the HIV care clinic. We developed the intervention. Content for the intervention was extracted from literature including the health belief model, cervical cancer prevention guidelines, Freire's problem posing pedagogy and gaps identified from a survey conducted among nurses in the County on utilization of interactive approaches in health education. The content was then organized into training modules for nurses. The modules were validated by a panel of content experts. We used the validated modules to train nurses in the County. Thereafter, the intervention was piloted by the trained nurses among groups of HIV-infected women in a different sub-County hospital.

Intervention fidelity was ensured by using a prepared intervention delivery check list. Each educational

intervention session was delivered by one trained nurse as another nurse reviewed the steps in the intervention delivery check list. The interactive health education included the definition of cervical cancer, causes, risk factors, signs and symptoms, relationship between cervical cancer and HIV, prevention of the disease including screening for cervical cancer and treatment of cervical cancer. The discussions during the health education sessions were structured along the Health Belief Model constructs and facilitated by the trained nurses. The interactive health education sessions were delivered face to face by trained nurses to groups of between 4-8 enrolled study participants in the intervention arm. We supervised each of the health education sessions. Study participants in the control arm received usual care that involved brief didactic health talks. Six months after the intervention, another survey using the same study questionnaire was conducted in both the intervention and control arms.

Data Collection

A structured interviewer-administered questionnaire was used to collect data at baseline (before the intervention) and six months after the intervention in both study arms. The tool was an adoption with modifications of the Champion HBM scale [11]. Permission from the tool developer was sought and granted. The modification took into account the health behavioral measures for HIV-infected women based on the national screening guidelines at the time.

The modified tool was pre-tested at a different sub-County hospital among a randomly selected sample of 47 HIV-infected women representing 15% of the intervention study population. The Cronbach's alpha results for the 19 items used to measure knowledge (0.76); 20 items for perceived susceptibility, severity, benefits and barriers (0.703); 3 items for perceived self-efficacy (0.835) were reliable in measuring the respective study variables.

The questionnaire assessed the study participants on their socio-demographic and clinical characteristics, knowledge of cervical cancer and screening, perceived susceptibility and severity to cervical cancer, perceived benefits, barriers and self-efficacy to cervical cancer screening. The study participants also responded on whether or not they had been screened for cervical cancer as a measure of the uptake of screening. We validated the responses on screening from the screening registers in the hospitals. At the time of the study, cervical cancer screening was being conducted by health care providers in the hospitals using the visual inspection with acetic acid method.

Ethical approval was received and the department of health, Kisii County also granted the principal investigator authority to conduct the study in the County. The autonomy and confidentiality of the study participants was ensured. The purpose, potential risks and benefits of the study was explained to the study participants. Participation in the study and cervical cancer screening was voluntary. Informed consent/assent was obtained from the study participants. The interviews and health education sessions were conducted in different rooms from other clients to ensure privacy.

Data Analysis

The Statistical Package of Social Sciences (SPSS) version 22 was used to analyze the data. Knowledge on cervical cancer and screening was measured using 19 items. The knowledge questions had Yes or No options, with 1 point for a correct answer and 0 point for an incorrect answer. Perceptions of cervical cancer and screening was measured using 23 items in a Likert scale ranging from strongly disagree (1) to strongly agree (5). Paired sample t-test and independent sample t-test was used to compare mean differences of knowledge and perception scores before and after the intervention at 95% confidence interval within and across the two arms respectively. Chi-square test was used to compare differences in proportions on the uptake of screening within the two arms. A p-value of <0.05 was considered statistically significant.

Results

During the pre-intervention survey, 306 respondents were enrolled in each arm of the study. In the post-intervention survey, the response rate was 91.2% (n=279) in the intervention arm and 93.8% (n=287) in the control arm.

Socio-demographic characteristics

The participants' ages ranged between 15 – 49 years in both arms. Their median age (IQR) in years was 42 (35, 48). More than 49% of the participants had primary school level of education. Majority (65%) of the participants were peasant farmers with more than 50% of them being married. Most (70%) participants were Protestants as shown in Table 1.

Knowledge on cervical cancer and screening

The mean scores of knowledge among the participants in the intervention arm increased from 21.2 at baseline to 23.4 after the intervention. A statistically significant (p=0.001) difference was observed in the mean scores of knowledge between the intervention and control arms of the study after the intervention, Table 2.

Perceptions to cervical cancer and screening

The mean scores of perceptions in the intervention arm increased from baseline to post-intervention. In perceived susceptibility the mean scores increased from 7.8 to 8.1, perceived severity from 12.2 to 14.1, perceived benefits from 20.4 to 22.1, perceived self-efficacy from 20.9 to 23.6. The mean scores of perceived barriers decreased from 24.3 at baseline to 22.2 after the intervention. The mean score differences between the two arms after the intervention for perceived susceptibility, perceived severity, perceived benefits, perceived barriers and perceived self-efficacy to cervical cancer screening was statistically significant (p=0.001), Table 2.

Uptake of cervical cancer screening

The proportion of participants who had cervical cancer screening increased significantly ($p<0.001$) from 16% to 57.3% in the intervention arm compared to the minimal

Table 1. Socio-Demographic Characteristics of Study Participants

Variable	Category	Control Arm (n=287) Frequency (%)	Intervention Arm (n=279) Frequency (%)	Total (n=566) Frequency (%)	Chi-square (χ^2)	P-value
Level of Education	None	12 (4.2)	12 (4.3)	24 (4.2)	3.054	0.383
	Primary	142 (49.5)	155 (55.6)	297 (52.5)		
	Secondary	115 (40.1)	101 (36.2)	216 (38.2)		
	Tertiary	18 (6.3)	11 (3.9)	29 (5.1)		
Marital Status	Single	22 (1.7)	27 (9.7)	49 (8.7)	10.376	0.015
	Married	165 (57.5)	142 (50.9)	307 (54.2)		
	Widowed	78 (27.2)	99 (35.5)	177 (31.3)		
	Separated	12 (4.2)	9 (3.2)	21 (3.7)		
	Divorced	10 (3.5)	2 (0.7)	12 (2.1)		
Religion	Catholic	80 (27.9)	64 (22.9)	144 (25.4)	1.817	0.178
	Protestant	207 (72.1)	215 (77.1)	422 (74.6)		
Occupation	Business	53 (18.5)	53 (19)	106 (18.7)	22.047	0.015
	Teacher	13 (4.5)	13 (4.7)	26 (4.6)		
	Peasant Farmer	189 (65.9)	204 (73.1)	393 (69.4)		
	Saloonist	6 (2.1)	1 (0.4)	7 (1.2)		
	Housewife	17 (5.9)	3 (1.1)	20 (3.6)		
	Casual Laborer	6 (2.1)	4 (1.4)	10 (1.8)		
	Students	3 (1.0)	1 (0.4)	4 (0.7)		

*Statistical significance, p-value<0.05

increase from 7.2% to 8.7% (p=0.493) in the control arm after the intervention, Table 3.

Discussion

The study evaluated the effect of a nurse-led educational intervention on knowledge, perceptions and uptake of cervical cancer screening. It involved conducting face to face group sessions during routine HIV care clinic attendance where information on cervical cancer and screening was shared among the HIV-infected women to increase their knowledge and to motivate

Table 2. Comparison of the Mean Scores of Knowledge and Perceptions of the Participants before and after the Intervention in the Two Arms

Variable	Time	Control Arm Mean±SD	Intervention Arm Mean±SD	P-value
Knowledge of cervical cancer & screening	Pre-test	20.3±1.7	21.2±5.3	0.570[b]
	Post-test	19.9±1.6	23.4±4.4	0.001[b]
	p value	0.441[a]	0.001[a]	
Perceived susceptibility to cervical cancer	Pre-test	5.6±1.5	7.8±1.2	0.001[b]
	Post-test	6.1±1.4	8.1±0.4	0.001[b]
	p value	0.001[a]	0.003[a]	
Perceived severity of cervical cancer	Pre-test	9.8±2.2	12.2±1.7	0.724[b]
	Post-test	9.4±1.9	14.1±0.8	0.001[b]
	p value	0.128[a]	0.001[a]	
Perceived benefits of screening	Pre-test	19.9±2.1	20.4±3.2	0.086[b]
	Post-test	19.2±2.8	22.1±0.9	0.001[b]
	p value	0.001[a]	0.122[a]	
Perceived barriers to screening	Pre-test	22.9±5.8	24.3±3.4	0.479[b]
	Post-test	23.7±6.2	22.2±3.8	0.001[b]
	p value	0.068[a]	0.001[a]	
Perceived self-efficacy	Pre-test	19.4±1.7	20.9±2.9	0.071[b]
	Post-test	19.6±2.4	23.6±1.2	0.001[b]
	p value	0.067[a]	0.001[a]	

[a], statistical significance determined using paired t-test, p-value<0.05; [b], statistical significance determined using independent t-test, p-value<0.05

Table 3. Comparison of the Proportion of the Participants who Screened for Cervical Cancer before and after the Intervention in the Two Arms

Cervical cancer screening	Intervention Arm				Control Arm			
	Pre-test (n=306) Frequency (%)	Post-test (n=279) Frequency (%)	Chi square (χ^2)	P-value	Pre-test (n=306) Frequency (%)	Post-test (n=287) Frequency (%)	Chi square (χ^2)	P-value
Screened	49 (16.0)	160 (57.3)	108.586	<0.001	22 (7.2)	25 (8.7)	0.47	0.493
Unscreened	257(84)	119 (42.7)			284 (92.8)	262 (91.3)		

*Statistical significance, p-value<0.05

them to undertake screening. The intervention applied an interactive approach in the health education as opposed to the traditional didactic health talks. Interactive approaches to health education have been reported to be effective in increasing knowledge and uptake of screening services [12, 13]. The engagement of the HIV-infected women through discussions in the interactive approach allowed them to learn and gain knowledge on cervical cancer and screening from each other's experiences. The intervention also integrated a culturally relevant case scenario in the form of a story which formed the basis of the discussions in the groups using the native language. Culturally-tailored interventions have been reported to have positive effects towards increased uptake of screening services [14, 15]. The discussions were structured along the Health Belief Model constructs targeting the participants' perceptions of the disease and screening. Theory-based interventions focusing on the participants' health beliefs influence their decision making towards increased utilization of screening services [16, 17].

The study observed significantly (p=0.001) increased mean scores of knowledge for cervical cancer and screening in the intervention arm compared to the control arm after the intervention. This could be attributed to the knowledge gained on cervical cancer and screening based on the content and delivery approach taken during the intervention. This finding is consistent with the impact reported about educational interventions in similar settings. A study in Tanzania observed significantly increased knowledge scores among women in the intervention arm compared to those in the control arm after the intervention [18]. Similar findings were reported in Ghana where the knowledge on cervical cancer and screening had significantly higher scores among participants in the intervention arm compared to those in the control arm [19, 20]. In Iran, significant increases in knowledge scores were observed among participants in the intervention arm compared to those in the control arm after an educational intervention [21].

There was a significant (p≤0.003) difference observed in the intervention arm in mean scores of perceived susceptibility, perceived severity, perceived barriers and perceived self-efficacy to screening after the intervention. This was supported by findings in other similar studies that evaluated the health beliefs of the participants in the intervention arm and reported significant changes in their perceptions to cervical cancer and screening after the intervention [18, 21]. However, no significant (p=0.122) difference was reported in the intervention arm in mean scores of perceived benefits after the intervention in this study. The mixed results in perception mean scores have been reported in other studies. In a study in Ghana, a significant difference in the intervention arm was only observed in perceived severity, perceived benefits and perceived barriers to screening after the intervention [19]. A randomized control trial conducted among women in Turkey reported a significant difference in the intervention arm only in the mean scores of perceived benefits and perceived barriers after the intervention [22]. The mixed findings regarding perception scores in this study can be explained by the frequency of the intervention delivery. This was a one-time educational intervention with no further follow up of the participants which may not have been adequate to completely change their perceptions about the disease and screening. However, the educational intervention increased the knowledge of the participants about their risk for the disease given their HIV status, thus the observed difference in perceived susceptibility.

The educational intervention significantly (p<0.001) increased the uptake of cervical cancer screening among the HIV-infected women in the intervention arm compared to those in the control arm. The observed change in the uptake of screening services could have been due to the discussions on their health beliefs on screening and the shared experiences from other group members during the health education sessions that improved their knowledge and perceptions towards cervical cancer screening. The increased knowledge on screening helped to address possible individual and sociocultural barriers that existed among those who had never screened. The significantly increased perceived susceptibility and severity after the intervention may mean that women believed they were more at risk for the disease. This could have motivated them to discuss and make arrangements to undertake screening with the health care providers. The findings are congruent with those of another study conducted in Kenya that reported a significant increase in cervical cancer screening among women of reproductive age in Kitui County after an educational intervention [23]. They are also consistent with the findings of other studies in similar settings that have observed significantly increased uptake of cervical cancer screening among women after educational interventions [13, 16, 18].

Health literacy on matters regarding cervical cancer and screening is important in the process of making an informed decision about screening [24]. Provision of health education on cervical cancer and screening to high risk populations including HIV-infected women influences their screening behavior by improving their health literacy levels. The Ministry of Health has increased efforts to

integrate cervical cancer screening services into HIV care and treatment services in Kenya. The regular HIV care clinic attendances for medical appointments provide an appropriate opportunity for the nurses and other health care providers to provide health education and cervical cancer screening services to the HIV-infected women. In conclusion, the findings of this study have showed that a nurse-led educational intervention in a health facility significantly increased the knowledge of cervical cancer and screening, improved perceptions of cervical cancer and screening and the uptake of cervical cancer screening among HIV-infected women. Therefore, implementation of nurse-led health education in hospital settings could be an effective strategy to improve knowledge and perceptions of cervical cancer and screening, and increase uptake of screening services among HIV-infected women in the country. This study was limited to the HIV-infected women on follow up in the HIV care clinics of two sub-County hospitals in a rural community in Kisii County, Kenya. The findings may not be generalizable to HIV-infected women from different sociocultural backgrounds or to HIV-infected women who have not been diagnosed and do not attend HIV care clinics.

Author Contribution Statement

Conceptualization and design of the study: IMO, IGM, MC. Collection of data, analysis and interpretation: IMO, IGM, MC, SW. Manuscript writing and critical review: MC, IMO. All authors read and approved the final version of the manuscript.

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Availability of data

The database analyzed in this study is not publicly available but can be obtained upon request and with an ethical approval

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Scientific Body

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Ethical Declaration

The study was reviewed and approved by the Kenyatta National Hospital-University of Nairobi ethics and research committee (KNH-ERC/A/76).

Conflict of interest

The authors have no conflict of interest to declare concerning this study

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