Coverage and Factors Associated with Cervical Cancer Screening: Results from a Population-Based WHO Steps Study in Ethiopia.

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Abstract

Background: Cervix cancer is the most common cause of cancer deaths in Africa accounting for 10.4 deaths, which represents one in five of all cancer deaths in African women Munoz et al. Sub-Saharan Africa bears the highest global burden of this fatal yet entirely preventable disease. The problem is particularly severe in sub-Saharan Africa, where the age-adjusted incidence rate is 45 per 100,000 women with Ethiopia at 35.9 per 100,000 women. Data from the Addis Ababa population based cancer registry showed that breast and cervical cancers were the leading causes of cancer, comprising 22.6% and 10.8% respectively of all cases of cancers.

Methods: Community-based Cross-sectional survey based on the World Health Organization (WHO) NCD Stepwise approach was done. The survey was conducted in the 9 regions and two city administrations (Addis Ababa and Dire Dawa) in Ethiopia. The target population for this survey included all men and 15-69 years old who consider Ethiopia to be their primary place of residence. A single population-proportion formula was used to determine the sample size design effect coefficient of 1.5, Z-score=1.96, proportion=35.2 and marginal error=0.04. A total of 513 EAs were covered nationwide. Thus, 5823 women were included in this study. A mix of sampling approach namely stratified, three-stage cluster sampling, simple random sampling and Kish method were employed to select the study settings and the study participants.

Results: Cervical cancer screening rate in Ethiopia is extremely low (2.9%). When adjusted for demographic and residence confounders (age, location, income, education), cervical cancer screening is significantly associated with being at urban area (AOR=2.5, 95% CI: 1.1, 5.7), age 30-49 years (AOR=2.4, 95% CI: 1.2, 4.8), having annual household income of more than 30,000 ETB (AOR=7.1, 95% CI: 4.8, 10.4) and college and above level of education (OR=2.8, 95% CI: 1.1, 7.8).

Conclusions: Cervical cancer screening rate in Ethiopia is extremely low as compared to the rates of other countries. This needs a mechanism to establish and strengthen the multi-sectoral response in general for the prevention and control of cervical cancer and increasing awareness of the community towards cervical cancer screening and strengthening the health system in particular.

Introduction

Cervix cancer is a public health problem. It is the third most common cancer in women worldwide and the second most common cancer among women in developing countries [1]. Cervix cancer is the most common cause of cancer deaths in Africa accounting for 10.4 deaths, which represents one in five of all cancer deaths in African women Munoz et al. Sub-Saharan Africa bears the highest global burden of this fatal yet entirely preventable disease [2]. The problem is particularly severe in sub-Saharan Africa, where the age-adjusted incidence rate is 45 per 100,000 women Kizer et al. [3]. With Ethiopia at 35.9 per 100,000 women [4] data from the Addis Ababa population based cancer registry showed that breast and cervical cancers were the leading causes of cancer, comprising 22.6% and 10.8% respectively of all cases of cancers [5]. A study conducted in the teaching hospitals of Ethiopia indicated that invasive cervical malignancy was the most common histological finding with its prevalence of 55.7 while cervical intraepithelial neoplasia (CIN) accounted for 8.6 of the cervical biopsy Nigatu et al. Oncologic outcomes can be improved by four principles namely early diagnosis, improved understanding of carcinogenesis, multimodality therapy, and interdisciplinary approaches [6]. But the majority of women with cervix cancer access health care in an advanced stage of the disease [2,7]. Possibly because cervical cancer tend not to have symptoms in the early stages and therefore women seek care once

they become symptomatic [7]. Where the incidence of cancer justifies it, and the necessary resources can be made available, screening for cancers of the breast and cervix is recommended. This is feasible mainly in medium and high-resource level countries. Screening for other cancer sites must be regarded as experimental and cannot be recommended at present as public health policy [8]. The ministry of health targeted to llaunch HPV vaccination demonstration program, and achieve at least 80 percent coverage of girls within the target population, disseminate the National Cancer-Control Plan, Open 58 "Screen-and Treat" sites and reach at least 80% coverage of the appropriate target populations with screening and treatment for pre-invasive cervical-cancer cases [9]. Therefore, the study is aimed to assess the coverage and factors associated with cervical cancer screening in Ethiopia.

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Methods and Materials

Data source and study participants

The data used for this paper were obtained from WHO NCD Steps survey conducted in Ethiopia from April to June, 2015. The survey was conducted using the WHO NCD STEPS instrument version 3.1. The questionnaire consisted of three STEPS for measuring the NCD risk factors. STEP I included questionnaires, STEP II included physical measurements and STEP III included biochemical measurements. This survey was a cross-sectional, representative National population based survey conducted by the Ethiopian Public Health Institute (Ethiopian Ministry of Health). A single population-proportion formula was used to determine the sample size. To adjust for the design effect, a complex sampling design effect coefficient of 1.5 was used to compute the sample size. In order to have an adequate level of precision for each age-sex estimate and place of residence, the sample was multiplied by the number of age sex and place of residence groups for which the estimates were reported. Thus, Z-score=1.96; proportion=35.2%(9) marginal error=0.04; design effect=1.5; age-sex estimate and place of residence-sex estimate=10 groups, and non-response rate=20. A total of 513 EAs were covered nationwide. Stratifying the sampling design by urban rural, 404 rural EAs and 109 to urban EAs. Taking into account the cost of the study and the level of precision - 20 Households (HHs) per EA and one eligible individual from each HH-the sample size the final sample size is calculated to be 10,260 HHs (10,260 study participants). Thus, 10,260 study participants were included in the study. A mix of sampling approach namely stratified, three-stage cluster sampling, simple random sampling and Kish method were employed to select the study settings and the study participants. Prior to sampling, supervisors and data collectors visited the selected EAs and conducted a fresh listing of all HHs in that EA in consultation with local health workers and any other active member who have a good understanding of the local context. Eligible individuals were selected from HHs using Kish method. Only one eligible participant in the selected HH was enrolled in the survey. Using the Kish method, eligible participants in each household were ranked in order of decreasing age, starting with men followed by women. Finally 9,800 participants were responded to the questions and making a response rate of 95.5%. As a result 5823 women were included in our analysis (Figure 1).

Measurement and ascertainment of variable

Cervical cancer screening status was assessed by asking about whether participants had undergone visual inspection with acetic acid (VIA) testing, a Pap smear and/or human papilloma virus (HPV) test.

Data collection and management

Data collection was done simultaneously at the 9 regions and 2 city administration by trained nurses and lab professionals during a face to face interview, using standardized questionnaire. Data were collected digitally using personal digital assistants (PDAs), eSTEPs software was used to design and program the data collection tools in the PDAs. The use of the software and PDAs to collect the data helped to generate the final dataset quickly following the completion of data collection. The collected datasets were stored in the device as well as the memory card in rml format. The rml files from the PDAs were transferred to the supervisors tablet computers via the Windows Mobile Device Centre. The files were then transferred to a central server located at EPHI via Internet file streaming system (IFSS) software. IFSS is an application that connects to and exchanges data with the server component. Supervisors managed tablets supported by internet (EVIDEO) and run the IFSS icon (IfssClientPC.exe) located in their desktop to send all the updated data files to central server by entering their user name and password. Finally IFSS automatically perform Automatic packaging and delivering file and Automatic receiving of incoming files. Data was managed using Excel and Stata software.

Data analysis

Descriptive analysis was done along with bivariate and multivariate analysis was conducted for cervical cancer screening. Further statistical analyses were done by using chi-squared tests and logistic regression models. Chi-squared tests were used when comparing groups. All factors with a p-value<0.05 in the bivariate analysis were further entered into the multivariate model to control for confounding effects. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. Statistical significance was accepted at the 5 level (p<0.05). All statistical tests were performed using STATA version 14.0 software (College Station, Texas 77845 USA).

Ethical clearance

Principles of Ethics were considered. Data were collected unlinked anonymously, without any personal identifiers. For the purpose of data collection, informed consent was obtained from the study participants before administering the questions/collecting blood sample and objectives of the study was explained to the participants by the data collectors. For under eighteen children (age<18 years) survey participants assent and consent from their parents or guardians was obtained. Ethical clearance was obtained first from the University of South Africa, Department of Health Studies, second from the EPHI Institutional review board (IRB) then from National research and Ethics review committee. Furthermore, official letter was produced and delivered to the respective regional health bureaus by EPHI during fieldwork.

Results

Socio-demographic characteristics

In this survey, a total of 5823 women were enrolled with 97 percent response rate of the 6000 originally estimated sample size. Majority of the study participants (43.2%) were in the age group 15-29 years followed by 41.3% of participants in the age group 30-44 years of age. Amhara (27.9%) and Oromo (27.8 percent) ethnic groups together comprised more than half of the study participants. Most of the participants were also from Oromia (22.5%) and Amhara (17.9%) followed by SNNPR (16.8%) regions respectively. Nearly seven out of ten study participants were dwellers from the rural area. More than half (56.6%) of the respondents attended no formal education and only 3.9% of them attended college and above level training. More than six in ten (63.8%) of the study participants were married and/or cohabitating. The study showed that seven in ten (71.4%) of the respondents were getting the annual income of less than ≤12,000 ETB (Table 1).
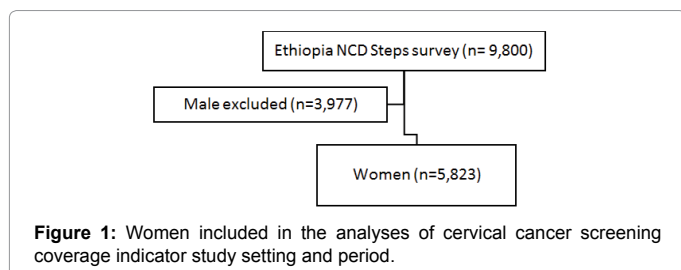

Figure 1: Women included in the analyses of cervical cancer screening coverage indicator study setting and period.

Background Characteristics		Area of residence					
		Urban		Rural		Total	
		n	%	n	%	n	%
Region	Tigray	130	6.8	465	11.9	595	10.2
	Afar	40	2.1	168	4.3	208	3.6
	Amhara	291	15.2	749	19.1	1040	17.9
	Oromiya	290	15.2	1023	26.1	1313	22.5
	Somali	133	7	267	6.8	400	6.9
	Benishangul Gumuz	44	2.3	155	4	199	3.4
	SNNPR	217	11.4	759	19.4	976	16.8
	Gambela	41	2.1	107	2.7	148	2.5
	Harari	28	1.5	98	2.5	126	2.2
	Dire Dawa	41	2.1	120	3.1	161	2.8
	Addis Ababa	655	34.3	2	0.1	657	11.3
	Total	1910	100	3913	100	5823	100
Age Group	15-29	798	41.8	1720	44	2518	43.2
	30-49	776	40.6	1630	41.7	2406	41.3
	50+	336	17.6	563	14.4	899	15.4
Ethnicity	Oromo	402	21	1216	31.1	1618	27.8
	Amhara	778	40.7	846	21.6	1624	27.9
	Tigray	204	10.7	462	11.8	666	11.4
	Somali	80	4.2	292	7.5	372	6.4
	Wolayita	51	2.7	79	2	130	2.2
	Sidama	24	1.3	171	4.4	195	3.3
	Gurage	155	8.1	55	1.4	210	3.6
	Hadiya	26	1.4	77	2	103	1.8
	Afar	17	0.9	162	4.1	179	3.1
	Gamo	23	1.2	59	1.5	82	1.4
	Others	149	7.8	492	12.6	641	11
Level of Education	No Formal Education	615	32.2	2683	68.6	3298	56.6
	Primary Education	861	45.1	1060	27.1	1921	33
	Secondary Education	260	13.6	114	2.9	374	6.4
	College and above	174	9.1	56	1.4	230	3.9
	Total	1910	100	3913	100	5823	100
Marital status	Single	892	46.7	1216	31.1	2108	36.2
	Married	1017	53.3	2696	68.9	3713	63.8
	Total	1909	100	3912	100	5821	100
Employment status	Employed	765	40.5	1912	49.3	2677	46.4
	Unemployed	1124	59.5	1970	50.7	3094	53.6
	Total	1889	100	3882	100	5771	100
Household Income level (annual)	≤12,000 Birr	971	60.4	2401	77.1	3372	71.4
	>12,000 ≤ 18,000 Birr	179	11.1	319	10.2	498	10.5
	>18,000 ≤ 23,300	57	3.5	135	4.3	192	4.1
	>23,300 ≤ 30,000	197	12.3	126	4	323	6.8
	>30,000	204	12.7	132	4.2	336	7.1
Currently smoke any tobacco	Yes	30	1.6	49	1.3	79	1.4
	No	1879	98.4	3862	98.7	5741	98.6
	Total	1909	100	3911	100	5820	100
Ever smoke any tobacco products	Yes	14	0.7	6	0.2	20	0.3
	No	1865	99.3	3855	99.8	5720	99.7
	Total	1879	100	3861	100	5740	100
Ever consumed any alcohol	Yes	846	44.3	1472	37.6	2318	39.8
	No	1063	55.7	2439	62.4	3502	60.2
	Total	1909	100	3911	100	5820	100
Consumed alcohol in the past 12 months	Yes	748	88.4	1297	88.1	2045	88.2
	No	98	11.6	175	11.9	273	11.8
	Total	846	100	1472	100	2318	100
Consumed any alcohol within the past 30 days	Yes	617	82.5	1176	90.7	1793	87.7
	No	131	17.5	121	9.3	252	12.3
	Total	748	100	1297	100	2045	100

Table 1: Distribution of sociodemographic characteristics of study participants (N=5,823), Ethiopia.

Cervical cancer screening coverage

Women respondents were asked whether they had ever had a screening test for cervical cancer. Of all the women age 15-69 years participating in the study, only 2.9% (95 CI: 2.5-3.4) reported ever having undergone a screening test for cervical cancer. The highest proportion of testing among women was in the age group 50 and above years, with 4.1% (95 CI: 3.0-5.6). Women in urban areas (6.9%) were more likely to have undergone cervical cancer screening than the rural (0.9%) women population (Table 2).

Factors associated with cervical cancer screening coverage

To identify the association of cervical cancer screening coverage, with socio demographic characteristics, bivariate and multivariate logistic regression analysis was conducted. After performing bivariate analysis, based on the significance levels of each independent variable multivariate analysis was conducted. Among the non-modifiable factors only age of the participant was associated with cervical cancer screening. Among the modifiable factors, area of residence, level of education and household income of the respondent were associated with cervical cancer screening. Based on the findings, cervical cancer screening is significantly associated with being at urban area (AOR=2.5, 95% CI: 1.1, 5.7), age 30-49 years (AOR=2.4, 95% CI: 1.2, 4.8), having annual household income of more than 30,000 ETB (AOR=7.1, 95% CI: 4.8, 10.4) and college and above level of education (OR=2.8, 95% CI: 1.1, 7.8). Women age 30-49 years were 2.4 times, living in urban area were 2.5 times, having secondary education were 3.6 times, having college and above level of education were 2.8 times, having household annual income of more than 23,300 to 30,000 ETB were 2.1 times and having household annual income of more than 30,000 ETB were 7.1 more likely to be screened for cervical cancer than their counter parts. There is no statistically significant different among the agrarian, emerging and urban regions (Table 2).

Discussion

Epidemiological studies have consistently shown a strong association between the risks of acquiring cervical cancer, exposure to Human Papilloma Virus (HPV) and factors linked to early sexual activity such as early marriage, young age at first pregnancy, large total number of pregnancies, short mean interval between pregnancies, and multiple sexual partners and all these risk factors are highly prevalent in Ethiopia [10]. The strategic statement of the national cancer control and prevention strategy indicated that Ethiopia will have a system of cancer prevention and control that will reduce cancer incidence, morbidity and mortality through the adoption of a multi-sectoral approach, implementation of concrete and sustainable actions, according to the priorities, taking the greatest advantage of available resources [2]. Therefore, in this study we have identified the coverage of cervical cancer screening rate in Ethiopia and its associated factors. The Ethiopian FMOH recommends cervical cancer screening every five years following normal results irrespective of HIV status following abnormal results and/or treatment, repeat screening in one year. If follow-up screening is normal, return to screening every five years [5]. Cervical cancer is a recognized complication of STI, related to infection

Background Characteristics		Cervical Cancer Screening Coverage			
		n	Percentage (95%CI)	COR [95CI]	AOR [95CI]
Regions	Emerging regions	38	4.0% (2.9, 5.4)	1	1
	Agrarian regions	52	1.3% (1.0, 1.7)	0.3 (0.2, 0.5)	0.6 (0.2, 1.6)
	Urban regions	79	8.4% (6.8, 10.3)	2.2 (1.5, 3.3)	1.1 (0.4, 3.2)
Area of residence	Urban	131	6.9% (7.8, 8.1)	7.5 (5.2, 10.8)	2.5 (1.1, 5.7)*
	Rural	38	1.0% (0.7, 1.3)	1	1
Age Group	15-29	41	1.6% (1.2, 2.2)	1	1
	30-49	91	3.8% (3.1, 4.6)	2.4 (1.6, 3.5)	2.4 (1.2, 4.8)*
	50+	37	4.1% (3.0, 5.6)	2.6 (1.6, 4.1)	2.3 (0.9, 6.0)
Level of Education	No Formal Education	67	2.0% (1.6, 2.6)	1	1
	Primary Education	55	2.9% (2.2, 3.7)	1.4 (.9, 2.0)	1.1 (0.5, 2.5)
	Secondary Education	27	7.2% (5.0, 10.3)	3.7 (2.4, 5.9)	3.6 (1.4, 9.2)*
	College and above	20	8.7% (5.7, 13.1)	4.6 (2.7, 7.7)	2.8 (1.1, 7.8)*
Household Income level (annual)	≤12,000 ETB	78	2.3% (1.9, 2.9)	1	1
	>12,000 ≤ 18,000 ETB	10	2.0% (1.1, 3.7)	0.8 (0.4, 1.7)	1.7 (.8, 4.2)
	>18,000 ≤ 23,300 ETB	6	3.1% (1.4, 6.8)	1.3 (0.6, 3.2)	1.0 (0.2, 4.5)
	>23,300 ≤ 30,000 ETB	20	6.2% (4.0, 9.4)	2.8 (1.7, 4.6)	2.1 (1.1, 4.7)*
	>30,000 ETB	24	7.1% (4.8, 10.4)	3.2 (2.0, 5.2)	7.1 (4.8, 10.4)*
Currently smoke any tobacco	Yes	9	11.4% (6.0, 20.5)	4.4 (2.2, 9.2)	6.5 (0.8, 10.5)
	No	160	2.8% (2.4, 3.2)	1	1
Currently consume alcohol	Yes	47	2.6% (2.0, 3.5)	1	1
	No	14	2.2% (3.3, 9.2)	2.2 (1.2, 4.0)	1.6 (0.8, 3.2)
National cervical cancer screening coverage		169	2.9% (2.5, 3.4)	NA	NA

Table 2: Distribution of sociodemographic factors associated with having had a screening pap smear in their life time (N=5,823), Ethiopia.

with a few specific strains of human papilloma virus. Screening and treatment of early stages (cervical dysplasia) can reduce cervical cancer mortality by 80% or more among screened women. In resource-poor settings like Ethiopia, 30 to 49 year old women comprise the target audience for screening because cervical cancer is rare in women under 30 [5]. Screening younger women will detect many lesions that are not likely to develop into cancer, will lead to considerable overtreatment, and are not cost-effective. In Ethiopia visual inspection with acetic acid (VIA) screening of cervical cancer is recommended [5]. For HIV negative women ,the target age groups for VIA are of women age 30-49 years while in case of HIV positive women the age is lowered to 25 years [5-12]. In this study the coverage of cervical cancer screening among Ethiopian women age 15-69 years was found to be very low as compared to findings from other African, Asian and developed country findings such as the cervical cancer screening rate of 21% in Tanzania [13]. 16.5-19.1% in Brazil Martins et al. 14-66% in France [14]. 34.7-73.9% in Finland Idehen et al. 51.9% in Korean, 75% in Canada and 75.6% in Spain. The possible explanation for this low coverage of cervical cancer screening could be due to the fact that the low level of awareness, limited access to screening services and lack of a national

cancer prevention and control strategy in Ethiopia. Ethiopia has invested little in the infrastructure, training, and laboratory capacity required for successful Pap smear screening. As a major public health problem, the disease disproportionately affects the country's most vulnerable: poor, rural, and HIV-positive women. Sociodemographic and economic conditions of the study women were the contributing factors to low cervical cancer screening rate in Ethiopia. Women age 30-49 years was 2.4 times more likely to be screened for cervical cancer than those in the age group of 15-29 years. This is consistent with the recommended age groups of the Federal Ministry of Health [5]. Living in urban area were 2.5 times, having secondary education were 3.6 times, having college and above level of education were 2.8 times, having household annual income of more than 23,300 to 30,000 ETB were 2.1 times and having household annual income of more than 30,000 ETB were 7.1 more likely to be screened for cervical cancer than their counter parts. This is consistent with other findings where the factors positively associated with screening were age 26 to 55 years, certain regions and higher SEL in Spain Puig-Tintoré et al. [12] Higher education (OR=2.63; p=0.014), among Russians Idehen et al. A significant relationship was found between regular CS and level of education in France Grangé [14]. Education was significantly associated with the participation rate for women aged 45-64 years old in Korea [15]. And higher prevalence ratios of cervical cancer screening failure were seen among women with low education, low per capita income and old age [11].

Conclusion and Recommendation

Cervical cancer screening rate in Ethiopia is extremely low as compared to the rates of other countries. Among the sociodemographic and economic variables contributing to the increased cervical cancer screening rate were advanced age of women, urban area of residence, high level of education and high household income of the women. This study outlines the major contributing factors for low cervical cancer screening in Ethiopia which should receive due priority in Ethiopia to establish and strengthen the multi-sectoral response in general for the prevention and control of cervical cancer and increasing awareness of the community towards cervical cancer screening and strengthening the health system in particular.

Availability of data and material

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests

The corresponding author declares that there is no financial or non-financial competing interest.

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Authors' contributions

All authors contributed equally during the process of proposal development and report write of the research.

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