



**CERVICAL CANCER SCREENING IN ETHIOPIA:
UNDERSTANDING CONTEXTS, DETERMINANTS AND EFFECT
OF COUPLE EDUCATION ON THE UPTAKE OF CERVICAL
CANCER SCREENING AMONG WOMEN IN SOUTHERN
ETHIOPIA**

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Cervical Cancer Screening In Ethiopia: Understanding Contexts, Determinants and Effect of Couple Education on the Uptake of Cervical Cancer Screening among Women in Southern Ethiopia

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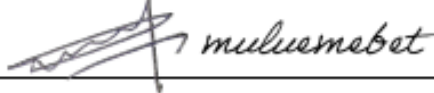
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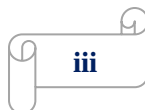
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DEDICATION

This work is dedicated to mothers who lost their lives due to cervical cancer.

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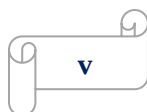
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LIST OF ORIGINAL PAPERS

This dissertation work is based on the following three published papers

- I. Determinants of cervical cancer screening utilization among women in Southern Ethiopia: Case control study. Published on *Scientific Reports*, 2022; doi: <https://doi.org/10.1038/s41598-022-18978-z>
- II. Women's and health professionals' perceptions, beliefs & barriers to cervical cancer screening uptake in Southern Ethiopia: a qualitative study. Published on *Sexual and Reproductive Health Matters*, 2023; doi: <https://doi.org/10.1080/26410397.2023.2258477>
- III. Effectiveness of couple education and counseling on knowledge, attitude and uptake of cervical cancer screening among women in Southern Ethiopia: cluster randomized control trial. Published on *Scientific Reports*, 2024; doi: <https://doi.org/10.1038/s41598-024-61988-2>

ACRONYMS AND ABBREVIATIONS

AORTIC	African Organization for Research and Training in Cancer
ASIR	Age Specific Incidence Rate
ASMR	Age Specific Mortality Rate
BCC	Behavior Change Communication
CC	Cervical Cancer
CCS	Cervical Cancer Screening
CIN	Cervical Intraepithelial Neoplasia
CIS	Carcinoma In Situ
cm	Centimeter
CRCT	Cluster Randomized Control Trial
CRT	Cluster Randomized Trial
DNA	Deoxyribonucleic Acid
Dr.	Doctor
ECHO	Extension for Community Healthcare Outcomes
FGA	Family Guidance Association
FGDs	Focus Group Discussion
FMOH	Federal Ministry of Health
GATHER	Greet, Ask, Tell, Help, Explain, Return
GLOBOCAN	Global Cancer Observatory
HAART	Highly Active Anti-Retroviral Therapy
HBM	Health Belief Model
HDI	human development index
HIV	Human Immune Deficiency Virus
HP	Health Professionals
HPV	Human Papilloma Virus
hrHPV	High Risk Human Papilloma Virus
ICC	Invasive Cervical Cancer
IUD	Intra Uterine Device
kg	Kilogram
KI	Key Informants

LHA	Lay Health Advisors
LMICs	Low- and Middle-Income Countries
NCCP	National Cancer Control Plan
NCD	Non-Communicable Disease
OR	Odds Ratio
RCT	Randomized Controlled Trial
SMS	Short Message Service
SNNPR	Southern Nations Nationalities and Peoples' Regional State
sq. km	Square Kilo Meter
SRS	Simple Random Sampling
SSA	Sub-Saharan Africa
STD	Sexually Transmitted Diseases
STI	Sexually Transmitted Infection
TASH	Tikur Anbesa Specialized hospital
US	United States
VIA	Visual Inspection with Acetic Acid
WCBA	Women of Child Bearing Age
WHO	World Health Organization

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ABSTRACT

Background

Majority of Human Papilloma Virus infections resolve naturally, but progress to precancerous lesions whenever there is persistent infection. When treatment is delayed, the precancerous lesions progress to the advanced cancerous stage. Cervical cancer is a major cause of morbidity & mortality in women mainly in resource-limited nations including Ethiopia due to lack of early detection & treatment brought by poor implementation & uptake of screening programs. Therefore, identification of determinants, understanding of the context and implementation of effective interventions aimed at increasing screening uptake for early detection and treatment can lead to a significant reduction in the morbidity & mortality associated with advanced disease.

Objectives

The objective of this study was to understand the context, identify determinants of screening uptake and determine the effectiveness of couple education and counseling on knowledge, attitude and uptake of cervical cancer screening among women in Southern Ethiopia.

Methods

This study involved three types of research designs namely, case control study, qualitative research method and cluster randomized trial. In the intervention study, we randomly assigned 16 clusters in to two arms, the intervention and control arm. Health education and counseling intervention was given to the intervention group while the control group received the usual standard of care. Baseline and endline surveys were completed by interviewing 288 women to evaluate the effect of the intervention on the screening uptake. In the case control study 410 eligible women for cervical screening (206 cases and 206 controls) were interviewed and the determinant exposure factors for cervical cancer screening uptake were identified using logistic regression model. For qualitative study we used, five focused group discussions among women and six key informant interviews among health professionals to explore the perceptions, beliefs and barriers to cervical cancer screening uptake.

Results

This study revealed that cervical screening uptake increased from 2.1% to 72.5% in the intervention group, the proportion of women who had been aware of cervical cancer and screening grew from 22.9% to 100%, and participants' mean knowledge scores showed

improvement from 3.18 to 11.9 ($p < 0.001$). The intervention brought statistically positive changes in the mean perceptions scores across the study period. Also, the difference in differences of screening uptake between the study groups was statistically significant ($p = 0.021$) and the intervention and husband's education were significant determinants of screening uptake ($p = 0.002$).

It also demonstrated that urban residence, being in marital union, membership in women development army, knowledge of cervical cancer screening location, use of maternal health care in the previous year and knowledge on cervical cancer and its screening were determinants for cervical screening uptake among women. Moreover, the study identified low level of awareness and perceived risk, low perceived benefit of health screening for cervical cancer shown by low screening utilization. There were various individual and psychosocial barriers to screening uptake which included low awareness, fear of stigma, low perceptions towards health screening and causes of the disease, and low level of perceived risk. The study also identified system related barriers to screening such as shortage of trained health human power and material resources, low implementation of screening program, trained health human power turnover and lack of close follow up.

Conclusion and recommendations

Receiving educational and counseling intervention, urban residence, being in marital union, membership in women development army, knowledge of screening location, use of maternal health care and knowledge regarding cervical cancer and its screening were determinants of screening uptake. Lack of awareness, misconceptions and misperceptions were common among women. Screening utilization and its implementation level was low due to individual, psychosocial and system related barriers. Therefore, it is important to create awareness, improve women's knowledge and perceptions on cervical cancer through structured home based couple education and counseling, promoting maternal health care use, disseminating cervical cancer information through women's groups to improve screening utilization among women group. Also, behavioral change communication and system strengthening efforts need to be in place to effectively tackle the observed gaps in the implementation of cervical screening program.

CHAPTER 1: INTRODUCTION

Background

Cervical cancer is a malignant, autonomous and uncontrolled growth of cells and tissues of the cervix. Such growth forms tumours, which may invade the tissues around the cancer and cause new growths similar to the original cancer in distant parts of the body. The revised FIGO staging system describes four stages of cervical cancer, from stage I to stage IV. In stage I, the disease is confined to the cervix; In stage II, cancer has spread outside the cervix into the upper vagina or to the tissue beside the cervix (parametrium), but not to the sidewalls of the pelvis; In stage III, cancer has spread to the lower part of the vagina or all the way through the parametrium to the sidewalls of the pelvis; In stage IV, cancer has spread to surrounding organs or distant tissue, such as the lungs and distant lymph nodes. The primary cause of cervical cancer is, persistent or chronic infection with one or more of the high-risk cancer-causing or oncogenic types of HPV (WHO, 2014).

The most common strains of Human Papilloma Virus (HPV) in Africa are 16 and 18 which cause over 65% of cervical cancer cases in Sub-Saharan Africa (SSA) (Bruni *et al.*, 2010). HPV is the necessary cause for the development of cervical cancer which is mainly transmitted through sexual intercourse. Majority of HPV infections resolve naturally, but it progresses to precancerous lesions whenever there is persistent infection. When treatment is delayed beyond the precancerous stage, the lesions progress to advanced cancerous stage. The precancerous lesion usually takes 10 to 20 years to advance into invasive cervical cancer. This, in majority of the cases, gives a good opportunity to prevent the development of advanced cervical cancer through early detection and treatment of precancerous lesions (WHO, 2014). Despite this opportunity, cervical cancer disease has been persistent public health problem globally.

An estimated 604 127 cervical cancer cases and 341 831 deaths occurred globally in 2020 among women. Cervical cancer incidence was three times and mortality rates were six times higher in countries with low Human Development Index (HDI) compared with very high HDI in the year (Singh *et al.*, 2020). Also, in 2018, cervical cancer occurred nearly in 570 000 women and 311 000 women died from the disease worldwide. Globally, cervical cancer was the fourth most common cancer and the fourth leading cause of cancer death among women. Nearly 84% of all cervical cancer cases and 88% of all deaths due to cervical cancer took place in resource-limited

nations. But in resource-rich countries the incidence and mortality due to cervical cancer were two to four times lower than what had been seen in resource scarce countries (Arbyn *et al.*, 2020).

In its incidence and mortality rates, cervical cancer ranks the second after breast cancer in lower human development index (HDI) regions of the world. Larger proportions of cervical cancer cases and deaths occurred in SSA countries. Of these, Eastern Africa shared the highest mortality rate due to cervical cancer in 2018 (Bray *et al.*, 2018). Also it has been reported that the highest prevalence of cervical infection with HPV is recorded in SSA countries (De Vuyst *et al.*, 2013). According to the projections made by World Health Organization (WHO), it will be responsible for 443,000 deaths in 2030 globally (WHO, 2012). Of these deaths, 98% will occur in low income countries, with SSA facing the highest number of deaths (Ferlay *et al.*, 2015).

Cervical cancer incidence and mortality have been considerably reduced in high resource countries during the last few decades. This is mainly due to the implementation of screening packages for the detection of precancerous cervical lesions and HPV. The availability of improved treatment options also played their role in this regard (Denny *et al.*, 2017) . However, in low and middle income countries where access to screening and treatment measures is limited, cervical cancer remains a significant public health problem (Bray *et al.*, 2018).

Statement of the problem

Global context

In 2012, the global cancer statistics showed that there were an estimated 527,600 new cervical cancer cases and 265,700 deaths worldwide (Torre *et al.*, 2015). Also, nearly 570, 000 women developed cervical cancer and 311, 000 women experienced cervical cancer deaths in 2018 worldwide. Globally it was the fourth most common cancer and the fourth major cause of cancer death among women in the year (Arbyn *et al.*, 2020; Bray *et al.*, 2018). Nearly 84% of all cervical cancers and 88% of all deaths caused by cervical cancer occurred in lower-resource countries but the incidence and mortality was two to four times lower in well developed countries (Arbyn *et al.*, 2020). All these numbers clearly describe that there have been heavy burden of cervical cancer among women in less developed regions of the world where women living in LMICs are increasingly at high risk of preventable morbidity and mortality due to cervical cancer (WHO, 2014). The statistics also shows an increasing trend in disease burden.

Regional context

In SSA, in 2012, the highest incidence rates of cervical cancer were observed (Torre et al., 2015) and it was the second most common cancer of reproductive-age women (Black and Richmond, 2018). It accounted for 25.2% of all cancer cases following breast cancer in the year (Harvey, Adeyoku and Brough, 2017). Moreover, in 2018, the highest disease burden due to cervical cancer was observed in eastern and southern Africa. In this year, cervical cancer was the most commonly diagnosed cancer in 28 countries and the leading cause of cancer death in 42 countries, of which the vast majority are found in Sub-Saharan Africa (Bray et al., 2018). Southern and Eastern Africa share the highest burden of cervical cancer (Bruni et al., 2019).

Disease situation in Ethiopia

According to world's summary report of HPV and related diseases, almost 6,300 new cervical cancer cases and about 4,884 deaths due to cervical cancer occurred among women each year in Ethiopia. This makes cervical cancer the second-most common, and the second-most deadly cancer in the country among women (Bruni *et al.*, 2019). In the country, the estimated number of new cases of cervical cancer was 6047 with age specific incidence rate of 22% in 2015. Cervical cancer accounts for about 20% of all identified female cancer cases in 2015 (Tessema *et al.*, 2018). In a trend analysis of the TASH cancer registry data, 5293 cervical cancer cases were diagnosed between 1997 and 2012. Cervical cancer cases accounted for 31.8% of all new cases of cancer and showed numeric increment during this period (Abate, 2015).

Determinant factors

Studies have repeatedly reported that invasive cervical cancer develops in the third decade and later years and women who remain chronic HPV carriers are high risk group for cervical cancer (Bosch *et al.*, 2001). Also, cervical cancer is the most common cancer in women younger than age 50 years (Lou *et al.*, 2018). It was demonstrated that smoking and HPV infection were significantly associated with the risk of cervical cancer and women who had sexual activity within 5 years of menarche were at increased risk for cervical cancer compared with those women who postponed it six years beyond menarche (Natphopsuk *et al.*, 2012).

A study conducted in Shirdi Sai Baba Cancer Hospital and Research Centre, Manipal, Udupi District, identified marital status (married), history of alcohol use, age at menarche of 13-14, age at first coitus (<18 years), history of abortion and parity of ≥ 3 to be the risk factors for cervical

cancer development (Sharma and Pattanshetty, 2018). Also, in a study conducted in Addis Ababa Ethiopia, age group (40-49), history of sexually transmitted infections (STIs), lifetime sexual partners of the women and the husband were identified as significantly associated factors for cervical precancerous lesions (Teame *et al.*, 2018).

Prevention efforts and challenges

The incidence and mortality associated with cervical cancer has been considerably declined in resource rich countries during the last decades. This is mainly due to the execution of screening services for the detection of precancerous lesions and HPV and the introduction of better therapeutic options (Denny *et al.*, 2017). Cervical cytology (Papanicolaou) played a significant role in detecting cervical cancer lesions mainly in high income countries though it has been less effective in low and middle income countries (Sankaranarayanan, 2014) where majority of deaths occur and cervical cancer remains a major public health problem (Bray *et al.*, 2018). With the advance of technology, new screening technologies like visual inspection with acetic acid (VIA) and HPV-based techniques to improve cervical cancer detection (Sahasrabuddhe *et al.*, 2012). In 2013, WHO suggested HPV-based screening programs as first-line approach, after then many LMICs endorsed this technique (WHO, 2013).

In African context, though there is policy support in different countries, there have been many challenges facing the prevention and control efforts of cervical cancer which include low government's financial commitment, inadequately implemented guidelines, low program coverage and low services quality (Tsu *et al.*, 2018). Many countries in SSA spend limited health budget compared to high income countries. Treatment of high number of patients with cancer will be impossible for most health-care systems in SSA as it generally needs a considerable investment in infrastructure (Abdel-Wahab *et al.*, 2013). Competing health needs particularly for tuberculosis, malaria, maternal mortality, and HIV epidemic, the scarcity of health care human power, and lack of adequately trained health care providers and the brain drain were continuing challenges for cancer control in SSA (Morhason-Bello *et al.*, 2013).

Access to prevention, early diagnosis, treatment, and palliative care for cancer-related disease is insufficient and the availability of cancer treatment is especially low in Africa (Abdel-Wahab *et al.*, 2013). Despite the importance of early detection to reduce cancer morbidity and mortality, most people diagnosed with cancer in Africa have advanced disease, which is only suitable for

palliative care (Adesina *et al.*, 2013). There have been other challenges responsible for the cancer burden in SSA which include insufficient cancer data for sustainable research; high cost of immunization against human papillomavirus; absence of collaboration among stakeholders and donors to combat cancer (Sambo *et al.*, 2012).

As studies demonstrated, one of the main reasons of high cancer mortality in SSA is low public knowledge and awareness about cancer which contributed to lower levels of cervical screening uptake. For example in a study conducted in Nigeria in 2011 among women attending gynecology clinics, 12.6% were aware of cervical cancer screening and only 8% were knowledgeable about cervical cancer prevention (Mbamara *et al.*, 2011). In another study conducted in South Africa in 2010 among female students, 33.0% were aware of cervical cancer and 31.0% had heard of Pap smear test (Hoque, 2010).

Additionally, in a study conducted in Tanzania among nurses, low level of awareness has been documented (Urasa and Darj, 2011). Moreover, different studies conducted among different segments of female population in Ethiopia determined the importance of knowledge in the uptake of cervical cancer screening. Accordingly, study conducted in Assosa (Gelassa *et al.*, 2023), Addis Ababa (Misgun and Demissie, 2023), Durame (Amado *et al.*, 2022), Shashemene (Argaw, Embiale and Amare, 2022) and Gurage zone (Endalew *et al.*, 2020) have demonstrated that better knowledge & information regarding cervical cancer is connected with better uptake of cervical cancer screening. This reveals that low awareness is a barrier to receive cervical screening.

Cancer advocacy is also an important area of weakness in sub-Saharan Africa (CISN, 2014). Problem in the organization of national cancer programs (NCCP) within the ministries of Health in African countries is an additional barrier. In most African countries, the structure is inconsistent, not suitable to mobilize resources and partners for NCCP implementation. NCCPs are part of the non-communicable disease (NCD) program which is usually coordinated by cancer-control or an NCD program officer with no dedicated cancer-control budget line (Duncan *et al.*, 2019). There are also locally operating contextual factors which made cancer control challenging that include poverty and the financial barriers to treatment, religious and cultural beliefs, stigma around cancer and other medical morbidities (Randall and Ghebre, 2016).

The Federal Ministry of Health (FMOH) Ethiopia in collaboration with Pathfinder piloted VIA screening services combined with access to cryotherapy. The service was introduced in 2009 as a single-visit approach to cervical cancer prevention integrated into a comprehensive care package for people living with HIV at 14 Hospitals. Later on the Ministry has scaled up the service further into public healthcare facilities and has developed comprehensive cervical cancer prevention and control guideline along with preparation of VIA and cryotherapy training materials. Accordingly, due to the difficulty of sustaining a high quality cervical cytology-based screening program, and the proven effectiveness of the VIA approach, the ministry has endorsed VIA with cryotherapy as the best approach for cervical cancer prevention and control in the country (FDRE MOH, 2015).

Before the implementation of this guideline, nearly 1% of age-eligible women ever received screening (Gakidou, Nordhagen and Obermeyer, 2008). But more recent studies reported an uptake of 9.9% –15.5% in selected populations in Southern and Southwest Ethiopia (Yitagesu, Samuel and Tariku, 2017, Dulla, Daka and Wakgari, 2017, Nigussie, Admassu and Nigussie, 2019). The progress shows a promising trend, though it is far away from 80% target coverage nationally set for the 30-49 years population by 2020 (FMoH, 2015). This huge gap happens despite the efforts in the health system that target cervical cancer prevention and control. This demands a proven and effective intervention to be in place that increase the uptake of cervical cancer screening among women group.

According to the SNNPRG regional report, cervical screening plan constitutes 206,238 women for 2020/21. This represents 12.7% of the eligible women in the region. The 2020/21 nine months' performance report showed that the screening performance was only 6.8% (14,108) of the regional plan (206,238) i.e. on average only one woman from twenty received screening. The performance varied across zones and Hadiya & Kembata-Tembaro zones have been labeled among the low performing zones in this regard. The two zones altogether contributed only 1.64% of the regional screening performance in the year. On the other hand, the proportion of precervical cancer in the reporting period was 9.84% & 4.7% for the zones respectively which is relatively higher capable of calling for public health intervention. This scenario drew our attention to target the problem in this area to understand the context, identify determinants & test the effect of education intervention on cervical cancer screening uptake.

The national health care system has been implementing health education and awareness activities on priority health problems, including cervical cancer, through the existing health care facilities and health extension program. The implementation of cervical screening program has been integrated into the health system to attain the desired targets in the screening program. However, despite the efforts, the implementation of the screening program has been weak in that women's knowledge level is low & the screening performance is far below the national target for 2020 (80% screening coverage) among the target women that show its ineffectiveness in achieving the desired targets. For this reason, we designed & structured the way how the health education intervention should be delivered at home environment for the couple to positively influence woman's knowledge, perceptions and screening behavior through the health extension program.

Significance of the Study

Despite the importance and availability of screening services in Ethiopia, only few of eligible women underwent screening for cervical cancer and the national performance in this regard shows extensive gap in the implementation of the screening program. There should be research that contributes positively and fills the observed gaps in the implementation of the screening programs. Moreover, researches which target effectiveness of educational interventions have not been conducted to improve cervical cancer screening uptake among eligible women in Ethiopia.

Also, contextual factors might have influenced and contributed to the observed low level of knowledge and cervical cancer screening uptake among the target group. In this regard, studies involving strong designs are needed to identify determinant factors to the uptake of cervical screening through case control study and explore the context of cervical screening program using qualitative research methods that generate inputs for planners and programmers to design appropriate locally adapted intervention modalities to overcome the implementation bottlenecks.

This research, therefore, aimed to bridge the observed information gaps by exploring the context of cervical cancer screening program, identifying determinants of cervical cancer screening use and determining the effect of structured couple based brochure assisted education intervention and counseling on the uptake of cervical cancer screening among eligible women. The findings of this study will also help in policy design & scale up of the intervention to improve the performance of cervical screening programs.

CHAPTER 2: LITERATURE REVIEW

Effect of health education on knowledge, attitude and uptake of screening

A number of randomized trials have been conducted to check the effectiveness of different health interventions on the knowledge, perceptions and screening uptake. In the community based clinical trial conducted in Barcelona, all the three intervention strategies significantly increased women's participation to screening services compared to the control group (Acera *et al.*, 2017). Similarly, in Turkey, in three health intervention modalities, the cervical cancer screening rates in the brochure + education group, and knowledge scores in the brochure + education and brochure only groups were significantly higher compared to the invitation-only group (Kurt and Akyuz, 2019). In the same country, the behavior, knowledge, and beliefs were evaluated where knowledge about cervical cancer was significantly higher in study group compared to control group. But, the study was limited to a certain group of women living in the apartments which might not represent the general women group. In addition, appropriate sampling techniques were not employed in participants' selection mechanisms (Bebis *et al.*, 2012).

In a study in rural Kenya, awareness and mean knowledge scores increased significantly after a brief health educational intervention with no significant difference in screening rates between the groups. This study did not explicitly frame the sample size & sampling procedures to ensure validity of the findings to generalize to the target women (Rosser, Njoroge and Huchko, 2015). Also, in Cameroon the impact of video based group health education produced a significantly higher knowledge about HPV and cervical cancer among the intervention group than the control group. However, the sampling techniques employed to recruit study participants were non probabilistic where only women who are interested and avail themselves on the days of sampling were included in the study which could have threatened the external validity of the findings (Sossauer *et al.*, 2014). Moreover, in a trial involving personal invitation letter with an information pamphlet, followed by a telephone reminder with counseling resulted in significantly higher proportion of participants in action stage for pap-smear screening in the intervention arm than the control group (Abdullah and Su, 2013).

Though, there has been methodological gap in terms of explicitly explaining the way how participants were invited for cervical cancer screening, a hospital based health information interventional study conducted in Ibadan, Nigeria, among women attending antenatal clinics,

showed significant improvement in women's knowledge after the intervention whereas screening services did not (Ndikom *et al.*, 2017). On the other hand, in a pilot randomized controlled trial in south Asia, a community health worker led multimedia intervention on the uptake of cervical cancer screening did not bring any significant difference in screening intention and uptake between the arms (Wong *et al.*, 2019). In a three arms randomized controlled trial involving video only intervention with video plus home based education session among Latinas who were non adherent to Pap test screening schedule, significantly more women in the video plus education received a Pap test in comparison with the video only and the usual-care arms (Thompson *et al.*, 2017).

Additionally, when the effects of two different invitation models on participation in cervical cancer screening were investigated in Germany among participants who were randomly assigned into intervention arm A (invitation letter) and B (invitation letter and information brochure) or control arm C (no invitation), the intervention group showed significantly higher proportion in cervical cancer screening uptake compared to women in the control group (Radde *et al.*, 2016). Similarly, in a study conducted in Japan to see the effect of risk information on undergoing cervical cancer screening among women, significant proportion of women in the intervention group participated in the screening when compared to control group (Fujiwara *et al.*, 2015).

There have been different quasi-experimental controlled studies conducted to test the effect of a health intervention on cervical cancer knowledge, perceptions and screening uptake and different findings were documented of which a study in rural Nigeria presented significant difference in awareness, knowledge, perception and uptake between the groups (Abiodun *et al.*, 2014); In other study in Nigeria the level of knowledge was significantly improved in intervention group when compared to the control group unlike that of the uptake of the screening which was not significantly different between the groups (Gana *et al.*, 2016) (Adamu, Abiola and Ibrahim, 2012). The study participants in above study involving female teachers have only been provided coupon for the Pap smear services on the last date of intervention and left free of follow up at which time data was collected three months after the intervention.

In a quasi-experimental controlled study that involved group counseling based on the Health Belief Model (HBM) among rural Iranian women, screening proportion increased significantly (Parsa *et al.*, 2017). Moreover, though a convenience sample of women was taken to randomly

assign to the intervention and control group, a protection motivation theory based quasi-randomized controlled trial in Iran resulted in significantly higher percent of women in first and second Pap test in the intervention group compared to the controls (Dehdari *et al.*, 2014). However, a quasi-experimental controlled study involving video based education with brochure in Losangeles demonstrated a selected increase in knowledge and attitude in both groups (Love and Tanjasiri, 2012). Though, the studies employed strong study designs, the non-probabilistic techniques in recruiting the study participants could have introduced nuisance to the external validity.

There exist studies that involved before-after designs, without the use of control group, to test the effectiveness of a health education intervention. A study in South-East Nigeria demonstrated in significant increase in proportion of participants who screened for cervical cancer after the intervention but the study setting is confined only to church environment which ignores other religious contexts (Mbachu, Dim and Ezeoke, 2017); Similarly, in a three stages intervention study conducted in Turkey, participants' participation in screening increased significantly (Guvenc, Akyuz and Yenen, 2013). However, in the later study, only women with available names and telephone numbers in a certain locality were targeted for the study which systematically excluded those women whose names were not in the list which could have led to the selection of non representative sample for the study.

In other studies conducted, for example, in Honduras (Perkins *et al.*, 2007), a three stages study conducted in Turkey, (Guvenc, Akyuz and Yenen, 2013), a video and brochure based educational intervention study (Obulaney, Gilliland and Cassells, 2016), a theory based educational intervention study in Jamaica (Interis *et al.*, 2015) and a study conducted among secondary school teachers in Nigeria (Chinwe R, 2015), health education interventions brought significant improvement in the knowledge regarding cervical cancer and screening among the participants. Though, the effect of the intervention is significant in the aforementioned studies, they however, did not employ control group that could help us ascribe the effect to the intervention alone by neutralizing the possible effect of time on the outcomes of the study.

The use of telephone technology has also been employed to test the possible effects of mobile phone based messages in the knowledge and screening for cervical cancer. Accordingly, mobile phone text messaging intervention for cervical cancer screening was evaluated for its

effectiveness on knowledge among Korean American women (Lee *et al.*, 2014) and on the uptake of screening in the Kilimanjaro and Arusha regions using RCT (Erwin *et al.*, 2019). As a result significant improvements were observed for knowledge about cervical cancer and screening uptake. However, these studies involved only women who had access to mobile phones and excluded those women without access to mobile phones who otherwise can participate in the study.

Determinants of cervical cancer screening uptake

Different studies have been conducted in African countries to demonstrate determinant factors for cervical screening uptake among women. Accordingly, cross-sectional study done in Uganda among women in rural areas revealed that respondents who had been recommended for screening by a health worker, those who knew where cervical cancer screening services were provided and those who knew someone who had ever been screened were found to be statistically significant variables (Ndejjo *et al.*, 2016). Also, in a study conducted in Western Kenya, older patients, patients living with HIV, women who do not know if bleeding immediately after sex might be a sign of cervical cancer, those who said they would go for cervical screening even if they had to pay, and those who do not know if they are likely to get cervical cancer in their lifetime were likely to accept screening (Orang'O *et al.*, 2016).

Moreover, in a study carried out in Zimbabwe knowledge of a cervical screening test, residence area and financial independence were significantly associated with cervical cancer screening use (Mupepi, Sampselles and Johnson, 2011). In a community based study conducted in Nigeria to assess the determinants of cervical cancer screening among women, only respondents' attitude towards screening for cancer of the cervix was found to be a significant predictor of screening uptake (Idowu *et al.*, 2016).

Few studies involving case control design and a number of cross-sectional studies have been conducted across Ethiopia to identify determinant factors to cervical screening uptake. According to a case control study in Tigray region, age group of 30–39 and 40–49 years, current occupation with government and private employment, ever give birth, multiple sexual partnership, good knowledge about cervical cancer, good knowledge and positive attitude on cervical cancer screening were factors found to be significantly associated with cervical cancer screening uptake (Teame *et al.*, 2019). Another case control study carried out in the Northwest

identified a number of variables significantly associated with screening service utilization such as providers' recommendation, history of sexually transmitted infection and history of facility visit. However, history of vaginal examination had an independent protective effect against cervical cancer screening service utilization (Muluneh, Atnafu and Wassie, 2019).

In a cross-sectional study conducted in Jimma town, cervical cancer screening service utilization was found to be associated with being government employee, knowing someone who has ever screened, having history of gynecologic examination, not preferring gender of physician for gynecological examination, getting advice from health care providers, having good knowledge of cervical cancer screening and having perceived susceptible for cervical cancer (Nigussie, Admassu and Nigussie, 2019). According to a study in Mekelle Zone, variables like age, history of Multiple sexual partners, history of sexually transmitted disease, HIV sero-status, overall knowledge of cancer and screening, perceived susceptibility to develop cancer and perceived barriers were found to be significantly associated with cervical cancer screening uptake (Bayu *et al.*, 2016).

Correlates of cervical cancer screening uptake have been identified in different cross-sectional studies. Hence, marital status, sexual experience, level of education and place of residence among female undergraduate students of Aksum University (Gebregziabher *et al.*, 2019); educational status, history of sexually transmitted disease, and multiple sexual partners in a cross-sectional study conducted at Shabadino district, Southern Ethiopia, (Kasim *et al.*, 2020); being government employee, attending care in the gynecology unit, being knowledgeable, being counseled by health care providers, and users of family planning in a facility-based cross-sectional study conducted at DireDawa (Belay *et al.*, 2020); partner support, attitude towards CC and its screening, educational status, and knowledge about risk factors in a cross-sectional study conducted among HIV positive women in Hawassa (Assefa, Astawesegn and Eshetu, 2019) were significant predictors of cervical cancer screening service utilization. Similar findings have also been documented in other studies (Seyoum *et al.*, 2017; Bante *et al.*, 2019; Ebo and , Temesgen Tilahun, 2020; Endalew *et al.*, 2020).

Summary of the literature review

Literature review of effectiveness studies shows the application of different health education intervention modalities to examine its effectiveness in different settings among different target groups. The studies used different designs which mainly included quasi-experimental and cluster RCT. They also used different sample size requirements though some studies employed no comparison group and non-probabilistic sampling procedures for participant recruitment. In these studies, the researchers followed the study participants for varied lengths of the intervention period. The studies produced different outcomes with respect to their intended outcomes of interest. Some studies showed that the intended interventions worked well and resulted in significant effects on the primary outcome whereas other studies showed that the health intervention modalities did not work well to affect the outcome positively.

Review of the available published evidence shows that effectiveness studies have not been conducted yet in Ethiopian context to determine the effect of a health intervention on cervical screening uptake. This highlights that, health education interventions have not been tested using strong designs in Ethiopian context whether it works well or not in improving cervical cancer screening. Therefore, studies involving strong designs like CRCT are required to bridge the observed information gaps in this area of public health concern. Also, none of the above reviewed studies elsewhere have tested the effect of couple education on cervical cancer screening uptake in their educational interventions. Moreover, the existing evidence demonstrates only the effects of interventions at individual or group level where the effect of couple based education and counseling remained an important research gap.

Therefore, employing structured couple based education & counseling intervention has been considered innovative approach in our study. The researchers also believe that testing the effectiveness of couple education and counseling in the women's uptake of screening in such male dominant cultures might bring an important input to design relevant public health intervention strategies. There is also evidence that male involvement through discussion, encouragement and support is significantly associated with the increased utilization of other maternal and reproductive health care services among women of reproductive age group.

In addition, determinant factors associated with the uptake of cervical cancer screening need to be identified using reliable study designs. Strong research evidence suggesting the determination

of independent determinant factors for cervical cancer screening uptake is generally lacking at national and local context. Few facility and community based studies have been conducted to assess factors associated with cervical cancer screening uptake among reproductive age women and selected female population groups in different parts of the country. These studies mainly employed crosssectional study design which is methodologically less trustworthy in generating reliable information regarding determinant factors to consider them further for intervention in cervical cancer screening programs.

Generally, information from rigorous research designs is deficient in this area except very few case control studies conducted in some areas among women attending public health facilities which may be scanty to understand the full range of the scenario adequately. To bridge this gap, studies with strong designs need to be carried out further to identify important determinants of cervical cancer screening uptake among women. Moreover, contextual factors which affect the uptake and provision of cervical screening services need to be explored, taking the user and provider perspectives in to account. We believe that qualitative studies generate and capture additional insights to better understand the context of cervical screening programs.

Conceptual framework

Knowledge about cervical cancer influences the women's belief system and consequently leads to behavioural change to influence the uptake of screening services. Additionally, socio-demographic factors, reproductive & sexual behavior and health service related factors of the woman might positively or negatively influence the uptake of cervical cancer screening services. Information on the cervical cancer & its screening will also influence the level of husband involvement which in turn enhances cervical screening uptake of their partners.

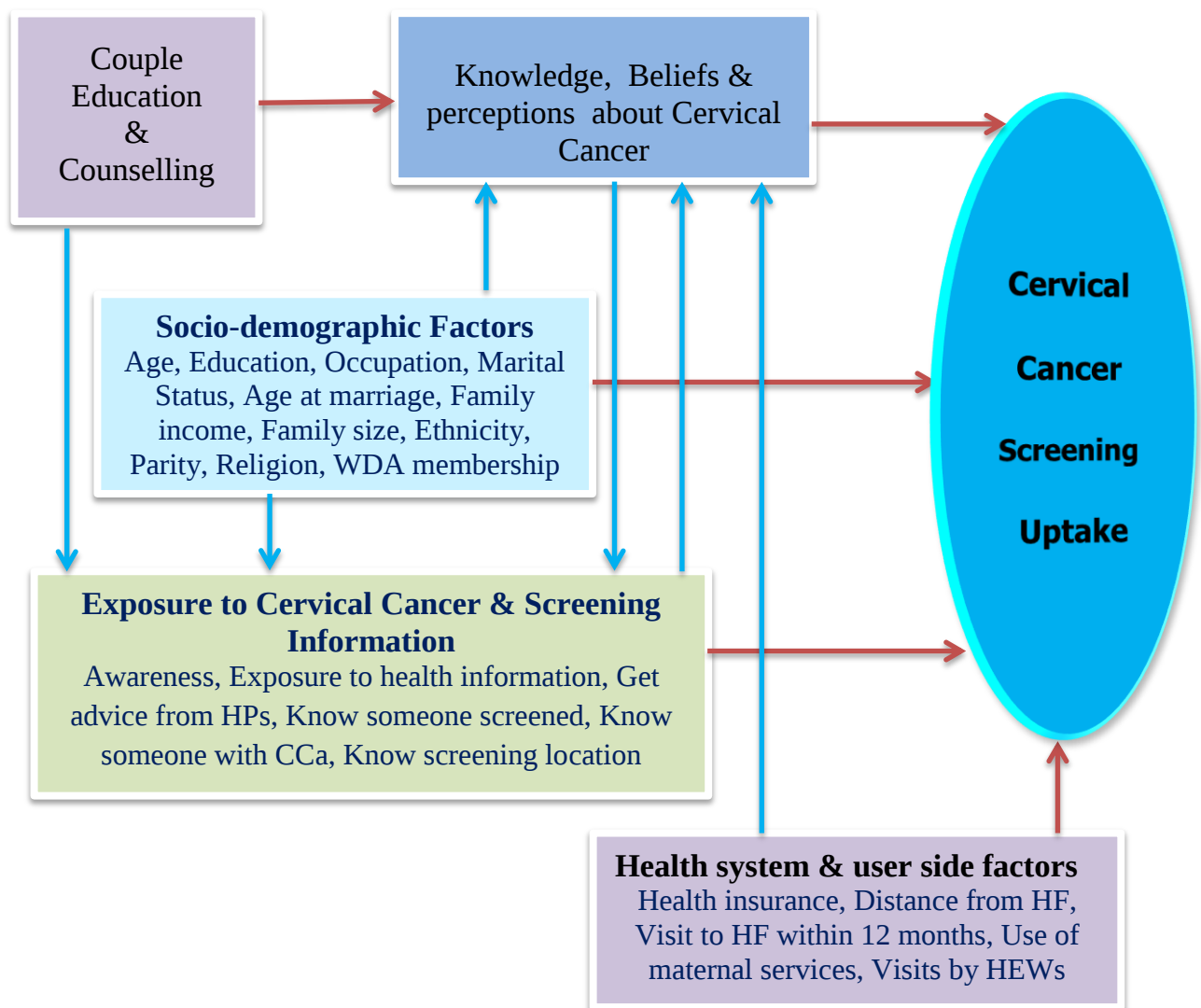


Figure 1 Conceptual frame work of the study developed from the literature review, 2021

CHAPTER 3: RESEARCH QUESTIONS AND OBJECTIVES

Research Questions

1. What are the perceptions, beliefs & barriers to cervical cancer screening among women and health professionals in Southern Ethiopia?
2. What factors determine the uptake of cervical cancer screening among women in Southern Ethiopia?
3. Does couple education and counseling about cervical cancer and its screening increase women's level of knowledge regarding cervical cancer and its screening in Southern Ethiopia?
4. Does couple education and counseling about cervical cancer and its screening improve women's attitude regarding cervical cancer and its screening in Southern Ethiopia?
5. Does couple education and counseling about cervical cancer & its screening and client referral increase cervical cancer screening uptake among women in Southern Ethiopia?

General Objective

The general objective of this study was understanding the contexts, determinants and, effect of couple education and counseling on the knowledge, attitude and uptake of cervical cancer screening services among women in Southern Ethiopia

Specific Objectives

1. To identify the perceptions, beliefs and barriers to cervical cancer screening uptake and implementation in Southern Ethiopia: *health professionals' & women's perspectives*
2. To identify the determinants of cervical cancer screening uptake among women in Southern Ethiopia
3. To determine the effect of couple education and counseling on the level of women's knowledge regarding cervical cancer and screening uptake in Southern Ethiopia.
4. To determine the effect of couple education and counseling on the women's attitude regarding cervical cancer and screening uptake in Southern Ethiopia
5. To evaluate the effect of couple education and counseling about cervical cancer and screening & client referral on cervical cancer screening uptake among women in Southern Ethiopia.

CHAPTER 4: METHODS

Study setting and period

This study was conducted in Kembata-Tembaro and Hadiya zones which are located in the Southern Nations Nationalities and Peoples' Regional State Ethiopia but currently in the central Ethiopia regional state according to the new regional configuration. The total projected population of Kembata Tembaro Zone in 2019/2020 (2012 E.C) was 941311 of which women of child bearing age constituted 214363 which represented 22.8% of the population. Age eligible women (30-49 years) for cervical cancer screening services in the zone constituted 41158 (19.2% of all WCBA). The zone comprised of 8 districts and 3 city administrations with the total number of 150 clusters or kebeles, the smallest administrative units. The zone has one general hospital, four primary hospitals, 33 health centers and 138 health posts.

The total population in Hadiya zone in 2020 was 1815110 of which 50.53% (917175) were females. Women of child bearing age constituted 23.3% of the total population which was 422920. The total number of age eligible women for cervical cancer screening in the zone was 81200 which represented 19.2% of women of child bearing age. The zone was administratively organized in to 13 districts and 4 city administrations having a total number of 329 clusters. The zone has one comprehensive specialized hospital, three primary hospitals, 61 health centers and 317 health posts.

The health care of women of child bearing age in general and maternal & child health care services in particular are one of the main strategic focuses of the health service delivery efforts in the zones. Cervical cancer prevention and control activities are integrated in to the routine health care delivery as an important health service package for the eligible women. Cervical cancer screening services have been implemented at selected hospitals and health centers of the two zones where our research activities were based. These facilities include Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital, Hosanna health center, Shurmo health center, Dr. Bogalech General hospital, Mudula Primary hospital and Doyogena Primary hospital. The study was conducted from 2021 to 2022.

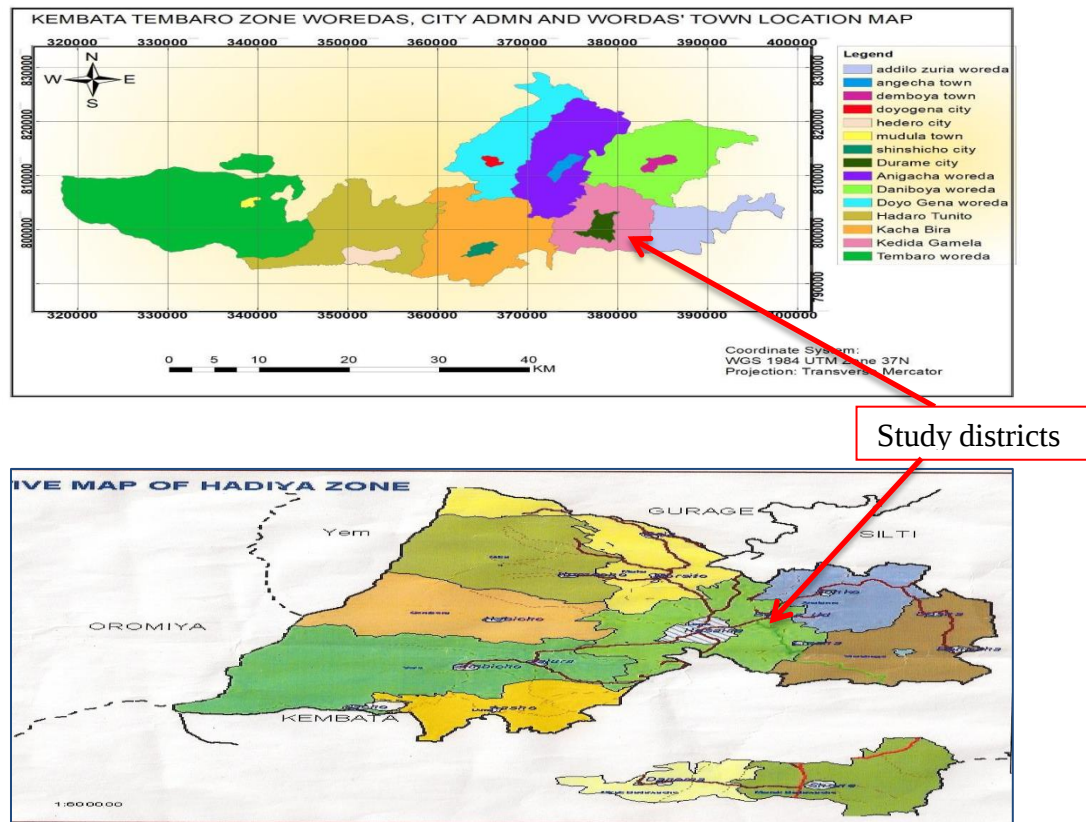


Figure 2 Map of Hadiya & Kembata-Tembaro Zone Southern Ethiopia, 2021; Source: Kembata-Tembaro & Hadiya zone Health Departments

Study Design

The whole research project has been organized in to three independent but interrelated studies each using different study design. These are case control study design to identify determinants of cervical cancer screening uptake; qualitative descriptive study design to explore perceptions, beliefs & barriers to cervical cancer screening uptake taking perspectives from women and health professionals; and cluster randomized controlled trial (CRCT) to test the effect of brochure assisted couple education & counseling on the women's uptake of cervical cancer screening.

Source population

The source population for the case-control and cluster randomized trial was age eligible women (30-49 years) living in the study zones who had history of sexual experience. But for qualitative research, we considered both eligible women for cervical cancer screening and health care professionals working in the public health facilities in the zones as a source population.

Eligibility criteria

The study population consisted women of child bearing age eligible for cervical cancer screening according to the national guideline. Women also satisfied the requirements of legal residency within their respective living quarters, having been engaged in sexual relations or marital union, and have not been diagnosed for cervical cancer and can provide informed consent. Women diagnosed with any gynecologic cancer, who had hysterectomy, who are pregnant and within the period of three months of postpartum were excluded from our study. Study participants represent women who were selected based on the appropriate selection criteria and process which suit the purpose of the specific study design.

In order to gain a diverse viewpoint for the qualitative research, a purposive sample of women was taken from varying backgrounds in terms of, age, educational level, job, and parity status. They were selected by the health extension workers using the selection criteria communicated with health extension workers prior to the data collection. As a result, participants' selection for FGDs was facilitated by the health extension workers using the health post records and women's local networks. Health professionals who participated in the qualitative study were found to have worked for at least 12 years in the health system inclusive of the service in cervical cancer prevention and control area to ensure information richness. Basically, we set a minimum of six months experience in the health system as a requirement to participate in the key informant interview.

Cluster Randomization

Initially, two zones and one district from each zone was selected based on the availability of the screening facilities. Consequently, Lemo district was selected from Hadiya zone which comprised of 35 clusters (kebeles) with 33546 households and a total population of 164377. The size of women of reproductive age group in the district represents nearly 38300. From Kembata-Tembaro zone, Kedidagamela district was selected for the study. This district has 11 clusters (kebeles), 14855 households and a total population of 72792. Women of reproductive age in the district were 16597. Both the districts have cervical screening facilities and the clusters within them are geographically situated around the main capitals of the zones and interconnected with the capital town with dry weather roads. Each cluster contains an average population of 5000 of which women of child bearing age constitute nearly 1200, according to districts' profile.

The clusters or kebeles were the units of randomization used for the effectiveness study. Sixteen non-adjacent clusters, eight from each of the selected districts, were identified. We stratified the selected clusters based on the study districts and created separate list of eight clusters alphabetically for each district. The stratification was done at district level to evenly distribute any known and unknown district level confounders across the study arms. Each cluster was assigned a unique cluster code. Then, the statistician assigned the eight clusters into two blocks of size 4 for each district based on the order they appeared alphabetically. The statistician determined the randomization sequence of clusters in each block by randomly selecting the sealed lots of the six possible permutations of the clusters.

The four clusters in each block were randomly assigned to intervention and control arms according to the randomization sequence evident by the selected permutation for each block in the stratum. We repeated the same process for blocks of clusters in the other stratum or district. Consequently, four clusters were identified from each district which formed eight clusters to the intervention arm and eight clusters to the control arm maintaining 1:1 allocation ratio. The statistician was made unaware of which group of clusters will receive the proposed intervention and which will receive the usual standard of care. This was achieved by representing the study arms and clusters by confidential codes.

Contamination reduction strategy

When women from the intervention clusters join those in the control clusters, the control clusters will be contaminated with the intervention messages. In the rural areas this may happen when different social groups come together due to different social events including funeral, wedding, marketing etc. Informal discussions of ideas regarding the intervention activities may arise on such occasions and individuals from control clusters may gain some health messages which may negatively affect the true effect of the intervention on the outcome. To reduce such an undesirable effect of information contamination, a buffer zone was created to separate clusters of the two arms by leaving clusters that did not take part in the study. As a result 16 non-adjacent and the farthest possible clusters to each other were selected from the two study districts.

Intervention description

The proposed intervention modality for the trial was brochure assisted home based couple education and counseling followed by formal referral to cervical cancer screening units. All the

selected women in the intervention clusters who were eligible & consented to participate were exposed to the proposed intervention. The woman and her husband were educated about cervical cancer and its screening and counseled on the importance of screening for cervical cancer. The husband was also counseled on the importance of providing support and encouragement to his wife. In addition, the woman received formal slip of referral to get screening services in the nearby cervical screening facilities.

The educational and counseling material was organized to address susceptibility to cervical cancer, its seriousness, the benefits of screening and barriers to screening with the objective to build cues to action and improve woman's self-efficacy to practice screening behavior based on HBM. The intervention is organized and designed to bridge the knowledge gap and positively influence women's belief system related to cervical cancer and its screening. This, in effect would bring positive behavior change among women to use cervical cancer screening services.

The educational brochure consisted of four sections. Section one provides general information on the definitions, magnitude and incidence of the disease. Section two gives information and knowledge of risk factors, signs and symptoms, complications, and preventive modalities of the disease. Section three offers an explanation of the eligibility criteria, screening schedule, benefits and barriers to screening services to encourage participants to adopt positive behaviors. Section four explains the meanings of screening results, available treatment options, the cost, location of the service and importance of male's support in woman's cervical cancer screening uptake.

After the development of the educational material, its face and content validity were checked and assessed by professional experts of behavioral sciences from Jimma University and their comments were incorporated to further increase the effectiveness and efficiency of the material in addressing the study objectives.

Implementation of the intervention

Most women in the intervention group received full intervention package of three contacts during the intervention period. Accordingly, each eligible woman in the intervention clusters was physically visited three times at her residential home. During the initial contact, brochure guided education & counseling session was held with the woman for an average of 45 minutes in her home environment to convey information on cervical cancer & its screening and counsel her to

encourage for screening uptake. At the end of the session, discussion was held with the woman to address any questions and concerns she may have. The woman was provided with the educational brochure for further reading in her convenience at least once per week by herself or to be read by any literate person within the family or neighborhood. The date of the next visit was made consensually with the woman to attend the session together with her husband.

A follow up visit was made to each woman one month after the initial visit according to the appointment to re-emphasize important points of the material and make further encouragement for screening. During this visit both the woman and her husband together received key messages on cervical cancer and the importance of its screening. The husband was also counseled on the importance of screening and the way how the woman receives his support and encouragement to get screened for cervical cancer. Additionally, any misconceptions related with the information were corrected and barriers to screening were addressed during this visit. Consequently, the woman was encouraged to identify potential barriers to the screening, and counseled and negotiated on the way how she overcomes the perceived barriers.

Finally, the last visit of the intervention modality was made one month after the second visit to emphasize key messages about cervical cancer and its screening and address any unresolved concerns related to cervical cancer and its screening. Also, a formal referral slip was granted during this visit for free screening services available in the nearby health facility. Women should have not waited for until they have received the last educational visit to go to the health facility to receive screening services. But, the woman can plan and visit health facilities starting from the initial contact until the end of the trial period in six months to receive the screening services. The full package was implemented regardless of the woman's utilization of the screening service during the intervention period. During all the visits participants were asked key questions at the end of the session to check their comprehension and encouraged to get screened for cervical cancer. Repeated visits were made in a case of participants' absence from home environment.

The trial period lasted for six months in two phases. Phase one involved the first three months of active delivery of the intervention package at which time intervention was actively provided to each woman in a monthly bases. The second phase consisted of the last three months of the trial period which was the passive phase. During this phase, women did not receive any intervention scheme but left unvisited with the objective to provide a period of rehearsal to translate their

knowledge into practice. The health extension workers of the respective intervention clusters were trained on the provision of the intervention to the couples at their homes. The control group received the usual standard of care during the study period but has been exposed to the same intervention after the trial period through the routine health extension service delivery schemes.

Implementation of screening service

Women were provided with the specific information, together with the referral slip, whom to contact and how to access the screening units within the specific health facility. Women who were interested to be screened and came from the study clusters were linked to the client reception procedures of the health facility to receive cervical cancer screening regardless of having referral slip with them. Trained health professionals conducted the screening procedure using visual inspection techniques with acetic acid according to the national implementation guideline after completing assessment and counseling (FDREMOH, 2015). Women with positive screening results received appropriate treatment immediately after the results became available on the same day. Women screened positive for cervical cancer were counseled to receive followup screening after one year but after five years for those who screened negative. The woman's screening status was verified using the health facility records & health extension workers' monitoring chart but, client's referral feedback system was not implemented.

Compliance parameter

All the study participants in the intervention clusters did not fully comply to the proposed intervention as indicated in the package due to different participant and provider related factors. This might have imposed undesirable consequences on the uptake of the screening services. The impact of variability in the compliance to the intervention was considered during analysis as a dose response function. Therefore, compliance parameter was completed to measure the level of women's exposure to the intervention to account for during statistical analysis (Table 1).

Table 1 Summary of the intervention modality and compliance, Southern Ethiopia, 2022

Modality of the intervention	Dosage	Frequency	Duration	Compliance parameter
Brochure guided couple education & counseling	45 minutes	Three rounds	Three months	92.4% full compliance to the intervention package
Participants were provided with referral slip to link them to the nearby screening facilities at the end of the third round Brochure guided couple education & counseling session				

Mechanism of the Health Belief Model

The Health Belief Model (HBM) shows that a woman's beliefs on a personal threat of cervical cancer together with her belief in the effectiveness of the screening behavior predict the likelihood she practices the screening behavior. The woman's course of action depends on her perceptions of susceptibility to & severity of the disease and the benefits & barriers related to screening behavior. When the woman's awareness, knowledge, belief system & self-efficacy is positively influenced by the health intervention & cues to action are made available, she most likely demonstrates the desired cervical screening behavior (Fig 3).

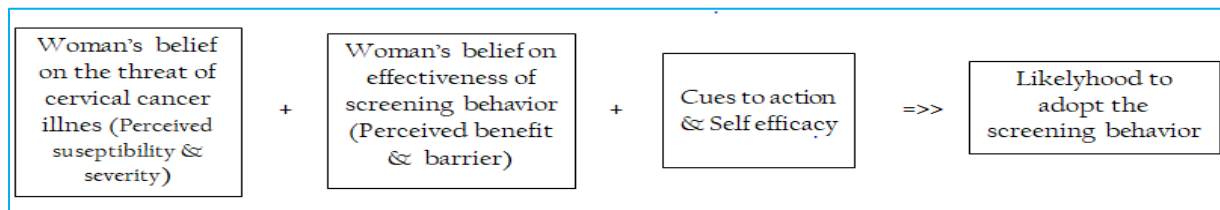


Figure 3 the mechanism how the health belief model works, Southern Ethiopia, 2021

Project implementation framework

The overall implementation of effectiveness study has been depicted below (Fig 4).

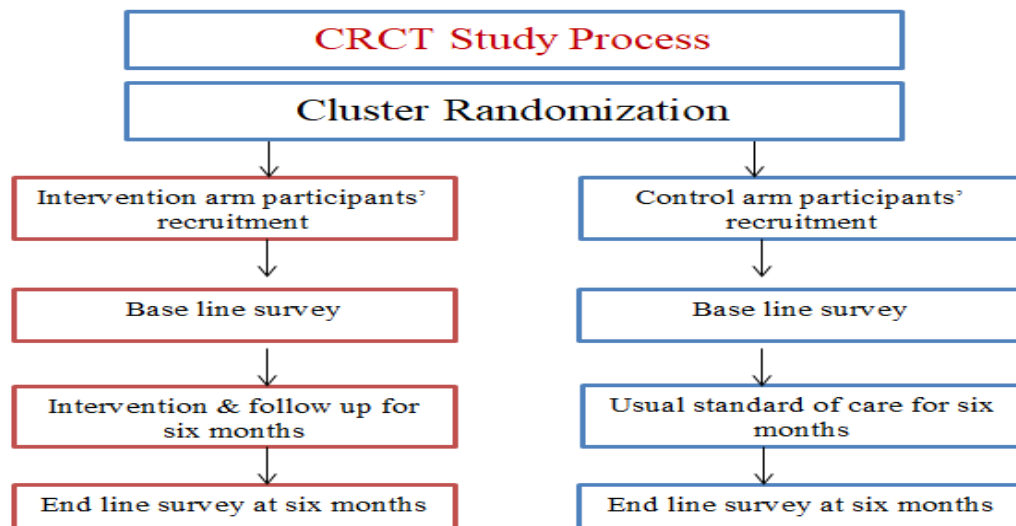


Figure 4 Implementation frame work and process for the intervention study, Southern Ethiopia, 2022

Sample size determination

Sample size for CRCT

The required number of study participants per arm for cluster randomized control trial was calculated using the following formula (Rutterford, Copas and Eldridge, 2015):

$$n = \frac{[z_{\alpha/2} + z_{\beta}]^2 [p_1(1-p_1) + p_2(1-p_2)] \times [1 + (m-1)\rho]}{[p_1 - p_2]^2}$$

Where

$z_{\alpha/2}$ is the value of z at $\alpha = 0.05$ significance level which is 1.96

z_{β} is the value of z at 1- β power (80%) which is 0.84

p_1 is the proportion of outcome in the control group (15.5%)

p_2 is the proportion of outcome in the intervention group (35.5% which is p_1 plus effect size)

m is the cluster size

ρ is the intra cluster correlation coefficient

$1 + (m-1)\rho$ was considered as the design effect which is 2 in our case

We identified current cervical cancer screening uptake from the existing literatures to be 15.5% among age eligible women (Nigussie, Admassu and Nigussie, 2019) and considered it as a baseline proportion that was assumed for the control arm. We anticipated an absolute increase of 20% in cervical cancer uptake from the baseline (15.5%) that produced the expected endline proportions of cervical cancer screening for the intervention arm (35.5%). We have set the power of the study at 80%, significance level for one-tailed test at 5%, and considered the design effect of 2 to adjust for the loss of variability due to clustering, and 5% as a compensation for incomplete and non-response rates.

We used the G*power software to calculate the required sample size. As a result, the number of participants determined per arm was 66 which gave the total sample size to be 132 participants for the study. Using the design effect of 2 and non-response rate of 5% the total participants for our research became 288 women age 30-49 years. The required number of clusters we determined for the study was sixteen.

Sample size for case control study design

The sample size for our case control study was determined using the following formula for difference in proportions,

$$n = \left(\frac{r+1}{r}\right) \frac{(\bar{p})(1-\bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{(p_1 - p_2)^2}$$

where,

n is the required sample size per group

r is the ratio of sample size in case group to sample size in control group which is 1:1

p_1 is the proportion of exposed among case group (52.9%)

p_2 is the proportion of exposed among control group (38.8%)

$\bar{p}$ is the average of proportions exposed among cases and controls

$Z_{\alpha/2}$ is the value of the normal distribution at 5% significance level which is 1.96

Z_{β} is the value at the desired power (80%) of the study which is 0.84

Based on proportions of different exposure variables among the determinant factors identified in the literature, we considered the proportion of women aged 30-39 among cases (52.9%) and controls (38.8%) to determine the maximum possible sample size for our study (Teame *et al.*, 2019). These proportions were selected because they provided an all inclusive sample size for this study among the identified determinant factors. Hence, considering the above parameters, our sample size per group was 196 individuals i.e. 196 cases and 196 controls. Therefore, the total sample size was 392 subjects. To adjust for incomplete responses, we added 5% to the final sample size yielding 412 individuals.

Sample size for qualitative study design

The sample size for our qualitative research was determined based on the level of information saturation during data collection. Accordingly, five focus group discussions (FGDs) and six in-depth key informant interviews were conducted based on the extent of idea saturation required to achieve the study objectives. The total of 42 participants (36 women for FGD and six health workers for KII) were involved in qualitative study to explore their perceptions, beliefs, and barriers to cervical cancer screening uptake.

Sampling technique/procedure

Sampling technique for CRCT

Sixteen clusters (kebeles) were selected from the two study districts where cervical cancer screening services are available. Sixteen clusters were taken based on the recommendation that taking fewer subjects from many clusters give better representation of the study population than taking many participants from fewer clusters. This improves the power of the study to detect the

true differences between the study arms as increasing the number of clusters enhances power more efficiently than does increasing the number of subjects within a cluster (Mahfoud, 2014). The clusters were randomly assigned into intervention and control groups using randomization sequence. Census was carried out in the selected clusters by HEWs to identify women who were eligible for screening and create sampling frame. Then, simple random sampling technique was performed to select study participants from each cluster in each arm. We selected an equal number of participants from each cluster which consequently led to selection of 18 participants per cluster. The same cohort of participants was used at the end of the trial phase, six months later, to measure outcome variables. Enrolment, sampling, allocation, and follow up were depicted in the following Consort Flow Diagram (Fig 5).

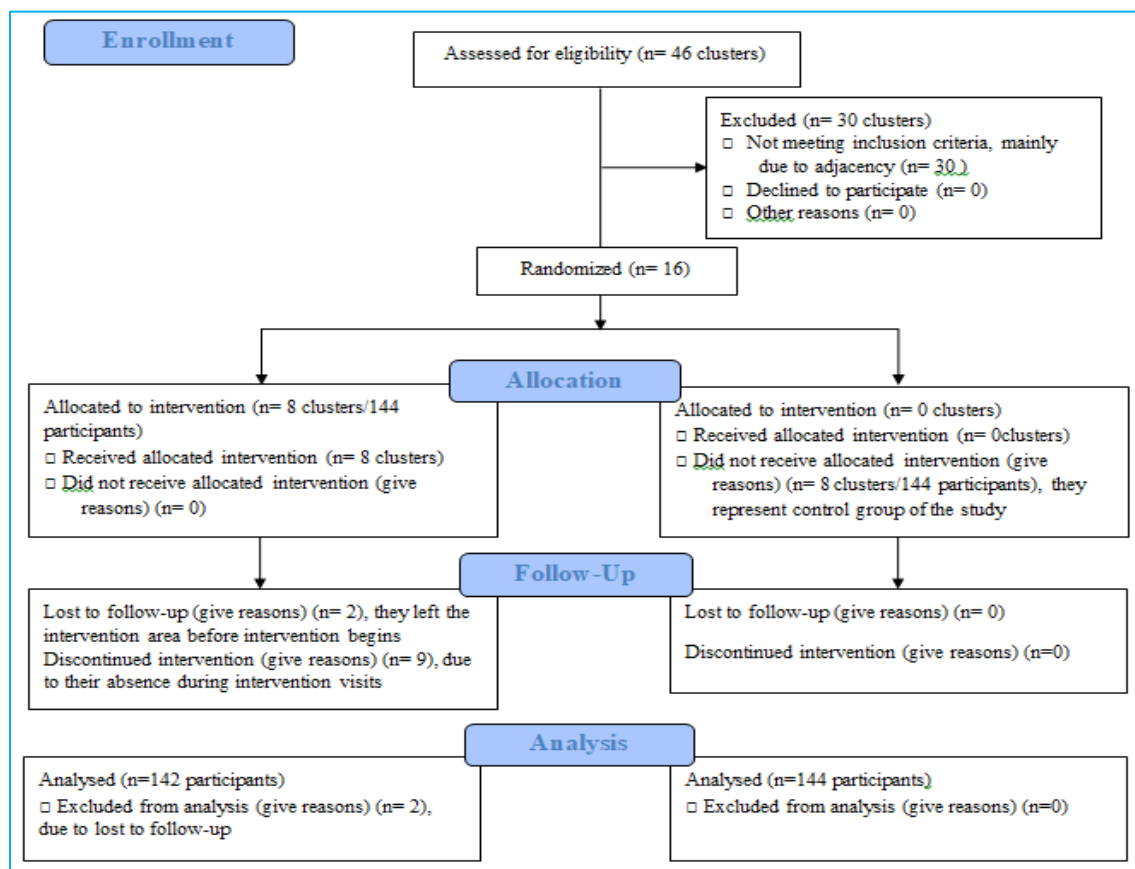


Figure 5 Consort Flow Diagram for cluster randomized control trial, Southern Ethiopia, 2022

Sampling technique for case control study

For the case control study, we selected cases from eligible women who visited the screening centers and received cervical cancer screening before the CRCT started. Controls were selected

from the pool of eligible clients that visited health facilities for different maternal health care services particularly family planning. During recruitment, we ensured that both the cases and controls came from the same source population. The selection of cases and controls were made based on recruitment criteria. Cases were eligible women (30-49 years) who received cervical cancer screening service within the last five years & during the study period regardless of their screening results whereas, controls were eligible women (30-49 years) who visited health facility for other services & did not receive screening for cervical cancer in the same period.

Sampling technique for qualitative study design

Women who participated in our focus group discussion were selected using purposive sampling techniques from five kebeles in the research area which did not take part in the CRCT. Also, health professionals were purposely selected from the two study districts. Those women and health professionals who we thought information rich were selected from the target pool of women and health professionals respectively. To gain a diverse viewpoint, a sample of women with varying background characteristics was employed in the research. The key informants were health extension workers, health professionals and district health authorities with different backgrounds and work experience in the area of cervical cancer control and prevention.

The purpose of the study and selection criteria were discussed and communicated with health extension workers prior to the data collection to facilitate participant selection process. Based on these grounds, health extension workers identified eligible women using the health post records and women's available local networks.

Data collection and measurement

Data collection and measurement technique for quantitative methods

Data were collected using structured questionnaire designed for the purpose of meeting specific research objectives. The tool had been developed based on the research objectives from relevant literature sources. The tool developed for case-control study contained cervical cancer screening performance, sociodemographic characteristics & different exposure variables. The data collection instrument was pretested to check for its clarity, logical sequence, appropriateness etc. and appropriate modification was made accordingly. For CRCT, participants were interviewed to complete baseline and endline survey about their sociodemographic characteristics, knowledge, attitudes, and cervical cancer screening uptake.

For CRCT, data were collected by face to face interview technique with each woman at her home environment. For CRCT, we employed two different groups of people for intervention administration and data collection to minimize bias associated with outcome measurement. Both the baseline and endline data were collected by the same individuals. Data for case control study were collected by interviewing the selected woman in the private counseling room in the health facility after the service was provided.

Data collection technique for qualitative study

The data collection guides were developed based on the specific objectives of the study for both the FGD and key informant interview. A semi-structured interview guide was organized in appropriate sections to facilitate the information gathering process. The required information was gathered using a face-to-face in-depth interview and FGDs by trained public health specialists. A group of three peoples were involved in the moderation of each of the focus group discussions. The focus group discussions were conducted at health posts of the respective clusters or kebeles. The participants participated adequately and responded to the questions during the focus group discussions.

The in-depth interviews were carried out at district offices, cervical screening units and health posts. Health post is a primary health care unit organized at community level and staffed with health extension workers which serves as an entry point in Ethiopia health care delivery system. Both the focus group discussion and the key informant interview sessions were tape recorded for further data analysis. Appropriate field notes were organized and used during data analysis to describe the perceptions, beliefs & barriers to cervical cancer screening, generated from women and health professionals' perspectives.

Operational definitions and measurements

Couple education and counseling in this study refers to the process of communicating relevant information on cervical cancer and screening with couples to encourage the woman to get screened for cervical cancer.

Cervical cancer screening uptake means having experience of cervical cancer screening within five years or during the study period reported by the participant during the interview & verified by health records.

Visual inspection of the cervix with acetic acid (VIA): Screening method which involves naked-eye inspection of the uterine cervix 1 min after application of a 3–5% solution of acetic acid using a cotton swab or a spray (FDREMOH, 2015).

Knowledge: knowledge assessment questions were delivered to study participants and their responses were recorded based on their awareness. Each correct response was given a score of 1 and a wrong answer given a score of 0. We computed the mean score to determine the overall knowledge assessment of cervical cancer screening of respondents and classified as poor and good based on the mean score. Accordingly, those who scored the mean value and above were classified as having good knowledge score and the rest not.

Attitude: we assessed the perception level using a Likert scale having three scales: disagree = 1, neutral = 2 and agree = 3. The responses were summed up and a total score was obtained. Then we calculated the mean score. Those who scored the mean and above were considered as having a positive perception, whereas those women who scored below the mean were categorized as having negative perception towards cervical cancer & its screening.

Data processing and analysis

Specific code was assigned to each of the completed questionnaire. In addition, cluster codes were assigned to CRCT questionnaire. The data were entered using Epi info 3.5.3 version and transported to SPSS version 28 to carry out the desired statistical analysis. Data were cleaned and edited. Qualitative data were tape recorded, transcribed and then translated in to English version. The translated data were coded for further analysis.

Data analysis for CRCT

Baseline screening proportions with 95% confidence interval, mean knowledge and perception scores were computed for each arm. The groups were assessed at baseline for any statistical differences with respect to baseline characteristics using chi-square test for categorical variables and independent sample t-tests for continuous variables. A one-sided P value was used to determine statistical significance of the tests.

At the endline, we calculated proportions of women screened, their mean knowledge and perception scores, and compared the baseline and endline values for each arm. We used paired sample t-test for continuous variables and paired proportions test for categorical variables. Then, at the endline, we used the independent-sample t-test to determine the presence of statistically

significant difference in the participants' mean knowledge and perception scores between the study arms whereas chi-square test was used to compare the screening proportions between the arms. We used Likelihood ratio value for tables bigger than 2x2 instead of Pearson Chi-square when the assumptions were violated. The results were computed in terms of the test statistic, confidence intervals and p-values.

Finally, we analyzed the difference of differences in cervical screening performances between the groups to examine the net effect of the intervention and carried out Generalized Estimating Equations (GEE) to identify the independent determinants of the uptake of cervical screening by employing intention to treat analysis approach. The effect size of the intervention, confidence interval and associated P-value were determined during GEE analysis.

Data analysis for case control study

Frequencies and percentages of different variables were computed for description of the data. Important predictor variables were quantified and compared among cases and controls. Analysis was done at two levels, bivariable and multivariable levels. Those candidate variables significantly associated at p value less than 25% in bivariable analysis were carried out to multivariable regression analysis. Then multiple logistic regressions with 95% CI was carried out to assess the presence or absence of association between the independent variables and screening utilization. Odds ratio with 95% confidence interval was determined to see the strength of the association & statistical significance was declared at $p < 5\%$.

Data analysis for qualitative research

The tape recorded data were first transcribed in verbatim using participants' words by public health experts and then translated into English. The congruence of the versions was cross-checked. The translated data were coded and further analyzed by the researchers. The data were analyzed using a thematic approach. Codes were generated by analyzing the participants' statements. Then, the codes were organized under subthemes and themes based on their similarity. Accordingly, four thematic areas have been identified namely, cancer perceptions and awareness, perceived causes of cervical cancer, perceived preventive mechanisms and perceived barriers to cervical cancer screening. These themes were emerged when the data were analyzed using codes and subthemes. Health care providers perceptions were also explored to address system level factors in relation to cervical screening program implementation.

Cancer awareness and perceptions describe participants' level of exposure to cancer information and what their view and insights look like regarding cancer in general and cervical cancer in particular. Perceived causes of cervical cancer refer to participants' opinion and belief about what puts the woman at risk of developing cervical cancer. Perceived preventive mechanisms define participants' opinions about the measures a woman should take to prevent the occurrence of cervical cancer disease. Perceived barriers to cervical cancer screening denote the participants' belief about what conditions or factors hinder or prevent a woman from receiving cervical screening service. The data organization and analysis process was supported by the use of Excel application software. The data analysis was illustrated using verbatim quotes as appropriate. The findings have been organized and described under the identified thematic areas.

Quality assurance

The questionnaire was translated into local languages (Kembatisa, Hadiysa Amharic) and back translated to English to improve its validity. Two days training was provided for the data collectors and supervisors before data collection. The questionnaire was pretested and checked to increase the validity of the measurement and improve their clarity, logical sequence, and appropriateness for interview. Completed questionnaire was checked for its consistency and completeness by the supervisors on daily basis during the data collection period. Qualitative data collectors and supervisors were oriented on how to interview, take notes and manage audio recording during the data collection process.

Ethical considerations

Ethical approval for the research was obtained from the Jimma University ethical review Board. Written permission was received from the regional health bureau, zonal health departments, respective districts and kebele administrations. The objectives of the study were explained for each participant and informed consent was obtained to ensure voluntary participation. Participants were also assured of the confidentiality of the information they provided.

Participants who were tested positive for cervical cancer were linked to the appropriate care and treatment modalities on the same visit. Those who were positive for cervical cancer were appointed after one year for checkup but women tested negative were informed about the next follow up visit after 5 years. The protocol for CRCT was registered on Pan African Clinical Trial

Registry (PACTR) with registration number PACTR202108529472385 on 05/08/2021 before participants' recruitment and published while the study was in progress.

Methodological mapping

The three study designs involved in this dissertation work were planned accordingly to their inherent connection and relationship between one another in achieving the overall research outcome. Initially, the case control study was implemented to identify important determinant factors that were significantly associated with the uptake of cervical cancer screening. Subsequently, preliminary qualitative study was executed, before the actual qualitative research data, to understand the overall sociocultural background of the study participants and context of screening program implementation in the study setting. The findings from the case control and preliminary qualitative study were used to shape and design the interventional study. The case control and qualitative findings were used to develop intervention package and figureout its delivery mechanisms. Finally, the cluster randomized trial was designed and implemented to see the effectiveness of the proposed intervention package.

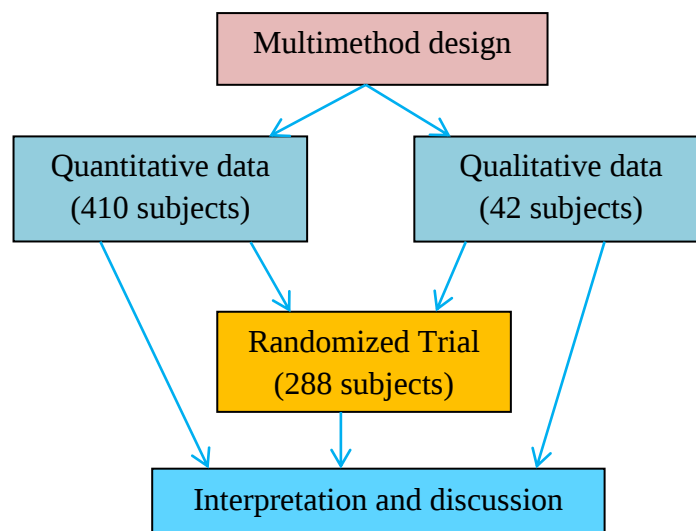


Figure 6 Methodological mapping of the study designs

Methods summary of the dissertation work

Table 2 Brief summary of the dissertation work, Southern Ethiopia, 2022

Objectives	Study Design	Sample Size	Sampling method	Population	Data Source	Outcome measure	Analytic Model
Determinants of cervical cancer screening uptake	Case Control	410	Criteria based selection	WCBA (30-49yrs)	Client interview	Screening uptake	Binary LR
Women's & HPs perceptions, beliefs & barriers to screening uptake	Qualitative	5FGD, 6KI (42 participants)	Purposive sampling	HPs & WCBA (30-49yrs)	KIIs & FGDs	Perception, beliefs, and barriers	Thematic analysis
Effect of couple Education & counseling on screening uptake	Cluster RCT	288	SRS	WCBA (30-49yrs)	Baseline & endline Survey	Screening uptake	GEE

CHAPTER 5:RESULTS

Determinants of cervical cancer screening uptake

Sociodemographic characteristics

A total of 410 women participated in our case-control study which represents 99.5% response rate of which 50.2% were cases and 49.8% were controls. The mean age of the study participants in the case group and control group was 35 ± 4 and 36 ± 4 SD years respectively. Most of the study participants, 205 (99.5%) of the cases and 178 (87.3%) of the controls, were in a marital union. Protestant Christianity is the major religion among the study participants where 142 (68.9%) of the cases and 127 (62.3%) of the controls belong to. The two major ethnic groups among the study participants were Hadiya and Kembata. Thus, 102 (49.5%) of the study participants in the case group and 93 (45.6%) of the study participants in the control group belong to Hadiya Ethnicity whereas 64 (31.1%) of the study participants in the case group and 60 (29.4%) of the study participants in the control group belong to Kembata Ethnicity. The major occupation of the study participants was household roles which accounted 133 (64.6%) in the case group and 129 (63.2%) in the control group (Table 3).

The study participants were majorly engaged into marital relations at the age of 18 years and above among which 174 (84.5%) were cases and 178 (87.3%) were controls. Cases and controls constitute 43 (20.9%) and 78 (38.2%) in the first quartile of monthly family income whereas, 59 (28.6%) and 44 (21.6%) in the fourth quartile of monthly family income respectively. The family size of 110 (53.4%) of the study participants among the cases and 99 (48.5%) of the study participants among the controls have less than or equal to the average household size in Ethiopia which is 5 (4.6) persons per household. One hundred sixty seven (81.1%) of the cases and 162 (79.4%) of the controls have had parity level less than or equal to 4.6, which is the national average number of children per woman in Ethiopia. One hundred thirty five (65.5%), of the study participants in the case group and 90 (44.1%) in the control group had been members of women development army (WDA). The categorization and comparison of family size and parity level were made based on the average cut off value (4.6) indicated in EDHS 2016 (CSA, 2017) (Table 3).

Table 3 Socio-demographic characteristics of study participants in Hadiya and Kembata Tembaro zones, SNNPRG, Ethiopia, October to November 2021

Back ground variable	Variable categories	Case n (%)	Control n (%)
Residence (n=410)	Urban	129 (62.6)	94 (46.1)
	Rural	77 (37.4)	110 (53.9)
Current Marital status (n=410)	Currently in union	205 (99.5)	178 (87.3)
	Not in union	1 (0.5)	26 (12.7)
Religion (n=410)	Protestant	142 (68.9)	127 (62.3)
	Islam	10 (4.9)	16 (7.8)
	Orthodox	38 (18.4)	43 (21.1)
	Catholic	15 (7.3)	13 (6.4)
	Others*	1 (0.5)	5 (2.5)
Ethnicity (n=410)	Hadiya	102 (49.5)	93 (45.6)
	Kembata	64 (31.1)	60 (29.4)
	Tembaro	23 (11.2)	34 (16.7)
	Others**	17 (8.3)	17 (8.3)
Participant's age (n=410)	30-39	179 (86.9)	162 (79.4)
	40-49	27 (13.1)	42 (20.6)
Participant's age at marriage (n=410)	<18 years	32 (15.5)	26 (12.7)
	≥ 18 years	174 (84.5)	178 (87.3)
Participants' education (n=410)	No formal education	23 (11.2)	27 (13.2)
	Primary education (1-8)	97 (47.1)	112 (54.9)
	Secondary education (9-12)	47 (22.8)	44 (21.6)
	Tertiary education (12+)	39 (18.9)	21 (10.3)
Participant's occupation (n=410)	Household roles	133 (64.6)	129 (63.2)
	Employee	37 (18)	26 (12.7)
	Merchant	28 (13.6)	36 (17.6)
	Others ***	8 (3.9)	13 (6.4)
Occupation of the Husband (n=383)	Employee	59 (28.8)	44 (24.7)
	Merchant	68 (33.2)	65 (36.5)
	Farmer	64 (31.2)	58 (32.6)

	Others *****	14 (6.8)	11 (6.2)
Education of the Husband (n=383)	No formal education	5 (2.4)	12 (6.7)
	Primary education (1-8)	87 (42.4)	80 (44.9)
	Secondary education (9-12)	60 (29.3)	48 (27)
	Tertiary education (12 plus)	53 (25.9)	38 (21.3)
Monthly income (n=410)	First Quartile	43 (20.9)	78 (38.2)
	Second Quartile	49 (23.8)	35 (17.2)
	Third Quartile	55 (26.7)	47 (23)
	Fourth Quartile	59 (28.6)	44 (21.6)
Family size (410)	≤ 4.6	110 (53.4)	99 (48.5)
	> 4.6	96 (46.6)	105 (51.5)
Parity (410)	≤ 4.6	167 (81.1)	162 (79.4)
	> 4.6	39 (18.9)	42 (20.6)
WDA Membership (n=410)	Yes	135 (65.5)	90 (44.1)
	No	71 (34.5)	114 (55.9)

Others* Adventist, Apostolic; Others** Amhara, Wolayita; Others *** Student, Daily laborer, Farmer; Others ***** Student, Daily laborer; Not in union refers to single, widowed, divorced and separated.

Participant's awareness and information sources

Among the study participants, 203 (99.5%) of the cases and 75 (36.4%) of the controls had been informed about cervical cancer and screening services before the study period. Health workers were the main channels or sources of information regarding cervical cancer and its screening which constituted 149 (73%) for the case group and 28 (13.6%) for the control group. Among the study participants, 63 (30.6%) of the cases and 61 (29.9%) of the controls knew other women in their social network who underwent cervical cancer screening. Also 20 (9.7%) of the participants in the case group and 19 (9.3%) of the participants in the control group knew other women who had been diagnosed with cervical cancer.

One hundred fifty nine (77.2%) and 106 (52%) of the study participants in the case and control groups respectively had been aware of the service locations where cervical cancer screening services were provided. Only 55 (26.8%) of the cases and 50 (28.1%) of the controls had had discussion with their husbands regarding cervical cancer and its screening (Table 4).

Table 4 Awareness level and information sources among study participants in Hadiya and Kembata Tembaro zones, SNNPRG, Ethiopia, October to November 2021

Variable name	Variable categories	Case n (%)	Control n (%)
Informed of cervical cancer & its screening (n= 410)	Yes	203 (99.5)	75 (36.4)
	No	1 (0.5)	131 (63.6)
Source of information (n=278)	Health workers	149 (73%)	28 (13.6)
	Mass media	43 (21.1)	39 (18.9)
	Social network	8 (3.9)	5 (2.4)
	Women development army	3 (1.5)	3 (1.5)
Knew anyone who underwent screening (n=410)	Yes	63 (30.6)	61 (29.9)
	No	143 (69.4)	143 (70.1)
Knew anyone who had cervical cancer (n=410)	Yes	20 (9.7)	19 (9.3)
	No	186 (90.3)	185 (90.7)
Knowledge of screening location (n=410)	Yes	159 (77.2)	106 (52)
	No	47 (22.8)	98 (48)
Discussion with their husbands (n=383)	Yes	55 (26.8)	50 (28.1)
	No	150 (73.2)	128 (71.9)

Health system & user side factors

Our study demonstrated that, 99 (48.1%) of cases and 117 (57.4%) of the controls were beneficiaries of community based health insurance. Among the majority of the cases, 186 (90.3%), and controls, 163 (79.9%), there existed a family member who visited a health facility in the previous year for health care services. Moreover, majority of the study participants in the case group, 192 (93.2%) and control group, 144 (70.6%) visited health facilities to use maternal health care services in the previous year before the study. Majority of the study participants in both the case group, 146 (70.9%) and the control group, 131 (64.2%) lived at 30 minutes or more walking distance from the nearest health center. Similarly, 149 (72.3%) of the cases and 151 (74%) of the controls resided at 30 minutes or more walking distance from the nearest hospital. Health extension workers made at least one home visit in majority of the cases, 170 (82.5%) and controls, 155 (76%) in the previous year before the study (Table 5).

Table 5 Health system and user related characteristics among study participants in Hadiya and Kembata Tembaro zones, SNNPRG, Ethiopia, October to November 2021

Service related characteristics	Categories	Case n (%)	Control n (%)
Health insurance status of the family (n= 410)	Yes	99 (48.1)	117 (57.4)
	No	107 (51.9)	87 (42.6)
Family members' visit to health facility last year(n=410)	Yes	186 (90.3)	163 (79.9)
	No	20 (9.7)	41 (20.1)
Use of any maternal health services last year(n=410)	Yes	192 (93.2)	144 (70.6)
	No	14 (6.8)	60 (29.4)
Walking distance from the nearest health center (n=410)	< 30 minutes	60 (29.1)	73 (35.8)
	≥ 30 minutes	146 (70.9)	131 (64.2)
Walking distance from the nearest hospital (n=410)	< 30 minutes	57 (27.7)	53 (26)
	≥ 30 minutes	149 (72.3)	151 (74)
Number of home visits made by HEWs last year (n=410)	No visits	36 (17.5)	49 (24)
	At least 1 visits	170 (82.5)	155 (76)

Participants' knowledge about cervical cancer

Two hundred seventy six (67.3%) of the study participants have had correct responses about multiple sexual partnership being a risk factor for the development of cervical cancer. The proportion of the study participants who scored correct answer regarding the cause of cervical cancer being Human Papilloma Virus was 227 (55.4%). Items concerning signs and symptoms of cervical cancer were generally the least correctly answered items of all knowledge assessment items. Accordingly, spotting between periods and foul smell discharge were symptoms correctly identified by 191 (46.6%) and 227 (55.4%) participants respectively. Also pain during sexual intercourse and heavy menses as cervical cancer symptoms were accounted for by 187 (45.6%) and 91(22.2%) participants respectively.

Two hundred seventy one (66.1%) of the study participants recognized that cervical cancer is preventable disease. Regarding the methods of prevention, 258 (62.9%) of them identified early screening and treatment as a mechanism for cervical cancer prevention. Also, 217 (52.9%) and 145 (35.4%) of the study participants correctly identified risk reduction and vaccination as

methods for cervical cancer prevention respectively. Only 186 (45.4%) of the study participants correctly responded to the item stating the age eligibility for cervical cancer screening.

Majority of the study participants correctly identified the advantages of early screening for cervical cancer which included early detection of the disease, 212 (51.7%), early treatment options, 230 (56.1%), and prevention of advanced cancer conditions, 212 (51.7%). Only 155 (37.8%) of the study participants correctly answered the item regarding the five years' regular screening interval for cervical cancer. In summary, 128 (62.1%) of the cases and 97 (47.5%) of the controls scored the mean (10.56) value and above in knowledge assessment and had been considered as having good knowledge regarding cervical cancer and its screening.

Participants' attitude about cervical cancer

The major proportion of study participants, 244 (59.5%), showed agreement with an item specifying every woman is at risk of developing cervical cancer in her life time. One hundred ninety two (46.8%) of the study participants disagreed with the statement demonstrating that women do not need to be screened for cervical cancer if they feel healthy. One hundred eighty eight (45.9%) of the study participants did not agree with the incurability of cervical cancer. Major percentage of the study participants, 319 (77.8%), demonstrated an agreement with the item suggesting preventability of cervical cancer.

Two hundred eighty eight (70.2%) participants agreed that getting screened for cervical cancer, even when they feel healthy, benefits the woman. Two hundred thirty four (57.1%) of the study participants showed agreement regarding attitude item specifying women's busyness with household roles should not hinder them from being screened for cervical cancer. Generally the participants' mean attitude score was 2.34 ± 0.48 on three Likert's scale ranging from 1 to 3. Accordingly, 100 (48.5%) of the participants in the case group and 96 (47.1%) in the control group scored mean and above in perception items and have been regarded as having favorable attitude towards cervical cancer and its screening.

Determinants of cervical cancer screening uptake

Binary logistic regression was performed to ascertain the effect of independent variables on the likelihood that participants underwent screening for cervical cancer. For this purpose, variables which showed association with cervical cancer screening utilization at p-value 0.25 were

transported to multivariable logistic regression. The logistic regression model was statistically significant at, $\chi^2 (11) = 144$, $p < 0.001$ based on Omnibus test of model coefficients and fits the data well, $\chi^2 (8) = 12$, $p = 0.15$ in Hosmer and Lemshow goodness of fit test. The model explained 39% (Nagelkerke R^2) of the variance in cervical cancer screening utilization and correctly classified 74% of the cases.

A multivariable logistic regression showed that, after adjusting for other confounders, urban residence, being in marital union, membership in women development army (WDA), knowledge of cervical cancer screening service location, use of maternal health care services in the previous year and participants' knowledge on cervical cancer and its screening were statistically significantly associated with cervical cancer screening service utilization. Accordingly, study participants with urban residence were 2.7 times more likely to use cervical cancer screening when compared with their rural counterparts [AOR: 2.7, 95% CI: (1.56, 4.56)]. Similarly, study participants who were in marital union were 26.41 times more likely to use cervical cancer screening as compared to study participants in other marital categories [AOR: 26.41, 95% CI: (3.18, 219.44)].

Study participants who had been members of women development army were 2.65 times more likely to use screening services for cervical cancer when compared to their non-member counterparts [AOR: 2.65, 95% CI: (1.60, 4.39)]. Likewise, participants who knew the location for cervical cancer screening service were 7.49 times more likely to use cervical cancer screening services when compared to those who did not have knowledge on cervical cancer screening locations [AOR: 7.49, 95% CI: (4.10, 13.68)]. Moreover, study participants who utilized maternal health care services in the previous year were 4.88 times more likely to use cervical cancer screening when compared with those participants who did not use maternal health care services in the year [AOR: 4.88, 95% CI: (2.35, 10.17)]. Also participants who scored the mean and above value in knowledge assessment items were 3.14 times more likely to utilize cervical cancer screening services when compared with those who scored below the mean value (Table 6).

Table 6 Multivariable binary logistic regression predicting cervical cancer screening utilization among participants in Hadiya and Kembata Tembaro zones, SNNPRG, Ethiopia, October to November 2021.

Variable	Variable category	frequency	Crude OR 95 % CI	Adjusted OR 95 % CI	P value
Participant's age	30-39	341	1	1	0.00
	40-49	69	0.58 (0.34, 0.99)	0.98 (0.50, 1.91)	0.94
Residence	Urban	223	1.96 (1.32, 2.91)	2.67 (1.56, 4.56)	<0.001
	Rural	187	1	1	0.00
Marital Status	Married	383	29.94 (4.02, 222.89)	26.41 (3.18, 219.44)	<0.001
	Others	27	1	1	0.00
Monthly Income	First quartile	121	1	1	0.00
	Second quartile	84	2.54 (1.43, 4.50)	0.98 (0.48, 1.98)	0.95
	Third quartile	102	2.12 (1.24, 3.64)	1.19 (0.61, 2.31)	0.61
	Fourth quartile	103	2.43 (1.42, 4.17)	0.76 (0.37, 1.59)	0.47
Membership in WDA	Yes	225	2.41 (1.62, 3.59)	2.65 (1.60, 4.39)	<0.001
	No	185	1	1	0.00
Know location for screening service	Yes	265	3.13 (2.04, 4.79)	7.49 (4.10, 14.90)	<0.001
	No	145	1	1	0.00
Families visited HF last year	Yes	349	2.34 (1.32, 4.16)	1.15 (0.52, 2.56)	0.73
	No	61	1	1	0.00
Use of maternal services	Yes	336	5.71 (3.07, 10.63)	4.88 (2.35, 10.17)	<0.001
	No	74	1	1	0.00
Participants' knowledge	Poor knowledge	225	1	1	0.00
	Good knowledge	185	1.81(1.22, 2.68)	3.14 (1.79, 5.50)	<0.001

Perceptions, beliefs & barriers to cervical cancer screening uptake

Participants' characteristics

We conducted five FGDs with women and six key informant interviews with health professionals. A total of 42 participants, 36 discussants & 6 key informants, were participated in the study. The FGD participants belong to various sociodemographic backgrounds whereas key informants were health workers from different responsibilities in the health care system. The age of the FGD participants ranged from 30 to 49 years whereas key informants' age was within the

range of 32 to 50 years. Key informants had a minimum of 12 years of experience, inclusive of experience in the area of cervical cancer prevention.

Emergent themes

Qualitative findings have been organized under four thematic areas. The themes include cancer perceptions and awareness, perceived causes of cervical cancer disease, perceived preventive mechanisms, and barriers to cervical cancer screening. Health professionals' perspectives towards cervical cancer screening have been organized into a distinct section. The themes were progressively emerged from the codes and subthemes.

Theme 1: Cancer perceptions and awareness

The FGD participants perceived cancer disease in general and cervical cancer in particular in different ways. Majority of the participants perceived that cancer is a non-curable disease that ultimately leads to the death of the patient. When participants were asked to mention the types of cancer they have known, they identified cancer of breast, blood, bone, uterus, lung, bone, throat, mouth and leg. Most of the participants mentioned breast and uterine cancer types. Cervical cancer was spontaneously mentioned only by few of the discussants. Participants opined that women are especially vulnerable to cancer disease when compared to other community members. Cancer is known as “Nekersa” in Amharic, “Miqicha” in Hadiysa and “Banicha” in Kembatisa local languages.

Women usually keep cancers of reproductive organs, including cervical cancer, undisclosed for protracted periods of time. They believe cancer to be the most dangerous of all the disease types but, as mentioned by a few, remains treatable and curable when identified early. Awareness about cervical cancer is non-existent among women in the study settings. Most of the study participants reported that they hadn't heard of cervical cancer before and did not mention it during the interview. Almost all women perceived cervical cancer as it was uterine cancer. For this reason, we made repeated explanations about reproductive structures and cervical cancer symptoms in order to help women partake in the interview as required.

Opinions that would favorably contribute to the prevention efforts of cancer were recognized amongst the study participants, as few of the FGD participants opined that cancer disease is curable if it is identified and treated early. A 32-year-old woman (FGDP24) said that, “... *if the*

disease is recognized before it advances and severely hurts the individual, it can be cured by medical treatment. If it becomes serious, it may not be curable.”

In the majority of the cases, women with cervical cancer disease keep it confidential, restrict their social networks and lag behind the social responsibility they are expected to play in the community due to perceived stigma associated with the disease. A 38-year-old woman (FGDP2) stated that, “...*People in the community see a woman with cervical cancer in different eyes, as it causes a foul smell; ... People discriminate against her. Since there exists a foul smell, she may not play a social role with others. She isolates herself.*”

Lack of awareness regarding cervical cancer and its screening was a commonly perceived gap among women in the study settings. The majority of the study participants did not hear about cervical cancer before the time of the interview and declared the interview to be their first encounter. A 35-year-old woman (FGDP11) stated that, “...*I heard of cervical cancer as of today. It was the first time that I heard about cervical cancer i.e. I haven’t heard it before. ... I came to know about cervical cancer as of today.*” This was also affirmed by health workers in the study area. A 50-year-old male health professional (KI2) said that, “... *cervical cancer is a very recent disease condition which is being recognized currently and not well known so far.*”

Theme 2: Perceived causes of cervical cancer

Women in this study perceived different socio-cultural, reproductive, sexual, hygienic, and spiritual factors as causes of cervical cancer. These include not keeping genital hygiene, touching genitalia with unclean hands, having many closer birth experiences, frequent sexual practices, multiple sexual partnerships, genital cutting, unhygienic home delivery, sitting on unclean ground and exposure to vapor from the ground during sunny hours, and evil eyes. Few women also associated the occurrence of cervical cancer with birthing, menstruation, sexual experiences and the exposure of reproductive organs, including uterine cervix, to germs.

As mentioned by a few women, exposure to disease causing germs was perceived to be the cause of cervical cancer as it takes advantage of weak cervical structures caused by many birth experiences to cause cervical cancer. A 38-year-old woman (FGDP2) stated that, “...*when the germ gets access to the cervix it causes cervical cancer; ... when there are too many births the cervix becomes loose and light. This predisposes to germs and finally leads to cervical cancer.*”

Some women related cervical cancer with the experiences of menstruation, child birth and sexual activity. Also, some associated that having multiple sexual partnerships or repeated sexual practice with a single partner may lead to cervical cancer. A 32-year-old woman (FGDP13) said that, *“...women are at the age of reproduction and many other things. They practice sexual contact with males i.e. with their husbands. Therefore, cervical cancer affects women with such life experiences. They are at the age of child birth and menstrual cycles.”* A 36-year-old woman (FGDP27) also mentioned that, *“... One cause of cervical cancer could be sexual practice with many partners. Also, having sex with one partner more frequently can lead to cervical cancer.”*

Some women perceived that exposure of genitalia to dirty things associated with poor hygienic practices causes cervical cancer. The perceptions of poor hygiene after toilet use and the practice of touching the vagina with unclean hands were also evident as perceived causes of cervical cancer. A 49-year-old woman (FGDP16) stated that, *“... cervical cancer develops due to poor washing and unhygienic practices. It is caused by sitting on dirty ground and not washing the genitalia properly.”* Also, a 30-year-old woman (FGDP33) indicated that, *“...After toilet use, touching the vagina with unclean hands leads to infection. The infection causes cervical cancer.”*

Moreover, unhygienic birthing conditions associated with home delivery were perceived to be the causes of cervical cancer. A 30-year-old woman (FGDP17) said that, *“... when women give birth at home, dirty things may predispose to cervical cancer. ...During home delivery when hygiene is not kept properly, this may cause such problems in my understanding.”*

Theme 3: Perceived mechanisms of prevention

Women identified a range of perceived cervical cancer prevention mechanisms related to hygiene, particularly washing the vagina and underwear pants; health care services like use of family planning, regular medical checkups and vaccination; and avoidance of sexual behavior that involve multiple sexual partnerships.

Women cited that limiting the number of births through the use of family planning prevents cervical cancer by averting women's exposure to many birthing experiences. A 35-year-old woman (FGDP11) said that, *“...we have to use contraception and keep ourselves. ... We will be*

hurt if we birth too many children. So we need to use family planning methods in order not to be hurt ourselves and not to be affected by cervical cancer.”

The practice of personal hygiene, especially of washing genitalia and keeping underwear clean, was among the identified perceived mechanisms to prevent cervical cancer. A 30-year-old woman (FGDP9) stated that, “...it is better to keep the body by cleaning and washing. Once we wash our underwear, the disease may not happen. Lack of cleanliness predisposes to cervical cancer disease.”

Women also identified the use of health care services like vaccination and regular medical checkups as a recommended means of cervical cancer prevention before the disease advances. A 30-year-old woman (FGDP20) said that, “... it is possible to prevent cervical cancer...through vaccination. That is, it is possible to prevent it when we get vaccinated all the time and get examined on every body part.” In addition, a 32-year-old woman (FGDP26) stated that, “...receiving medical follow-up and checkup from the health facilities is the main thing to prevent cervical cancer. In doing so, we can prevent it before it advances.”

Theme 4: Perceived barriers to cervical screening

Health screening practices were non-existent among the study participants. However, women in the study area mainly seek care from modern medical or health care facilities for cancer at its advanced stages. Women with cancer diseases also make treatment-seeking visits to traditional healers to receive herbal medications.

The majority of women in the study area were not using cervical cancer screening, mainly due to lack of information regarding cervical cancer and screening. Other perceived barriers to cervical screening include fear of stigma and discrimination, low perception of the importance of screening, being ashamed of exposing private body parts, competing household priorities, low level of perceived risk, transportation costs associated with the screening service, and the need for husbands’ approval to get the service.

The perceived importance of screening during disease free periods was nil among women and they didn’t acknowledge the need to go to a health facility for screening purposes unless explicit disease symptoms are observed otherwise. A 32-year-old woman (FGDP26) said that, “... the reason why women are not receiving screening is that women do not see any disease symptoms

in themselves. I think women are not receiving the screening service due to the absence of symptoms related to cervical cancer disease.”

Stigma and discrimination associated with cervical cancer was a prevailing condition among women which prevented them from getting screened for cervical cancer. A 38-year-old woman (FGDP2) reported that, “... *they (women) may be ashamed of stigma and discrimination and don’t have the courage to go for cervical screening. They feel that it becomes publicly known once a woman is screened positive and starts treatment. Due to fear of bad rumors related to cervical cancer, she may not go for screening.*”

Women’s busy work schedule at home environment with competing domestic priorities followed by lack of attention to their health needs was a perceived barrier to screening. In the majority of the cases, women prioritize family concerns in favor of their health needs, which is further aggravated by poor husbands’ attention to the health needs of their wives. A 35-year-old woman (FGDP32) stated that, “... *women most of the time are concerned about and occupied in fulfilling different things important to their family needs. They do not recognize their health needs. On the other hand, husbands do not pay attention to the health conditions of their wives due to lack of knowledge.*”

The low level of perceived risk of cervical cancer observed among the study participants was another important barrier to screening for cervical cancer, as women didn’t recognize well their level of risk to cervical cancer. A 30-year-old woman (FGDP20) stated that, “... *women feel that they are not at risk and will not be affected by cervical cancer. As a result, they do not go for screening.*”

In most of the cases, women are ashamed of exposing their private body parts and refuse to get screened for cervical cancer, particularly when the health professional that provides screening is male. A 47-year-old woman (FGDP31) stated that, “... *as far as my understanding, women are afraid of exposing their private body parts to others. They are most of the time afraid of this.*” Moreover, a 45-year-old health extension worker indicated that, “...*when the screening service provider is male, women are not comfortable enough to receive the service...They are afraid of exposing their body parts to male health workers.*”

Women's financial constraints negatively affected the screening uptake as most women cannot afford transportation and other costs associated with screening services. The need for husbands' approval and associated financial requests to get the service hindered the uptake of screening as well. A 36-year-old woman (FGDP27) said that, "... *I think women may postpone the screening due to financial problems i.e. they may not have money that will be paid in charge of examination and screening.*" In addition, a 49-year-old woman (FGDP30) stated that, "... *there may be a problem with husbands. Husbands, when asked for money, might complain about the financial expenses associated with the screening.*"

Health professionals' perspectives

The summary of findings from key informants' interviews has been organized to distinctly demonstrate health professionals' perspectives from the provider side. Health professionals working in the study area perceived a range of barriers to the cervical cancer screening program. Such barriers include, low health workers' awareness, weak screening program implementation, lack of resources and supplies, service interruptions, inadequate trained human power and its turn-over, poor client reception & handling, and lack of close follow-up of the program.

Inadequate attention from health authorities demonstrated by poor follow-up of the screening program undesirably affected its implementation status in the study area. Maternal and child health expert (KI6) said that, "...*There is inadequate support and monitoring of the program. ... We are not working as seriously as required in terms of close follow-up of the screening program. The support and monitoring is not adequate. It is not problem solving.*" In some areas, the perceived work load at the health post level further impaired its execution. A 45-year-old health extension worker (KI1) stated that, "... *there are urgent and routine health related activities to be carried out in the health post. Due to such work load and time shortages, I am not making adequate home visits to inform and encourage women for cervical screening.*"

Health care providers' non-receptive and unwelcoming attitude towards client handling mechanisms at health facility level was noticed to affect women's use of screening services. Maternal and child health expert (KI4) said that, "... *What deters women from showing interest in going to health facilities is the unwelcoming approach of health care providers. Lack of professional ethics and client respect can obstruct women's cervical screening uptake.*"

Shortage of supplies and resources needed for screening in screening centers played a considerable role in hindering the provision and uptake of cervical screening in a sustained manner. Maternal and child health expert (KI4) said that, “...*Sustained provision of screening supplies and logistics from higher levels of the health system is vital. The government needs to give attention in this regard.*”

In the study area, there existed an obstacle to screening service provision and utilization related to shortage of trained human power, staff turnover and inadequate service coverage. Maternal and child health expert (KI4) said that, “...*There are only two health professionals who received training on cervical screening from one health center in the entire district. So this is not adequate. When there is a turnover, there should be an adequate pool of trained health professionals to sustain the service. Moreover, there are no trained health professionals in other health facilities in the district.*”

Furthermore, service irregularities associated with poor coordination and professionals’ absence due to off-duty from the screening units made its utilization further challenging. A 27-year-old health extension worker (KI3) said that, “...*the absence of professionals from the screening units when women go for screening may sometimes create a problem. There was an occasion when women were told to come back again. Since women came at the expense of transportation and time, it may be difficult for them to come back again for the service.*”

Effect of couple education and counseling on cervical screening uptake

Participants’ baseline characteristics

In our CRCT, 142 (98.6%) of the study participants from the intervention group and 144 (100%) of the participants from the control group responded to the questionnaire. All the participants were married women in the age range from 30-49 years with the mean age of 38 ± 5.34 and 38 ± 5.11 years for the control group and the intervention group respectively. The difference in the mean age of the participants in the intervention and the control group was not significantly different ($p=0.482$). There were no statistically significant differences between the intervention and control group in terms of other sociodemographic characteristics like participants’ education & occupation, family income, family size, parity level and awareness about cervical cancer and screening at baseline. But the groups were significantly different with respect to health insurance

membership ($p<0.001$) and maternal service use in the last year ($p=0.011$). More than 70% of the participants in both groups completed primary education (Table 7).

Table 7 Sociodemographic characteristics of the study participants, Southern Ethiopia, 2022

Participants' characteristics	Categories	Intervention group N=144 (%)	Control group N=144 (%)	Test statistics	P-value
Age	Intervention vs control	38 (SD=5.11)	38 (5.34)	$t=0.045$ (df=286)	0.482
Religion	Protestant	110 (76.4)	114 (79.2)	$\chi^2 = 0.724$	0.432
	Orthodox	15 (10.4)	15 (10.4)		
	Islam	9 (6.2)	6 (4.2)		
	Others	10 (6.9)	9 (6.2)		
Ethnicity	Hadiya	86 (59.7)	84 (58.3)	LR= 1.96	0.375
	Kembata	57 (39.6)	56 (38.9)		
	Others	1 (0.7)	4 (2.8)		
Participants' education	No formal education	26 (18.1)	25 (17.4)	LR=0.453	0.465
	Primary education	101 (70.1)	105 (72.9))		
	Secondary education	14 (9.7)	12 (8.3)		
	Tertiary education	3 (2.1)	2 (1.4)		
Participants' occupation	Domestic roles	130 (90.3)	136 (94.4)	$\chi^2 = 1.77$	0.092
	Others	14 (9.7)	8 (5.6)		
Membership in WDA	Yes	79 (54.9)	72 (50)	$\chi^2 = 0.682$	0.205
	No	65 (45.1)	72 (50)		
Health Insurance membership	Yes	103 (71.5)	73 (50.7)	$\chi^2 = 13.149$	<0.001*
	No	41 (28.5)	71 (49.3)		
Maternal service use in previous year	Yes	129 (89.6)	115 (79.9)	$\chi^2 = 5.258$	0.011*
	No	15 (10.4)	29 (20.1)		
Monthly family income	1 st quartile	44 (30.6)	41 (28.5)	$\chi^2 = 2.522$	0.236
	2 nd quartile	34 (23.6)	25 (17.4)		
	3 rd quartile	31 (21.5)	38 (26.4)		
	4 th quartile	35 (24.3)	40 (27.8)		

LR= likelihood ratio; * Significant baseline variables

Participants' knowledge, perceptions and screening uptake at baseline

The awareness level of the participants in both the intervention and control groups regarding cervical cancer and screening was low at baseline in that 22.9% and 20.1% of the participants ever heard of cervical cancer in the intervention and control groups respectively. The difference in awareness level was not statistically significant. Only 2.1% of the participants in the intervention and 0.7% in the control group have had cervical screening experiences at baseline. More than 3/4th of the participants in both the intervention and control groups had poor knowledge regarding cervical cancer and screening at baseline. The mean and standard deviation of knowledge scores for the intervention group was 3.18 (SD = 4.47) whereas, the control group had mean score of 3.44 (SD = 4.74). The difference is not statistically significant.

The perceived severity score for the disease and perceived benefits score of screening were relatively higher in both groups at baseline however the difference was not statistically significant. For example, the majority of the participants in the intervention (62.5%) and control (65.3%) groups had mean and above score in perceived severity items. Also, participants who earned mean and above score in perceived benefit items were 61.8% and 57.6% in the intervention and control group respectively. The mean scores for perceived susceptibility, perceived barriers and readiness for cervical screening were lower in both groups. The groups are not different significantly in terms of the perception scores (Table 8).

Table 8 Participants' awareness, knowledge of cervical cancer and screening, perceptions, readiness for screening and uptake of cervical screening at baseline, Southern Ethiopia, 2022

Variable	Intervention	Control	Test statistic	P-value
Ever heard of cervical cancer and screening	33 (22.9%)	29 (20.1%)	$\chi^2 = 0.329$	0.283
Cervical screening uptake	3 (2.1%)	1 (0.7%)	Fisher's exact test	0.311*
Mean knowledge score	3.18 (SD=4.47)	3.44 (SD=4.74)	$t = -0.499$ (df=286)	0.309
Mean perceived susceptibility score	1.61 (SD=0.56)	1.69 (SD=0.57)	$t = -1.218$ (df=286)	0.112
Mean perceived severity score	2.47 (SD=0.49)	2.5 (SD=0.51)	$t = -0.444$ (df=286)	0.329
Mean perceived benefit score	2.42 (SD=0.58)	2.5 (SD=0.54)	$t = -1.226$ (df=286)	0.111
Mean perceived barriers score	1.76 (SD=0.57)	1.79 (SD=0.51)	$t = -0.438$ (df=282)	0.331
Mean readiness score	1.49 (SD=0.80)	1.56 (SD=0.76)	$t = -0.832$ (df=286)	0.203

*Fisher's exact test for primary outcome; (SD = standard deviation)

Participants' knowledge, perceptions and screening uptake at baseline

At the end-line, among participants in the intervention group, the awareness of cervical cancer and screening experiences became higher; and the knowledge and perception levels were considerably increased. However, the control group remained lower in terms of awareness, knowledge and perception scores. Also, the proportion of mothers who received screening has been improved among the intervention group whereas, screening performance remained low in the control group. The difference between the intervention and the control group in terms of the above parameters was statistically significant ($p < 0.05$) (Table 9).

Table 9 Participants' knowledge of cervical cancer and screening, perceptions, readiness and uptake of cervical screening after intervention, Southern Ethiopia, 2022

Variable	Intervention group	Control group	Test statistic	P-value
Ever heard of cervical cancer and screening	142 (100%)	32 (22.2%)	$\chi^2 = 181.54$	$P < 0.001$
Cervical screening uptake*	103 (72.5%)	2 (1.4%)	$\chi^2 = 155.76$	$P < 0.001$
Mean knowledge score	11.99 (SD=2.64)	3.45 (SD=4.70)	$t = 18.97$ (df=226)	$P < 0.001$
Mean perceived susceptibility score	2.03 (SD=0.91)	1.72 (SD=0.53)	$t = 3.55$ (df=227)	$P < 0.001$
Mean perceived severity score	2.66 (SD=0.64)	2.50 (SD=0.34)	$t = 2.6$ (df=213)	$P = 0.005$
Mean perceived benefit score	2.72 (SD=0.55)	2.47 (SD=0.48)	$t = 4.02$ (df=284)	$P < 0.001$
Mean perceived barriers score	1.06 (SD=0.19)	1.82 (SD=0.54)	$t = -15.87$ (df=179)	$P < 0.001$
Mean readiness score	2.49 (SD=0.85)	1.59 (SD=0.84)	$t = 9.04$ (df=284)	$P < 0.001$

* Primary outcome

Effectiveness of the intervention

The brochure assisted home based couple education and counseling intervention had brought statistically significant effect on the knowledge, perceptions and screening uptake among the participants in the intervention group. The mean knowledge and perceptions scores showed statistically significant improvement with regard to cervical cancer and screening in the intervention group. The perception constructs of the health belief model demonstrated statistically significant improvement among the participants in the intervention group. Consequently, the perception of the study participants was improved in terms of cervical cancer susceptibility and severity and benefits of cervical screening. Also, the perceived barriers to screening showed statistically significant decrement among the intervention group. The

proportion of women who received cervical screening showed a marked improvement among the participants in the intervention group. However, there was no statistically significant difference among the participants in the control group between baseline and end-line (Table 10).

The proportion of participants in the intervention group with good knowledge score on cervical cancer and screening grew from 32.6% at baseline to 98.6% at endline. On the other hand, the proportion of participants with good knowledge in the control group progressed only from 31.9% at baseline to 33.3% at endline. Also, the proportion of participants with a good perception about barriers to cervical cancer screening was improved from 49.3% to 98.6% in the intervention group, whereas it was reduced from 45.8% to 41.7% in the control group. Similarly, the percentage of women who had good score in perceived benefit of screening grew from 61.8% at baseline to 80.6% at end-line in the intervention group but in the control group it steadily rose from 57.6% to 59%. Moreover, the mean score for risk perception showed significant improvement among participants in the intervention group unlike the control group.

The proportion of women who have been informed about cervical cancer and screening increased from 22.9% at baseline to 100% after the intervention with the absolute increase of 77.1% which is statistically significant ($p < 0.001$). The progress in the awareness level between the baseline and endline was insignificant and only 2.1% in the control group ($p = 0.124$). Similarly, the cervical screening uptake among participants in the intervention group showed statistically significant increase from 2.1% at baseline to 72.5% after the intervention with 70.4% increment ($p < 0.001$), whereas the participants in the control group demonstrated poor progress in terms of cervical screening uptake during the study period with only 0.7% change ($p = 0.5$) (Table 10).

As identified by the study participants during the baseline study, the major barrier, 71.5% in the intervention group and 78.5% in the control group, to the uptake of cervical screening was lack of awareness about cervical cancer and screening. However, during the endline survey, lack of awareness was not reported as a reason for not receiving cervical screening among the participants in the intervention group.

Table 10 The effect of home based Brochure assisted couple education and counseling on cervical screening uptake among study participants, Southern Ethiopia, 2022

Variables	Intervention group					Control group				
	Baseline (n= 144)	Post intervention (n= 142)	Difference	Test Statistic	P-value	Beginning (n= 144)	End (n= 144)	Difference	Test Statistic	P-value
Ever heard of cervical cancer & screening (proportions)	0.229	1	0.771	0.768, 95%CI (0.691, 0.844)	<0.001	0.201	0.222	0.021	0.021, 95%CI(-0.009, 0.051)	0.124
Cervical screening uptake* (proportions)	0.021	0.725	0.704	0.704, 95%CI (0.622, 0.786)	<0.001	0.007	0.014	0.007	0.007, 95%CI(-0.014, 0.027)	0.50
Mean knowledge score	3.18 (SD=4.47)	11.99 (SD=2.64)	8.767	t=19.944 (df=141)	<0.001	3.44 (SD=4.74)	3.45 (SD=4.70)	0.0069	t=0.199 (df=143)	0.421
Perceived susceptibility score	1.606 (SD=0.55)	2.028 (SD=0.907)	0.423	t=4.669 (df=141)	<0.001	1.69 (SD=0.57)	1.742 (SD=0.53)	0.023	t=0.785 (df=143)	0.217
Perceived severity score	2.47 (SD=0.49)	2.66 (SD=0.64)	0.1907	t=2.831 (df=141)	0.0025	2.5 (SD=0.51)	2.50 (SD=0.34)	0.0081	t=0.224 (df=143)	0.412
Perceived benefit score	2.42 (SD=0.58)	2.72 (SD=0.55)	0.3068	t=4.422 (df=141)	<0.001	2.5 (SD=0.54)	2.47 (SD=0.48)	-0.0225	t=-0.528 (df=143)	0.299
Perceived barriers score	1.76 (SD=0.57)	1.06 (SD=0.19)	-0.7012	t=14.383 (df=141)	<0.001	1.79 (SD=0.51)	1.82 (SD=0.54)	0.0258	t=0.711 (df=143)	0.239
Readiness score	1.49 (SD=0.80)	2.49(SD=0.85)	1.014	t=9.421 (df=141)	<0.001	1.56 (SD=0.76)	1.59 (SD=0.84)	0.0278	t=0.533 (df=143)	0.298

Difference in differences analysis

We performed chi-square for trend analysis of the screening proportions of the groups using analysis for linear trends in proportions in EpiInfo StatCalc to determine the presence of statistically significant difference in screening performances. Accordingly, the difference in differences in screening performances between the groups is statistically significant. The analysis result is graphically represented below (Fig 7).

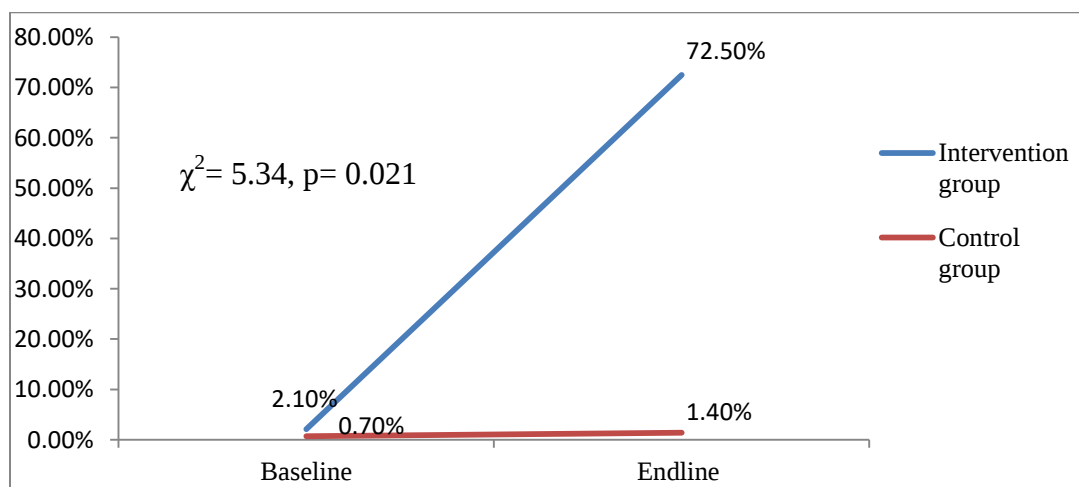


Figure 7 Cervical cancer screening utilization trend among the study participants at baseline and end-line between the groups, Southern Ethiopia, 2022

Dose response analysis

All the participants within the intervention group did not fully comply with our intervention package. However, over 92% of the participants in the intervention group received the full intervention package, and less than 8% did not. The relation between the intervention intensity and uptake of cervical screening was cross tabulated using linear trend chi squared test. There is a linear by linear association between intervention frequency and cervical screening uptake among the study participants. Consequently, as the dose of the intervention went from none to three, the likelihood of using cervical cancer screening increased significantly ($\chi^2 = 169$, $df = 1$, $p < 0.001$) which signifies the importance of repeated exposure to the proposed health education intervention to bring about the desired improvements in the uptake of cervical screening among the study participants.

Determinants of screening uptake

In the multivariable Generalized Estimating Equations, intervention status and husband's education were statistically significantly associated with cervical screening use among the study participants. Consequently, participants with no formal education of their husbands were 93% less likely to use cervical screening as compared to those whose husbands attained tertiary education [(AOR: 0.066; 95% CI: (0.010, 0.446)]. Also, those who received the intervention were nearly 43 times more likely to use cervical screening when compared to those who did not receive the intervention [(AOR: 42.68; 95% CI: (2.21, 82.3)] (Table 11).

Table 11 Multivariable Generalized Estimating Equations for effect of couple education & counseling on cervical screening use among study participants, Southern Ethiopia, 2022

Variable	Variable category	n	B	Crude OR 95 %CI	Adjusted OR 95 % CI	P value
Education of the husband	No education	29	-3.00	0.190 (0.045, 0.812)	0.066 (0.010, 0.446)	0.005
	1° education	165	-1.865	0.271 (0.078, 0.938)	0.199 (0.059, 0.671)	0.009
	2° education	80	-1.643	0.316 (0.088, 1.140)	0.021 (0.239, 0.071)	0.021
	3° education	12		1	1	0.00
Received Intervention	Yes	140	3.69	200 (47, 350)	42.683 (2.21, 82.3)	0.013
	No	146		1	1	0.00

Parameters were adjusted for age at marriage, knowledge of someone with cervical cancer, membership in health insurance, husband's participation in community activities, maternal services use, family members received health services previous year, knowledge score, perceived barrier score

N.B: maternal services use and membership in health insurance caused baseline imbalances

CHAPTER 6: DISCUSSION

Determinants of cervical cancer screening uptake

The Federal Ministry of Health Ethiopia, in its strategic documents, recommended regular cervical cancer screening every five years and at least once for every woman in her life time. In resource-poor settings, including Ethiopia, 30-49 years old women are the target beneficiaries for the current recommendations and screening services. Cervical cancer has been commonly identified within this age range in the country and rare event in women under the age of 30 years except for high-risk groups (FDRE MOH, 2015; FMOHE Disease Prevention and Control Directorate, 2015). In this study, this age group has been considered appropriate for the identification of the determinants of screening uptake and effective screening and treatment services. To benefit women from the importance of early screening and treatment, identification of its determinants paves fertile ground for further implementation of effective interventions. In this study, different determinants of utilization of cervical screening have been identified.

This study showed that, the utilization of cervical cancer screening services was significantly higher among study participants having good knowledge scores in knowledge assessment items regarding cervical cancer & screening when compared with those participants who have had poor knowledge scores. Similarly, studies conducted in Ethiopia, Arbaminch (Seyoum *et al.*, 2017), Mekele (Bayu *et al.*, 2016), Shebedino (Kasim *et al.*, 2020), Diredawa (Belay *et al.*, 2020) and Tanzania (Cunningham *et al.*, 2015) demonstrated that participants' good knowledge regarding cervical cancer is an important determinant of screening services utilization among women. Generally, it has been established that knowledge on particular issue reinforces desired attitude and promotes positive health behavior among target individuals (Fabrigar *et al.*, 2006). Therefore, the observed participants' good knowledge in our study could have positively contributed to the desired participants' behavior to better utilize the screening services.

In our study, it was found that knowledge on the location where the cervical cancer screening has been provided was one of the significant determinants of cervical cancer screening utilization. This finding is consistent with the finding reported by the study conducted in rural Uganda (Ndejjo *et al.*, 2016). Cues to action are important factors which may play positive role in the demonstration of desired health behavior. Being aware of the service location as cue to action in

addition to knowledge on cervical cancer and screening could have helped study participants to get screened for cervical cancer more in this group.

The proportion of participants screened in the age group 30-39 years was higher when compared to the proportion of participants screened in the age group 40-49 years. However, unlike other studies, this is not significantly associated with cervical cancer screening utilization. Different studies demonstrated that cervical screening service utilization was significantly higher in the age group from 30-39 and 40-49 years when compared with those below 30 years (Cunningham *et al.*, 2015; Bayu *et al.*, 2016; Hirut *et al.*, 2019). Our study has included only participants who are eligible for screening within the context of national recommendations, age 30-49 years (FDREMOH, 2015), and did not include participants in the younger age group who are below 30 years. This limitation restricted us from making comparison between our study participants and younger age groups.

Though, it was not statistically significant, screening service utilization in our study vary across participants' occupational statuses. That is, majority of the study participants who had an employment opportunity utilized the screening services more when compared to participants with other occupation categories. Other studies conducted in Ethiopia Tigray region and Jimma town demonstrated that screening utilization was significantly higher among employed participants as compared to other occupations (Hirut *et al.*, 2019; Nigussie, Admassu and Nigussie, 2019). This could be due to the fact that employed participants could have gained better opportunities to information exposure and awareness outside the home environment on different health matters. Moreover, in majority of the cases employed participants have higher educational status than unemployed participants which might have contributed to the observed differences in screening practices.

The place of residence was significantly associated with cervical cancer screening utilization as study participants who lived in urban areas were more likely to have been screened than rural participants in our study. Study conducted in Uganda revealed similar findings (Ndejjo *et al.*, 2016). Access to cervical screening services may be more difficult in rural settings than urban due to screening centers not being within walking distances, lack of transport and cost of transportation (Mupepi, Sampselle and Johnson, 2011; Cunningham *et al.*, 2015). Moreover,

urban settings could have provided better health information exposure opportunities to residents due to accessibility of information sources relative to rural settings which could have brought differences in screening utilization between women in urban and rural settings.

In our study, participants who had been members of women development army (WDA) utilized cervical cancer screening significantly more than those who were not members of women development army. This formally organized women's social network is believed to expose group members to different health related information and creates conducive learning social environment. Additionally, the existing functional link between health extension workers and these teams serves as a channel to circulate and disseminate different information relevant to social welfare including health matters. This could have influenced members in women development army significantly to utilize cervical screening services more.

Moreover, our study showed that the use of maternal health care services in the previous year among the study participants significantly determined the use of cervical cancer screening service. Studies conducted in DebreMarkos Ethiopia (Bante *et al.*, 2019), Jamaica (Interis *et al.*, 2015) and Kenya (Morema *et al.*, 2014) reported similar findings in that participants who visited health facilities in previous year for any reason were more likely to utilize cervical screening services than those who did not utilize health care services. Any visit to health care facility provides a good opportunity to receive health education and increases the chances of exposure of service users to health information which would in turn increases health awareness. This could have positively influenced participants' health behavior to utilize screening services for cervical cancer more than their non-using counterparts.

Perceptions, beliefs & barriers to cervical screening uptake

Our study demonstrated a low level of community awareness about cervical cancer and its screening. In spite of such gaps, women identified a wide range of individual, socio-cultural and psychosocial factors as barriers to cervical cancer screening uptake. Such factors include stigma and discrimination, low perception of the importance of screening, being ashamed of exposing private body parts, competing household priorities, low risk perception, transportation and service related costs, the need for a husband's approval to get the service and women's low attention to their health needs. System related barriers recognized by health professionals include

poor implementation of the screening program characterized by lack of screening resources and supplies, interruption of the screening services, lack of support and follow-up, shortage of trained human power and its turn-over, and poor client handling practices.

Moreover, women identified a range of perceived causes of cervical cancer which include infection of the cervix, poor hygiene of the genitalia, touching genitalia with unclean hands, multiple sexual partnerships, repeated and closer births, sitting on dirty ground, and evil eyes. They also mentioned various mechanisms to prevent cervical cancer: hygienic practice, regular medical checkups, avoiding multiple sexual partnerships, vaccination and use of family planning. Participants perceived that cervical cancer is preventable when identified and treated early.

Our findings showed that there are misperceptions about cervical cancer in that it is not recognized in its scientific form. Other studies conducted in Ethiopia reported similar findings (Birhanu *et al.*, 2012; Demissie *et al.*, 2022). The misperceptions associated with cervical cancer could have been arisen due to inadequate knowledge about cervical cancer and cervical structure in the women's reproductive system. Traditionally, the vagina and uterus are known by the same term “mahitsen” in the local context. Furthermore, women didn't differentiate the cervix and uterus as distinct organs, rather perceived them as one. These might have made the identification of diseases that originate from such reproductive structures in their real form more difficult for women. The gaps could have also influenced women to have confused cervical cancer with uterine cancer during the interview.

There is a low level of risk perception for cervical cancer among the study participants in our study. Our finding is supported by evidence from other studies conducted in different parts of the country (Z and M, 2016; Burrowes *et al.*, 2022; Demissie *et al.*, 2022). Also, studies conducted in Nigeria (Adurrahman *et al.*, 2022), Ghana (Opoku *et al.*, 2016), Iran (Taghizadeh Asl *et al.*, 2020), Ecuador (Vega Crespo *et al.*, 2022) and UK (Marlow, Waller and Wardle, 2015) reported low cervical cancer risk perception among women. However, in a study conducted among Saudi women, the majority of the participants had a high risk perception regarding cervical cancer (Ibrahim *et al.*, 2022) unlike our findings. This is because of the fact that, unlike our study, it involved women residing in urban areas where access to cervical cancer information could be better when compared to our study participants, which could have brought the observed differences in risk perception.

In the Ethiopian context, the Ministry of Health has been committed to expanding cervical screening centers to primary health care unit level to improve service accessibility (FMOH, 2015). Consequently, screening centers have been established at primary health care unit level, especially at primary hospitals and health centers. Nevertheless, cervical cancer screening uptake among eligible women, including health professionals, was identified to be low in the study area. Similarly, different studies have shown low levels of cervical screening uptake among women in Ethiopia (Ayenew, Zewdu and Nigussie, 2020; Ruddies, Gizaw, Teka, Thies, Wienke, Andreas M. Kaufmann, *et al.*, 2020; Yeshitila *et al.*, 2021; Desta, Endale and Aklil, 2022). In addition, like our study findings, evidence shows that low awareness about cervical cancer and screening has been documented as a barrier to cervical screening uptake among women in other parts of Ethiopia (Z and M, 2016; Lott *et al.*, 2021) and other African countries (Sudenga *et al.*, 2013; Hasahya *et al.*, 2016; Natasha Buchanan Lunsford, Kathleen Ragan, Judith Lee Smith, Mona Saraiya, 2017; Ndejjo *et al.*, 2017).

The demonstration of preventive health behavior in symptom-free periods among women was non-existent in the study area, as evidenced by women's low perception of the importance of cervical screening in disease-free periods. As a result of the community's perceptions, women made health facility visits only for medical consultations whenever there were observable disease symptoms which had negatively influenced the demonstration of the required cervical screening uptake among women. This finding is supported by other studies done in Ethiopia (Getachew *et al.*, 2019; Burrowes *et al.*, 2022; Demissie *et al.*, 2022), UK (Marlow, Waller and Wardle, 2015) and Nepal (Greibe Andersen *et al.*, 2020) where the absence of cervical cancer symptoms was a perceived barrier to screening uptake.

This study revealed that the awareness level regarding cervical cancer and its screening among the study participants was low. This finding is in agreement with study findings conducted in Ethiopia (Saleem *et al.*, 2019; Ruddies, Gizaw, Teka, Thies, Wienke, Andreas M. Kaufmann, *et al.*, 2020; Demissie *et al.*, 2022) and other African countries like Cameroon (Fongang *et al.*, 2022), Sudan (Ahmed *et al.*, 2023), Uganda (Ndejjo *et al.*, 2017) and Malawi (Munthali, Ngwira and Taalo, 2015). It is also supported by a systematic review of studies from LMICs (Petersen *et al.*, 2022) and a study conducted among ethnic minorities in UK (Marlow, Waller and Wardle, 2015). Furthermore, the observed poor implementation of public awareness and programmatic

activities about cervical cancer at the community and health system level could have contributed to the low level of awareness among women in our study. This could have in turn hampered the uptake of a screening program by the target women.

Cervical cancer preventive and awareness creation activities were not well implemented in the Ethiopian health care system due to the fact that cervical cancer prevention and control activities had not given adequate emphasis (FDRE MOH, 2015). Such implementation gaps evidenced by inadequate awareness about the nature of the disease in Ethiopia could have restricted women from receiving appropriate information regarding cervical cancer. For these reasons, there were misperceptions regarding cervical cancer among women in this study, which in turn put screening and early detection of precancerous lesions below expectations. The demonstration of such misperceptions about cervical cancer among women is consistent with the study finding conducted ten years back in some parts of the country (Birhanu *et al.*, 2012). Likewise, a systematic review of evidence from LMICs (Petersen *et al.*, 2022) and study from Malawi (Munthali, Ngwira and Taulo, 2015) show that community misperceptions about cervical cancer were barriers to its screening.

Uncomfortable community beliefs and perceptions regarding cervical cancer disease had negatively contributed to the uptake of cervical screening among women. Accordingly, stigma and discrimination associated with cervical cancer disease in the study setting was a barrier to the uptake of the available screening services among women. Other studies in Ethiopia (Z and M, 2016; Burrowes *et al.*, 2022), Kenya (Natasha Buchanan Lunsford, Kathleen Ragan, Judith Lee Smith, Mona Saraiya, 2017), Nepal (Greibe Andersen *et al.*, 2020), Caribbean (Ahmed *et al.*, 2022) and Norway among Somali and Pakistani immigrants (Abdi A gele, 2017) demonstrated stigma as a perceived barrier to cervical cancer screening and care. Moreover, women in the study area are usually labeled to have violated normal sexual practices or committed promiscuity when they are found screened for cervical cancer and become ashamed of screening, as supported by a study from India (Dsouza *et al.*, 2020). This psychosocial condition could have exerted emotional influence and discouraged women's efforts to use cervical screening.

Important health system related deterrents were identified as barriers to cervical screening uptake and delivery efforts, including transport costs associated with the service, unfriendly client handling, interruption of the service due to shortage of supplies and resources, and attrition of trained human power. These findings are in line with the findings from other studies done in Ethiopia (Lott *et al.*, 2021). Studies from Uganda implicitly reported organizational and health system challenges as a barrier to cervical screening (Hasahya *et al.*, 2016; Ndejjo *et al.*, 2017). Financial constraint is also among the perceived barriers to screening as supported by findings from Arbaminch Ethiopia (Z and M, 2016), Kenya (Were, Nyaberi and Buziba, 2011; Natasha Buchanan Lunsford, Kathleen Ragan, Judith Lee Smith, Mona Saraiya, 2017), Cameroon (Fongang *et al.*, 2022), and Uganda (Hasahya *et al.*, 2016; Ndejjo *et al.*, 2017). In Malawi, lack of equipment and supplies and supportive supervision hindered the use of cervical screening (Munthali, Ngwira and Taulo, 2015). Studies demonstrate that health facility readiness in providing sustained screening services is found to be low in Ethiopia (Shumet Wasiyahun *et al.*, 2021) which could have hampered the provision of effective screening services. As identified in our study, poorly resourced health systems in LMICs hindered screening uptake (Petersen *et al.*, 2022).

Effect of couple education and counseling on cervical screening uptake

Our cluster randomized control study involved home based structured couple education and counseling to improve the knowledge, perceptions and uptake of cervical screening among women who were eligible for screening. As far as our knowledge is concerned, this is the first effectiveness cluster randomized controlled trial regarding cervical cancer screening uptake in Ethiopia. Our study demonstrated that, the proportion of screening uptake for cervical cancer, awareness and knowledge levels on cervical cancer and screening were low among women at baseline in the study settings. However, the proportion of women with good knowledge score, perceptions scores and cervical screening uptake increased substantially from baseline to end-line in the intervention group. The proportion of women who underwent screening showed considerable increase among women in all age groups in the intervention arm.

The proportion of the study participants who have heard information regarding cervical cancer and screening was 22.9% [95%CI: (16.3%, 30.7%)] in the intervention group and 20.1% [95%CI: (13.9%, 27.6%)] in the control group at baseline. This lower figures show that lack of

awareness about cervical cancer and screening has been the main reason for not receiving screening services evidenced by low screening uptake among the study participants at baseline. Other studies showed similar findings and reported low awareness level among women as the main reason for low uptake of cervical screening (Abiodun *et al.*, 2014; Gana, G. J, Oche, M. O, Ango, J. T., Raji, M. O. and Okafoagu, 2016). However, at the end-line survey after the intervention was provided, the proportion of women who had been informed about cervical cancer and screening demonstrated a significant improvement in the intervention group. A study conducted in Nigeria to test the effectiveness of education intervention produced similar finding regarding awareness level (Abiodun *et al.*, 2014). These findings emphasize the need for designing policy directions that promote awareness creation interventions to improve implementation of the screening programs.

The proportion of women with good knowledge score at baseline in the control and intervention groups was 32.6% and 31.9% respectively. Nearly similar finding (30.3%) was observed among women in a study conducted in Finoteselam Ethiopia (Geremew, Gelagay and Azale, 2018). On the other hand, the overall pooled prevalence of good knowledge about cervical cancer in Ethiopia is 43% (Derbie *et al.*, 2021) which is nearly in alignment with our findings. After the intervention, the mean knowledge score among the participants significantly increased among women in the intervention group ($p < 0.001$). Also, the proportion of women with good knowledge considerably increased from 32.6% at baseline to 98.6% at endline whereas, the change remained poor among the control group. Similarly, a very brief educational intervention in rural Kenya resulted significant changes in the knowledge of the study participants in the intervention group (Rosser, Njoroge and Huchko, 2015). This indicates that structured educational intervention efforts play key role in improving the knowledge level of the target group that imply the importance of program activities that help improve cervical cancer and screening knowledge to establish causal pathway to screening practices.

All the perception measures of HBM have shown statistically significant changes in their mean score between before and after the intervention when compared using paired samples t-tests. Consequently, there was a statistically significant difference between before and after the intervention scores for perceived susceptibility ($p < 0.001$), perceived seriousness ($p = 0.003$), perceived benefits ($p < 0.001$), and perceived barriers ($p < 0.001$) in the intervention group. This

finding is in accordance with the findings from other studies even though the educational methodologies and duration of the intervention differ (Abiodun *et al.*, 2014; Ebu *et al.*, 2019). Similarly, a study conducted in South Asia and Turkey reported a significant improvement in perceived benefits and reduction in perceived barriers among women in the intervention group (Bebis *et al.*, 2012; Wong *et al.*, 2019). These findings suggest the significance of designing and integrating interventions, which positively influence women's perceptions towards screening behavior, in the implementation of screening programs.

As the baseline study has shown, screening uptake was low among the study participants in our study where only 0.7% in the control group and 2.1% in the intervention group received screening in the last five years before the study. Studies have shown that screening proportion for cervical cancer among women in Ethiopia is low, less than 10% (Kasa, Tesfaye and Temesgen, 2018; Belay *et al.*, 2020; Endalew *et al.*, 2020; Ruddies, Gizaw, Teka, Thies, Wienke, Andreas M Kaufmann, *et al.*, 2020). However, studies in urban areas of the country demonstrated relatively higher prevalence of screening uptake among women (Bayu *et al.*, 2016; Bante *et al.*, 2019) but still lower performance than what is expected nationally. A systematic review and meta-analysis revealed that the pooled prevalence of screening uptake among age eligible participants in Ethiopia is 13.46% (Ayenew, Zewdu and Nigussie, 2020) which is relatively higher than what we observed in our baseline study due to the fact that most of the included studies in meta-analysis involved positive participants for Human Immune-deficiency Virus and women living in urban settings. In a quasi-experimental study conducted in Nigeria, only 1.1% of the participants had received screening during baseline study in both the control and intervention group (Gana, G. J, Oche, M. O, Ango, J. T., Raji, M. O. and Okafoagu, 2016). On the other hand, studies revealed a relatively higher proportion (43.48%) in the uptake of cervical cancer screening as seen in Cameroon (Donatus *et al.*, 2019) even though the pooled prevalence for cervical screening uptake in SSA was determined to be 12.87% (Yimer *et al.*, 2021). All the above findings illuminated the lower levels of cervical cancer screening performances than what is expected of the current disease burden indicating the need for urgent public health interventions to improve screening coverage.

In this study, after the intervention was provided, the screening proportion among women in the intervention group showed statistically significant increase where the screening uptake grew to

reach 72.5% ($p < 0.001$). The study conducted among rural communities in Nigeria demonstrated similar findings in that the education intervention significantly improved screening uptake among women in the intervention group (Abiodun *et al.*, 2014). Also, a home based brochure assisted education in Turkey produced a significant improvement in the uptake of cervical cancer screening among women (Kurt and Akyuz, 2019). However, on the other hand, an effectiveness study on educational intervention conducted on market women in Nigeria did not bring any significant changes in screening uptake (Gana, G. J, Oche, M. O, Ango, J. T., Raji, M. O. and Okafoagu, 2016) probably because of the nature of the study participants being mentally and temporally occupied by businesses related matters. Hence, contextually designed and locally adapted education interventions are needed to improve the uptake of cervical cancer screening among the target women.

As seen from the multivariable analysis, the intervention was an independent predictor of the primary outcome of the study even though the effect of the intervention on the primary outcome seems to have relatively large confidence interval. The large confidence interval for the effect estimates could be due to the extremely low post intervention cervical screening proportion in the control arm. However, the effect of the intervention has been evident to bring statistically significant change on the women's cervical screening performances. The test statistics in the determination of the difference in differences has also confirmed the significant contribution of the intervention package in establishing its effectiveness on the screening practices among women.

CHAPTER 7: VALIDITY, GENERALIZABILITY & POLICY IMPLICATIONS

Validity and generalizability of the findings

A research process should be designed & implemented in a way it produces valid results to be relied upon. Researchers are expected to apply all possible measures in the research process to ensure the validity of the study outcomes. Research validity can be measured both internally and externally. Internal validity of the research measures the extent to which the entire research process achieves the intended objectives of the study. Generalizability of a research findings on the other hand enables the research findings to work well for similar participants who did not take part in the actual research process and context. The fulfillment of internal validity is a necessary precondition for external validity or generalizability of the findings to be meaningfully interpreted. The internal and external validity of this research findings have been examined and described under these considerations in the following sections.

Internal validity is the extent to which the study process achieves the desired research objectives by overcoming the effect of bias at all stages of the research undertakings. Consequently, the study should be capable of reflecting the true effect of the exposure on the occurrence of the desired outcome of interest. It is the process of eliminating an alternative explanation to the study findings and ensuring that the effect is solely due to the influence of the exposure variable on the outcome. According to some epidemiological books there is always a possibility of an alternative explanation to the outcome of the study mainly due to the introduction of the effect of random error, bias or confounding variables. All these possible ways of explanation to the research outcome should be effectively addressed during the entire research process including the design, data collection and statistical analysis. If such conditions are not effectively controlled for in the research process, validity of the research becomes questionable and more likely that the research outcomes deviate from the desired true value of the study objectives. This usually warns the researchers to demonstrate all possible ways to minimize the effect of chance, bias & confounding.

Random error

To minimize the role of chance and maximize the validity of the study outcomes, researchers need to ensure adequate representation of the study population in the study by employing

adequate sample size. In this regard, we calculated the desired sample size considering all the necessary statistical assumptions that enabled us determine the minimum required sample size to carry out the study. In addition, the power of the study has been set to the statistically acceptable level to ensure adequate precision of the findings, which was 80%. The largest possible sample size was also used whenever required (for case-control) to improve the precision of the research outcomes. In the determination of the association or effect measures, we quantified random error by estimating the p-values and 95% CI to clearly demonstrate the effect of chance.

Bias

Bias in research is the introduction of systematic error in research process. It usually disturbs the estimation of the true effect of the measure of association between variables and results in the misleading estimates. Controlling mechanisms to prevent the introduction of bias in to the study should be in place during the design phase of research process to minimize its effect in the validity of the research findings. In Epidemiological study designs, particularly in observational studies, there could be the possibility of the introduction of bias into the study due to selection bias or information bias. Selection bias arises when the study participants in the study groups differ systematically with respect to some characteristics related to exposure or outcome. In our observational study design, we addressed the risk of selection bias through the use of appropriate selection criteria to recruit study participants from the target population and formation of comparable groups. However, this type of bias is unlikely in our cluster randomized study design where the clusters were randomly assigned into both study arms and individuals were randomly selected from the target group. In study designs involving randomization, selection bias may only be possible when lost to follow up, connected with the exposure or outcome, happens. In our CRCT only two participants experienced such lost to follow up behavior which occurred randomly and not related either to exposure or study outcome.

On the other hand, information bias happens when information gathered from research participants are systematically different between the study groups. This bias is introduced mainly as a result of variation among data collectors, misunderstanding of the data collection tool either by the data collectors or the participants during data collection, memory loss or refusal by respondents, incomplete responses or incorrect recordings. We employed certain measures to reduce the effect of bias due to such factors: adapting the data collection tool from existing

literature sources, testing the instrument before actual data collection, assignment of the same data collectors for baseline and endline survey in CRCT, the use of data collectors who were familiar with the local language, culture and context. In addition we provided intensive training for data collectors and supervisors for better understanding of the data collection tool and its proper completion. Moreover, the data collection tool was translated in to the local languages to improve data collectors' understanding on the tool for better gain of the required information. The introduction of recall bias in our CRCT is unlikely as it is a prospective study whereas, in the case control study, the variables we traced back were factors which show participants' recent exposures.

Confounding

In research that investigates cause-and-effect relationship, confounding exists when unmeasured third variable distorts an association entirely or partially due to its independent relationship with both the exposure and outcome variables. This leads to spurious results which may not reflect the true relationship between the variables and affects the validity of the study results. Therefore, it's important to consider potential confounding variables and account for them in research design and analysis to ensure the validity of the research findings. Researchers employ different methodological and statistical techniques like restriction, stratification, matching or multivariable analysis to avoid the effect of confounding variables.

With regard to addressing the effect of confounding in our research work, we have demonstrated all the possible steps we can in the process including identification of as many variables from the literature as possible during the design phase, and application of multivariable analysis techniques to the identified variables to control for their effect. The presence or absence of interaction effect among different study variables has also been tested and investigated.

The internal and external validity of qualitative research can be ensured by carefully addressing the four quality parameters of trustworthiness identified by Lincoln and Guba. These are credibility, dependability, confirmability and transferability. Accordingly, the validity of our qualitative research findings has been addressed systematically through all the possible approaches that ensure these quality parameters. The strategies we employed were, selection of data collectors who are familiar with the local context, language and culture of the study groups, recruitment of different groups of participants to the study like women from varying

sociodemographic backgrounds, health extension workers, health professionals working in cervical screening centers and health authorities to get different insights and opinions to ensure the accuracy of the information. We also employed different data collection techniques which included key informant interviews and focus group discussions. Also, all the methodological aspects of the study process have been clearly and transparently documented to enable others adequately understand the context in which our research was undertaken. Furthermore, we have annexed all the interview and group discussion guides we have used to generate data from the research participants to this dissertation work for further considerations. Consequently, the findings of our qualitative research can be confirmed using the available audio taped data and its transcripts which has been kept with the authors.

Generalizability

Generalizability is the measure of how well the research findings can be considered for target groups in other contexts or similar settings. It can be affected by the geographic area, the background characteristics of the participants, and the representation of different socio-cultural and ecological characteristics. As a mechanism to improve generalizability, our study used representative sample size determined by sound statistical techniques and considerations of necessary assumptions. Also, research participants were randomly selected and included into our quantitative research. All the possible quality assurance measures during information gathering were demonstrated and plausible statistical analytical models were employed to come up with valid research findings in this study.

Moreover, cervical screening uptake is mainly influenced by contextual factors inherent within the specific study context which matter its utilization among the target women groups. Consequently, these research findings can be generalized to rural women in the specified age group who are particularly residing in the two research zones of the Sothern nations, nationalities and people's regional state. However, the generalizability of the findings outside the study zones can be possible as far as the research context is similar with regard to socio- cultural, socio-economic and women characteristics. The transferability or external validity of the qualitative research will mainly depend on the similarities of the context of the study area and the target population being studied.

Policy implications

The implementation of brochure assisted home based couple education and counseling intervention strategy has brought important findings to light in that it improved the screening performances of women in the study area through its effect on participants' knowledge & perceptions. This intervention aimed at improving cervical screening knowledge and perceptions of women to influence their cervical cancer screening behavior or performances. The finding is suggestive of the importance of locally adapted and structured health education intervention in improving cervical screening uptake among target women groups. Such home based interventions, when properly designed to suit the local context and integrated to the implementation of the existing health extension program, can bring the desired change in the screening program.

Additionally, the demonstration of significant association between woman's membership in development army, use of maternal health care services, and good knowledge about cervical cancer and the uptake of cervical screening in our study suggests important programmatic and policy implications in cervical screening programs. The use of these locally constructed formal women groupings at community level for effective dissemination and awareness creation strategies regarding cervical cancer screening plays essentially an important role. Therefore, local health programmers might make use of these local networks in designing effective policy directions to disseminate cervical cancer information and raise the health literacy of the target group. This in turn boosts the women's knowledge, improves the use of maternal care services and directly influences the uptake of cervical screening among women in particular and implementation status of screening programs in general.

Moreover, contextually operating health system barriers, and community and individual level factors had a contribution to the currently observed lower level of implementation status of cervical cancer screening programs in the study context. The findings suggest that, these factors operating at the system, community and individual levels have negatively affected the screening performances of women in the community and the service delivery efforts of the health care providers in the health care setting. This implies the need for the formulation of contextually feasible multifactorial policy directions to be in place in a concerted manner to improve the implementation status of the program and screening uptake by the target groups.

Therefore, tackling the implementation bottlenecks in the health care system, creating cervical cancer awareness through local networks, improving the use of maternal care services, implementation of locally adapted structured health education interventions by integrating with other health extension program activities can significantly improve women's cervical cancer knowledge, their perceptions, and uptake of cervical screening and the screening service delivery efforts in general. The intervention package we have tested in this study can favorably be scaled up to other screening contexts in the study zones in particular & contextually customized to other zones outside the study area in the country in general by integrating into the routine health extension program implementation schemes.

Future research perspective

The feasibility and cost effectiveness of the intervention remain further research gaps in the area.

CHAPTER 8: STRENGTHS & LIMITATIONS OF THE STUDY

Strengths

These studies involved different research approaches and study designs to achieve valid and reliable research findings regarding cervical screening uptake. Basically, it involved a case control study design to identify factors that determine cervical cancer screening uptake among age eligible women for screening. It also provided contextual information regarding cervical screening program implementation in the study area and explored perceptions, beliefs and barriers to screening uptake from women and health professionals' perspective for better understanding of the context of screening implementation from supply and demand side using qualitative research methods. In addition, an effectiveness study was designed using the gold standard study design, cluster randomized controlled design, to determine the effect of locally adapted structured couple education and counseling in improving the uptake of cervical screening among eligible women. Moreover, the CRCT was implemented based on the methodological details and requirements depicted within the published study protocol to ensure the fidelity of the intervention during the trial period.

Limitations

Our case control study did not consider participants' HIV and STIs status for their inclusion into or exclusion from the study. Cognizant of the fact that those women who are at risk of HIV and STIs visit health facilities more as compared to the general women population, they could have utilized cervical screening more during the study period. As a result, there could have been high possibility of participants with HIV and STIs risk to be recruited in the case category which could have affected the chance of women's recruitment from the general population as cases into our study as required. The qualitative study has covered a limited geographic scope in the region, which might have limited the inclusion of more diverse viewpoints into the study findings. We also noted that the skill of moderation in some FGDs and key informant interviews was not sufficiently deep which might have compromised the richness of the data that led to less detailed information. In cluster randomized study the baseline differences suggesting more maternal service use in the last 1 year and community health insurance membership among the participants in the intervention group compared to the control arm could have affected the measurement of the true effect of this intervention on the primary outcome. Therefore, it is important to consider this limitation when interpreting the findings of the study.

CHAPTER 9: CONCLUSION & RECOMMENDATIONS

This study revealed important determinant factors and contextual setting for cervical cancer screening utilization and provision among the study participants. Determinants for cervical cancer screening uptake include urban residence, being in marital union, membership in women development army (WDA), knowledge of cervical cancer screening location, use of maternal health care services in the previous year & knowledge regarding cervical cancer & screening.

In the study area contextual factors which provided insights and understanding of the context at the community and health system levels related to cervical cancer screening have been explored particularly of low level of awareness and screening uptake among the study participants. The low level of cervical screening uptake can be attributed to a wide range of important individual, socio-cultural and belief related factors that operate at the community. These barriers include low awareness level, poor perception of health screening, stigma and discrimination, misconceptions about the causes of the disease, and low level of perceived risk. There have also been system related barriers to screening recognized by health professionals which encompassed low awareness among health professionals, low implementation of screening program, lack of resources and supplies, service interruptions, lack of close follow up and monitoring, shortage of trained human power, human resource turn-over, and unwelcoming client handling practices.

Locally adapted and structured home based couple education and counseling followed by referral of clients to cervical screening sites showed a remarkable improvement in the uptake of screening services among rural women eligible for cervical screening in Southern Ethiopia. This has been achieved through improving participants' knowledge status on cervical cancer and screening, and their perceptions status. Creating awareness, increasing knowledge and improving women's perceptions through structured health education and counseling interventions made cervical screening uptake effective in the study setting.

Based on the findings of this study, we recommend health extension workers and health care providers to exercise efforts aimed at improving women's knowledge on cervical cancer and promoting activities that target the utilization of maternal health care services in general and cervical screening in particular among the group. It is also highly valuable for health extension workers to consider locally existing social groupings like women development army as a channel

for health information dissemination activities to realize improved screening service uptake among this group.

District health officers and zonal health planners of the study area need to ensure concerted strategic efforts in place to address barriers that negatively influenced screening uptake at individual and community level through implementation of behavioral change communication strategies. They also need to design and implement close follow-up and problem solving supportive supervision activities to address factors that affect the implementation and provision of cervical screening programs at lower health system levels.

Moreover, all concerned bodies of the health system in the study zones including health extension workers, district health officers and zonal health planners need to scaleup the implementation of this intervention package through the existing health extension program to improve the cervical screening program in the respective areas. Finally, the regional health bureau and FMOH are responsible to design and implement locally adapted couple based education and counseling intervention package to other contexts outside the study zones and also provide close monitoring and support towards the implementation of cervical screening programs at lower levels of the health system in Ethiopia.

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APPENDICES

Annex 1 Ethical Approval of the study



Jimma University Institute of Health

Institutional Review Board

Ref. No. JHRPGN/355

Date: 16/7/2021

To: Mr. SAMUEL YOHANNES

Subject: Ethical Approval of Research Protocol

The IRB of Institute of Health has reviewed your research project "CERVICAL CANCER SCREENING IN ETHIOPIA: UNDERSTANDING CONTEXTS, DETERMINANTS AND EFFECT OF COUPLE EDUCATION ON KNOWLEDGE, ATTITUDE AND UPTAKE OF CERVICAL CANCER SCREENING SERVICE AMONG WOMEN OF CHILD BEARING AGE IN SOUTHERN ETHIOPIA"

Thus, this is to notify that this research protocol has presented to the IRB meets the ethical and Scientific standards outlined in national and international guidelines. Hence, we are pleased to inform you that your research protocol is ethically cleared under the following strict conditions:

1. Any significant deviation from the methodological details indicated in the approved protocol must be communicated to the IRB before it has been implemented.
2. Approval shall be only for a period of twelve months. The principal investigator is required to submit an application for the renewal of the ethical approval.
3. The Committee must be notified, in writing, of any alteration to the project including unforeseen events/circumstances that might affect the acceptability of the approved protocol.
4. The Principal researcher is required to immediately notify the committee in the event of any adverse effects on participants or of any unforeseen events that might affect continued ethical acceptability or amendment to the original consent form.
5. The inability of the Principal Researcher to continue in that role, or any other change in research personnel involved in the project, should be communicated.

The IRB wishes you every success in your research.

IRB, Chairperson

Million Tesfaye, PhD

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Annex 2 Data collection instrument

Annex 2.1 Information sheet and informed consent

PROJECT TITLE: CERVICAL CANCER SCREENING IN ETHIOPIA: UNDERSTANDING THE CONTEXTS, DETERMINANTS AND EFFECT OF COUPLE EDUCATION ON KNOWLEDGE, ATTITUDE AND UPTAKE OF CERVICAL CANCER SCREENING SERVICE AMONG WOMEN OF CHILD BEARING AGE IN SOUTHERN ETHIOPIA

Information Sheet

Dear Respondent:

My name is _____. I am working for the research project entitled “*understanding the contexts, determinants and effect of couple education on knowledge, attitude and uptake of cervical cancer screening service among women of child bearing age in southern Ethiopia*”. The study involves research and its purpose is to determine the effect of couple education on knowledge, attitude and uptake of cervical cancer screening services among women of child bearing age. Participation in this research will benefit individual woman by increasing her knowledge and encourage behavioral change to utilize the screening services. It also gives an opportunity to ask questions and learn more about the topic confidentially after the interview. Currently I am working with the research team of Jimma University to realize such objectives. Now, I am going to interview you & collect information which is required for the research purposes. You are randomly selected to be included in the study as part of the sample population to complete the questionnaire designed by the research team. The information obtained in this study will be used only for research purposes. The information you will provide is helpful to achieve the intended objectives of the study so that you and your community will benefit from. Any information obtained will be kept strictly confidential and will not be exposed to any other body. No personal identifiers will be attached to the information you will provide. Involvement in this study is voluntary and you can drop any individual question or the whole questionnaire at any time without giving a reason. Your refusal to participate or drop out will not produce penalty. However, your participation and contribution in the study is very helpful to come up with important findings to intervene the problem. The questionnaire will probably take 30-40 minutes to complete. For any information you can contact Mr. Samuel Yohannes; phone 0912009158/0933711704

Do you have any opinion regarding this study? Do you agree to participate in this study?

Yes, continue

No, thank you!

Consent form

I, the undersigned have been informed, in the language I can understand, and understood the purpose of this particular research project. I have been informed that the information I give will be used only for the purpose of this study; my identity, the information I give will be treated confidentially. I have also been informed that I can refuse to participate in the study, not to respond to question if I am not interested or stop responding to question at any time in the process. Based on the above information I agree to participate in the research voluntarily.

Participant's Sign _____ Person in charge of the informed consent, sign _____

Annex 2.2. Questionnaire for the case control study

You will tell us about the general information about the address of your household

General Information
Participant's Woreda _____ Kebele _____ Code : _____ _____ _____
Date of interview (dd/mm/yyyy) _____ _____ _____ Time ____:____

SECTION-I: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

We are going to ask you about your sociodemographic characteristics

Q_ID	Questions	Response and Coding	Skip
101	Participant's category	1. Case 2. Control	
102	What is your age in completed years?	_____ years	
103	What was your age at marriage?	_____ years	
104	Where is your residence?	1. Urban 2. Rural	
105	What is your current marital status?	1. Married 2. Single 3. Divorced 4. Widowed 5. Separated	
106	What is your religion?	1. Protestant 2. Orthodox 3. Muslim 4. Catholic 5. Others (specify) _____	
107	What is your ethnicity?	1. Kembata 2. Tembaro	

		3. Hadiya 4. Wolayita 5. Amhara 6. Others (specify)_____	
108	What is your highest educational attainment?	_____ grade	
109	What is your occupation?	1. House wife /domestic responsibilities/ 2. Employee (GO/NGO) 3. Merchant 4. Student 5. Farmer 6. Daily worker 7. Others (Specify)_____	
110	What is your husband's occupation? (if any)	1. Employee (GO/NGO) 2. Merchant 3. Student 4. Farmer 5. Daily worker 6. Others (Specify)_____	
111	What is your husband's educational attainment? (if any)	_____ grade	
112	How much is the monthly income of your family (salary, farming, trade, rental etc)	_____ in ETB	
113	How many family members do you have?	_____	
114	How many times did you give birth?	_____	
115	Are you a member of women development army?	1. Yes 2. No	

SECTION II: AWARENESS & INFORMATION FACTORS

We are going to ask you about the information related to cervical cancer & its screening

S.N	Questions	Response and Coding	Skip
201	Have you ever heard of cervical cancer? (<i>applicable for those who are not screened</i>)	1. Yes 2. No	
202	If yes for question 201, from where did you get the information? (<i>applicable for both screened and not screened women</i>)	1. Health professionals 2. Mass media 3. Colleagues 4. Women's development army 5. Others_____	
203	Have you ever heard of cervical pre-cancer screening? (<i>applicable for those who are not screened</i>)	1. Yes 2. No	
204	If yes for question 203, from where	1. Health professionals	

	did you get the information? (applicable for both screened and not screened women)	2. Mass media 3. Colleagues 4. Women's development army 5. Others_____	
205	Do you know any one screened for cervical pre-cancer?	1. Yes 2. No	
206	Do you know anyone who has got cervical cancer?	1. Yes 2. No	
207	Do you know where cervical pre-cancer screening is provided?	1. Yes 2. No	
208	Have you ever discussed about cervical cancer with your husband?	1. yes 2. No	

SECTION III: HEALTH SERVICE RELATED FACTORS

We are going to interview you about health services related factors

S.N	Questions	Response and Coding	Skip
301	Have you been a member of the health insurance?	1. Yes 2. No	
302	Have your family members visited health facility within the last 12 months for health care?	1. Yes 2. No	
303	Have you ever used maternal health services (FP, ANC, DC, PNC)?	1. Yes 2. No	
304	How far is your home from the health post on foot?	_____walking hours	
305	How far is your home from the nearest health center?	_____walking hours	
306	How far is your home from the nearest hospital?	_____walking hours	
307	How many times have you been visited by HEWs last year?	_____ times	

SECTION IV: KNOWLEDGE RELATED INFORMATION

We will ask you about your level of knowledge about cervical cancer & its screening

S.N	Questions	Response and Coding	Skip
401	Do you think that woman with multiple sexual partners is at higher risk of getting cervical cancer?	1. Yes 2. No 3. Do not know	
402	Which one do you think causes cervical cancer?	1. Sexually transmitted germs 2. Curse of God 4. Do not know	
403	Do you think that any woman who has engaged in sexual relations can be at risk of getting cervical cancer?	1. Yes 2. No 3. I don't know	

404	Which of the following symptoms do you think is of cervical cancer? (More than one answer is possible)	1. Bleeding in between periods 2. Foul smelling vaginal discharge 3. Pain during sexual contact 4. Heavier and longer periods 5. Do not know	
405	Do you think that cervical cancer is preventable?	1. Yes 2. No 3. Do not know	
406	Which of the following measures do you think prevents cervical cancer? (More than one answer is possible)	1. Regular screening & treatment 2. Minimizing risky behavior 3. Vaccination of girls at age 9-13 4. Do not know	
407	Do you think that early detection of cervical cancer has treatment?	1. Yes 2. No 3. Do not know	
408	Which of the following age groups of women do you think are eligible for cervical pre-cancer screening in Ethiopia?	1. Less than 30 years 2. 30 to 49 years 3. 50 years and above 4. Do not know	
409	Do you think that married woman like you should have cervical pre-cancer screening?	1. Yes 2. No 5. Do not know	
410	Do you think that cervical pre-cancer screening is more important for woman having multiple sex partners?	1. Yes 2. No 3. Do not know	
411	Which one of the following do you think is the advantage of receiving early screening for cervical pre-cancer? (More than one answer is possible)	1. Early detection of pre-cancer cells 2. Help receive early treatment option 3. Help prevent advanced cervical cancer 3. Do not know	
412	Do you think that women should have screening tests only when they experience problems such as pain or vaginal bleeding?	1. Yes 2. No 3. Do not know	
413	What do you think is the regular screening interval for cervical pre-cancer following normal results?	1. Every 3 years 2. Every 4 years 3. Every 5 years 4. Do not know	

SECTION V: ATTITUDE RELATED INFORMATION

We will interview you about your attitude and beliefs regarding cervical cancer & its screening

S.N	Questions	Response Categories		
		Agree=1	Neutral=2	Disagree=3
501	Women believe that any woman can acquire cervical cancer in their lifetime	Agree	Neutral	Disagree
502	If women look healthy, they will not get cervical cancer	Agree	Neutral	Disagree

503	Women believe that cervical cancer is fatal disease & has no treatment & cure	Agree	Neutral	Disagree
504	Women feel that cervical cancer would threaten a relationship with their husbands & social network	Agree	Neutral	Disagree
505	Women believe that having cervical pre-cancer screening identifies the disease early & prevents advanced cancer through treatment	Agree	Neutral	Disagree
506	Women feel that having cervical pre-cancer screening would make difference even if they do not have any symptom	Agree	Neutral	Disagree
507	Women feel that having regular cervical pre-cancer screening will decrease their chances of dying from cervical cancer	Agree	Neutral	Disagree
508	Women are ashamed of lying on examination bed and show their private parts to have a cervical pre-cancer screening	Agree	Neutral	Disagree
509	Women feel busy with their family responsibilities not to go to the health facility for screening services	Agree	Neutral	Disagree
510	Women are afraid of having a cervical pre-cancer screening for fear of a bad result & social stigma	Agree	Neutral	Disagree

Name of data collector _____ sig. _____ date _____

Name of Supervisor _____ sig. _____ date _____

Annex 2.3 Qualitative Research Interview Guide

Jimma University, Institute of Health, department of Population and Family Health an interview guide for the research entitled ‘Exploring Perceptions, beliefs, attitudes & challenges regarding cervical cancer screening uptake: women’s & health professionals’ perspectives.

Focused Group Discussion interview guide

Interview guide for FGD: Exploring perceptions, beliefs, challenges and attitudes of women regarding cervical cancer screening uptake: <u>Women’s perspectives</u>					
Demographic Information of the Participants					
Participant	Age	Occupation	Educ status	Marital status	Residence
P1					
P2					
P3					
P4					
P5					

P6					
P7					
P8					
P9					
P10					
P11					
P12					

Interview Guide

- We will discuss on cervical cancer, its causes, how to prevent, its screening etc.
 1. Please would you tell us [me] about cancer?
 - ✓ Probe: what is cancer, types of cancer, who is affected, home remedies, self-care, family, or non-professional, friends, etc - - - and why? If they know or mention about cervical cancer, ask;
 2. Would you tell me about cervical cancer?
 - ✓ Who is affected, perceived causes, perceived threat, etc - - - then, possible sources of help seeking sites like home remedies, self-care, family, or non-professional, friends, etc --
 - ✓ Probe: How other community members perceived about cervical cancer, and why? - Who is affected, perceived causes, perceived threat, etc
 3. Would you tell me how to deal with cervical cancer?
 - ✓ Probe: screening, treatment, Where to seek help for screening? Traditional vs modern treatments, and why?
 4. How do people in the community perceive about cervical cancer screening service utilization?
 - ✓ **Probe:** where they seek help for cervical cancer screening, kinds of care, and do people go to health facilities to get screened? **If yes;** why? Importance, choices, alternatives
 - ✓ **If no; why?** --- and proceed to question on challenges/ problems/ barriers
 5. Would you tell me why women do not seek for screening / not to get screened for cervical cancer in your locality?
 - ✓ Probe: cultural, economic, awareness, distance, health facility related, husband willingness, decision autonomy etc
 6. What do you suggest for women to get screened for cervical cancer in your locality? Why and How?
 7. Do you have anything to add/ more information

Thank you for your time and idea!

Annex 2.4 Indepth Interview Guide

Key informants interview guide: *Exploring perceptions, beliefs, challenges and attitudes of women regarding cervical cancer screening uptake: health workers' perspectives*

Demographic Information of key informant

Age_____ Sex_____ Marital status_____ Profession_____
Educational Status_____ Years of Experience_____

Interview Guide

- We are going to discuss about cervical cancer, its causes, how to prevent, its screening etc.
- 1. Would you tell us about your responsibilities/participation in health issues in your locality?
Probe: experience, if any
- 2. Please would you tell us [me] about cancer? What is cancer, types of cancer, who is affected, home remedies, self-care, family, or non-professional, friends, etc - - - and why?
- 3. Would you tell me about cervical cancer? What it is,
- 4. Who is affected, causes, threat, etc - - - then, possible sources of help seeking sites like home remedies, self-care, family, or non-professional, friends, etc --
- 5. How community members perceived about cervical cancer, and why? - Who is affected, perceived causes, perceived threat, etc
- 6. Would you tell me how women deal with cervical cancer? Probe: screening, treatment, Where to seek help for screening? Traditional vs modern treatments, and why?
- 7. How do people in the community perceive about cervical cancer screening service utilization? **Probe:** do women go to health facilities to get screened?
If yes; why? Importance, choices, alternatives
If no; why? --- and proceed to question on challenges/ problems/ barriers
- 8. Would you tell me why women do not seek for screening / not to get screened for cervical cancer in your locality? **Probe:** cultural, economic, awareness, distance, health facility related, husband willingness, decision autonomy etc
- 9. What do you suggest for women to get screened for cervical cancer in your locality? Why and How?
- 10. Do you have anything to add/ more information

Thank you for your time and idea!

Annex 2.5. Questionnaire for cluster randomized controlled trial

We will ask you about general information about your household addresses

Household Identification
Woreda : _____ Kebele ID: ____ ____ household code : ____ ____ ____
Kebele Name _____ Village Name: _____
Date of interview (dd/mm/yyyy) _____ _____ _____
Time at the beginning of the interview ____:____

SECTION-I: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

We are going to ask you about your sociodemographic characteristics

S.N	Questions	Response and Coding	Skip
101	What is your age in completed years?	_____years	

102	What is your current marital status?	1. Married 2. Single 3. Divorced 4. Widowed 5. Separated	
103	What is your religion?	1. Protestant 2. Orthodox 3. Muslim 4. Catholic 5. Others (specify)_____	
104	What is your ethnicity?	1. Kembata 2. Tembaro 3. Hadiya 4. Wolayita 5. Amhara 6. Others (specify)_____	
105	What is your highest educational grade?	_____ grade	
106	What is your occupational status?	1. House wife /domestic roles/ 2. Employee (GO/NGO) 3. Merchant 4. Student 5. Farmer 6. Daily worker 7. Others (Specify)_____	
107	What is the occupation of your husband? (if any)	1. Employee (GO/NGO) 2. Merchant 3. Student 4. Farmer 5. Daily worker 6. Others (Specify)_____	
108	What is the highest educational status attained by your husband? (if any)	_____ grade	
109	How much is the monthly income of your house hold? (salary, farming, trade, rental etc)	_____ in ETB	
110	Are you a member of the health insurance?	1. Yes 2. No	
111	Are you a member of women development army?	1. Yes 2. No	
112	What was your age at your first marriage?	_____ years	
113	How many times did you give birth?	_____	
114	How many family members do you have?	_____	
115	What is the age of your husband?	_____ years	

SECTION II: WOMEN's KNOWLEDGE ABOUT CERVICAL CANCER

We are going to ask you about your knowledge regarding cervical cancer

S.N	Questions	Response and Coding	Skip
-----	-----------	---------------------	------

201	Have you ever heard of the cervical cancer?	1. Yes 2. No	
202	If yes for question 201, where did you get the information from? (<i>Multiple response is possible</i>)	1. Health workers 2. Mass media 3. Women in the social network (screened/unscreened) 3. Others_____	
203	Do you think that woman with multiple sexual partners is at higher risk of getting cervical cancer?	1. Yes 2. No 3. Do not know	
204	Which of the following do you think causes cervical cancer?	1. Sexually transmitted germs 2. Curse of God 3. Do not know	
205	Do you think that any woman who has engaged in sexual relations can be at risk of getting cervical cancer?	1. Yes 2. No 3. I don't know	
206	Which of the following symptoms is of cervical cancer? (<i>Multiple response is possible</i>)	1. Bleeding in between periods 2. Foul smelling vaginal discharge 3. Pain during sexual contact 4. Heavier and longer periods 5. Do not know	
207	Do you think cervical cancer is preventable?	1. Yes 2. No 3. Do not know	
208	Do you know the ways how you can prevent cervical cancer? (<i>More than one answer is possible</i>)	1. Regular screening & treatment 2. Minimizing risky behavior 3. Vaccination og girls at age 9-13 4. Do not know	
209	Do you think that early detection of cervical pre-cancer has treatment?	1. Yes 2. No 3. Do not know	

SECTION III: WOMEN'S KNOWLEDGE ABOUT CERVICAL CANCER SCREENING

We are going to ask you about your knowledge regarding cervical cancer screening

S.N	Questions	Response and Coding	Skip
301	Have you heard about cervical cancer screening?	1. Yes 2. No	
302	If yes, for 301 where did you get the information from? (<i>More than one answer is possible</i>)	1. Health workers 2. Mass media 3. Women in the social network (screened/unscreened) 4. Others_____	
303	Which of the following age groups of women do you think is eligible for screening of cervical pre-cancer in Ethiopia?	1. Less than 30 years 2. 30 to 49 years 3. 50 years and above 4. Do not know	

304	Do you think that married woman like you should have cervical pre-cancer screening?	1. Yes 2. No 3. Do not know	
305	Do you think that cervical pre-cancer screening is more important for woman having multiple sex partners?	1. Yes 2. No 3. Do not know	
306	Which of the following do you think is the advantage of receiving early screening for cervical pre-cancer? (<i>Multiple answer is possible</i>)	1. Early detection of pre-cancer cells 2. Help receive early treatment option 3. Help prevent advanced cancer stage 4. Do not know	
307	Do you think that women should receive screening tests only when they experience problems such as pain or vaginal bleeding?	1. Yes 2. No 3. Do not know	
308	Which of the following is the regular screening interval for cervical pre-cancer following normal results?	1. Every 3 years 2. Every 4 years 3. Every 5 years 4. Do not know	
309	At which health facility do you think cervical pre-cancer screening service is being provided?	1. _____ 2. Do not know	

SECTION IV: WOMEN'S CERVICAL CANCER SCREENING PRACTICES

We are going to ask you about your cervical cancer screening practice

401	Have you ever been screened for cervical pre-cancer?	1. Yes 2. No	Skip
402	If yes for question 401 when was last time you screened?	1. Within the last 5 years 2. More than 5 years ago	
403	If yes for question 401, who initiated you to get screened?	1. Health professionals 2. Mass media 3. Friends/relatives 4. Others _____	
404	If yes for question 401, where did you get the screening service?	1. Government hospital 2. Private hospital	
405	If no for question 401, why haven't you been screened for cervical pre-cancer?	1. Lack of awareness /not being informed/ 2. Fear of the procedure & bad results 3. Lack of family support 4. Others (distance, stigma) _____	
406	If you have screened before five years, do you have plan to be screened in the future?	1. Yes 2. No	
407	If not planned in the future, why?	1. I thought one time test is enough 2. I am busy with other responsibilities 3. I tested negative before 4. Others _____	
408	How likely do you think that you will develop cervical cancer disease?	1. Likely 2. Not likely	

SECTION V: WOMEN's ATTITUDE ABOUT CERVICAL CANCER & ITS SCREENING

We are going to ask you about your attitude & beliefs regarding cervical cancer screening and its uptake

S.N	Questions	Response Categories		
		Agree=1	Neutral=2	Disagree=3
5.1.	Perceived susceptibility towards the disease (<i>an individual's subjective perception of being at risk of cervical cancer</i>)			
5.1.1.	Women are very worried of getting cervical cancer when they get pain in their womb & vaginal discharge	Agree	Neutral	Disagree
5.1.2.	Women should not worry about cervical cancer because God protects them	Agree	Neutral	Disagree
5.1.3.	Women believe that any woman can acquire cervical cancer in their lifetime	Agree	Neutral	Disagree
5.1.4.	If women look healthy, they will not get cervical cancer	Agree	Neutral	Disagree
5.1.5.	Some women feel that they are likely to get cervical cancer in the future	Agree	Neutral	Disagree
5.2.	Perceived severity of the disease (<i>subjective evaluation of an individual to perceive the seriousness or the possible consequences of cervical cancer</i>)			
5.2.1.	Women believe that cervical cancer is serious disease & affects daily activities	Agree	Neutral	Disagree
5.2.2.	Women feel that having cervical cancer does not put a woman to grave	Agree	Neutral	Disagree
5.2.3.	Cervical cancer worries woman about missing her social network with her friends	Agree	Neutral	Disagree
5.2.4.	Women feel that there is no medical treatment and cure for cervical cancer	Agree	Neutral	Disagree
5.2.5.	Women feel that cervical cancer would threaten a relationship with their husbands	Agree	Neutral	Disagree
5.2.6.	Women who experience cervical cancer would suffer for a longer time	Agree	Neutral	Disagree
5.3.	Perceived benefit (<i>the subjective perception of the benefits of engaging in cervical cancer screening to prevent cervical cancer</i>)			
5.3.1.	Women believe that having cervical pre-cancer screening is the best option to identify the disease early	Agree	Neutral	Disagree
5.3.2.	Women feel that their participation in screening cannot help prevent cervical cancer disease	Agree	Neutral	Disagree
5.3.3.	Women believe that being screened for cervical pre-cancer benefit them through early treatment options	Agree	Neutral	Disagree
5.3.4.	Women feel that having cervical pre-cancer screening would make difference even in the absence of any symptom	Agree	Neutral	Disagree
5.3.5.	Women feel that having regular cervical pre-cancer screening will not decrease their chances of dying from cervical cancer	Agree	Neutral	Disagree

5.3.6.	Women believe that having regular cervical pre-cancer screening decreases worry about cervical cancer	Agree	Neutral	Disagree
5.4.	Perceived barrier (<i>factors perceived to be hindering one's ability to engage in cervical cancer screening or overcoming possible factors associated with seeking cervical cancer screening</i>)			
5.4.1.	Women believe that screening would not be helpful, since cervical cancer has no cure	Agree	Neutral	Disagree
5.4.2.	Women do not want to get screened because they feel the procedure is painful	Agree	Neutral	Disagree
5.4.3.	Women are ashamed of lying on examination bed and show their private parts to have a cervical pre-cancer screening	Agree	Neutral	Disagree
5.4.4.	Women feel that their husband might not be willing & interested when they expose their private body parts	Agree	Neutral	Disagree
5.4.5.	Women feel busy with their family responsibilities to go to the health facility for screening services	Agree	Neutral	Disagree
5.4.6.	Women are afraid of having a cervical pre-cancer screening for fear of a bad result & social stigma	Agree	Neutral	Disagree
5.4.7.	Women may have other problems more important than having a cervical pre-cancer screening in their life	Agree	Neutral	Disagree
5.4.8.	There is no health facility nearby to have a cervical pre-cancer screening	Agree	Neutral	Disagree
5.5.	Cues to action (<i>the stimulus needed to trigger the decision-making process to take a recommended health action</i>)			
5.5.1.	I understand that early detection provides chance of cure	Agree	Neutral	Disagree
5.5.2.	I know where to get screened for cervical pre-cancer	Agree	Neutral	Disagree
5.6.	Perceived self-efficacy (<i>the woman's level of confidence to engage in cervical cancer screening</i>)			
5.6.1.	I feel confident enough to get screened for cervical pre-cancer	Agree	Neutral	Disagree

SECTION VI: MALE INVOLVEMENT IN WOMAN'S CERVICAL SCREENING UPTAKE

We are going to ask you about your husband's involvement in your cervical cancer screening uptake

601	Has your husband initiated discussion about cervical cancer and its screening? (<i>Involves spousal communication</i>)	1. Yes 2. No	Skip
602	Is your husband willing enough to discuss about cervical cancer and its screening? (<i>Involves spousal communication</i>)	1. Yes 2. No	
603	Does your husband encourage and support you to get screened for cervical cancer?	1. Yes 2. No	

	<i>(Involves psychological support)</i>		
604	Does your husband approve your choice and decision to get screened for cervical pre-cancer? <i>(Involves psychological support)</i>	1. Yes 2. No	
605	Is your husband willing to accompany you to screening site when you get screened for cervical pre-cancer? <i>(Involves practical support)</i>	1. Yes 2. No	

Name of data collector _____ sig. _____ date _____

Name of Supervisor _____ sig. _____ date _____

Annex 3 Health Education & Counseling Brochure /English Version/

“Cervical Cancer Screening Saves Women’s Lives”

Educational brochure prepared to increase cervical cancer knowledge and promote positive attitude and screening uptake among eligible women

Section One

What is cervical cancer?

Cervical cancer is a type of cancer that occurs in the tissues of the cervix — the organ in the lower part of the uterus and the entrance to the uterus from the vagina. Various strains of the human papillomavirus (HPV), a sexually transmitted infection, play a role in causing most cervical cancer.

Current disease burden (incidence & mortality)

Nearly 6,300 new cases are diagnosed annually, and about 4,884 women die from cervical cancer each year in Ethiopia. This makes cervical cancer the second-most common cancer in the country, and the second-most deadly cancer among Ethiopian women.

Section Two

Risk factors for cervical cancer

The risk of developing cervical cancer markedly increases with infection with HPV, the number of lifetime sexual partners, co-infection with other sexually transmitted infections, history of smoking, younger age before 18 at first intercourse and at first pregnancy, high parity 4 and more children, and long-term use of oral contraceptives.

Signs, symptoms and complications of cervical cancer

During precancerous stage cervical cancer may have no symptoms. But symptoms of early stage cervical cancer may include: Irregular light bleeding between periods in women of reproductive age; bleeding after sexual intercourse; increased vaginal discharge, sometimes foul smelling; pelvic pain or pain during sexual intercourse. Some of the complications that can occur in advanced cervical cancer are severe bone or muscle pain, kidney failure, blood clots, bleeding, fistula etc.

Methods of prevention

Cervical cancer is one of the most preventable female cancers. It can be prevented by vaccination and cervical screening methods. Two vaccine doses provided six months apart are helpful for adolescents aged 14 years in Ethiopia. It is not helpful once a woman has been engaged in sex.

Section Three

Benefits of screening

Regular screening is the most important practice you can perform to prevent cervical cancer. Screening tests detect precancerous cells in the cervix, which can be treated before cancer ever develops. In fact, most invasive cancers are found in women who have not had regular screening.

Screening Eligibility and Schedule

Screening of cervix for pre-cancer cells is recommended for women aged 30 to 49 years old who have been engaged in sexual relations. Every woman has the right to be screened for cervical cancer at least once in her lifetime. But the regular schedule for cervical cancer screening is every five years.

Barriers to screening /fears or stigma associated with screening/

The major factors identified by the women that influence screening utilization were lack of knowledge about the need for cervical screening, fatalistic attitudes about cervical cancer, low perceived susceptibility, having many contending issues, financial constraint, and emotional barriers like fear of having a positive result, embarrassment and anticipated shame, lack of time, absence of symptoms. Counseling will be tailored & focuses on specific barriers to each woman.

Section Four

Meaning of screening results

The available screening technique in Ethiopia is VIA. When VIA is positive it means the woman has developed abnormal pre-cancerous cells of the cervix. When VIA is negative it means the woman did not develop any abnormal cervical pre-cancer cells. This does not guarantee future condition.

Treatment options

The treatment option for pre-cervical cancer is cryotherapy. But once it advances treatment depends on the stage of the cancer and options include surgery, radiotherapy and chemotherapy. Palliative care is also an essential element of cancer management to relive unnecessary pain and suffering due the disease.

The cost of screening & where to get the service

Cervical cancer screening is free of charge. It is available at nearby public health facilities during the working days. The Health facilities currently providing screening services are Mudula primary hospital and Dr. Bogalech Gebre general hospital.

N.B: Ask key questions in each section to check wome's comprehension.

Key messages to summarize each session: 'Screening is the key to preventing cervical cancer', 'Women aged 30 and over are most at risk for cancerous changes' and 'Screening saves women's lives'.

Contact person in charge of the intervention: Samuel Yohannes (Cell phone: 0912009150)

Annex 4 Professional CV of the Author

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Personal Identification	
Date of Birth	August 11, 1975 GC
Sex	Male
Marital Status	Married
Nationality	Ethiopian
Career Objective	
To make use of my potential as to the maximum level of my academic preparation & attain advancement in my professional development	
Summary of Qualification	
I have MPH degree in Reproductive health from Jimma University, BSc degree in Public Health from Dilla University and Higher diploma in reflective training and teaching skills from Dilla University. I have attended and completed medium term online training course in sexual and reproductive health research in 2016 from Geneva Foundation for Medical Education and Research.	
Education background	
2010	MPH, Reproductive health Jimma University, Jimma, Ethiopia
2000	BSc, Public Health Dilla University, Dilla, Ethiopia
2011	Diploma in Reflective Training and Teaching Dilla University, Dilla, Ethiopia <i>/Higher Diploma Program/</i> Sexual and reproductive health research training
2016	Geneva Foundation for Medical Education and Research
Professional Work Experience	
Sept.2000 – Oct. 2005	<i>Clinician and technical team coordinator Adis Hiwot and Abomsa Health centre</i>
Nov. 2005 to Nov. 2006	<i>Disease prevention and control expert (Merti Woreda Health Office)</i>
Dec. 2006 to June 2007	<i>Instructor Hosanna College of Health Sciences</i>
June 2007 to Sept. 2009	<i>Academic and research vice dean Hosanna College of Health Sciences</i>
April 2009 to Sept. 2009	<i>Dean of the College (delegated) Hosanna College of Health Sciences</i>
Sept 2009 to June 2010	<i>Post graduate studies in Jimma University (working with postgraduate academic duties including research activities)</i>

February 2011 to April 2013	<i>Health extension upgrading program coordinator Hosanna College of Health Sciences</i>
April 2013 to February 2014	<i>Instructor, Hosanna College of Health Sciences</i>
February 2014 to Jan 2018	<i>In-service training coordinator, Hosanna CHS</i> • Coordinating different in-service trainings in the college
Feb 2018 to present	<i>Instructor and Researcher, Hosanna College of Health Sciences</i>

Publications

1. Duration and determinants of birth interval among women of child bearing age in Southern Ethiopia. <http://www.biomedcentral.com/1471-2393/11/38>
2. Assessment of knowledge, attitude and practice about malaria and ITNs utilization among pregnant women in Shashago district, southern Ethiopia. <http://www.malariajournal.com/content/pdf/s12936-015-0755-7.pdf>
3. Prevalence of smear positive pulmonary tuberculosis and associated risk factors among prisoners in Hadiya Zone prison, Southern Ethiopia: <http://bmcrenotes.biomedcentral.com/articles/10.1186/s13104-016-2005-7>
4. The association between malaria and malnutrition among under five children in Sheshogo District, Southern Ethiopia. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5234126/>
5. Knowledge, attitude and practice for cervical cancer prevention and control among women of childbearing age in Hossana Town, Hadiya zone, Southern Ethiopia: Community-based study. <https://doi.org/10.1371/journal.pone.0181415>
6. Utilization and Factors Affecting Adolescents and Youth Friendly Reproductive Health Services among Secondary School Students in Hadiya Zone, Southern Nations, Nationalities and Peoples Region, Ethiopia ([Int. J. of Public Health & Safety](#))
7. Health seeking behavior and its determinants for cervical cancer among women of childbearing age in Hossana Town, Hadiya zone, Southern Ethiopia: community based cross sectional study. <https://doi.org/10.1186/s12885-018-4203-2>
8. Hypertension and its associated factors in Hosanna town, Southern Ethiopia: community based cross-sectional study. <https://doi.org/10.1186/s13104-018-3435-1>
9. Adolescent-parent communication regarding SRH issues among high school students of Hadiya zone <https://doi.org/10.1186/s12887-018-1388-0>
10. Proximate determinants of fertility in Ethiopia; an application of revised Bongaarts model <https://doi.org/10.1186/s12978-019-0677-x>
11. Utilization of Integrated Community Case Management and Its Factors in Southern Ethiopia: Facility Based-Cross-Sectional Study: <https://doi.org/10.1155/2021/8835804>
12. Effectiveness of couple education and counselling on knowledge, attitude and uptake of cervical cancer screening service among women of child bearing age in Southern Ethiopia: A cluster randomized trial protocol: <https://doi.org/10.1371/journal.pone.0270663>
13. Determinants of cervical cancer utilization among women in Southern Ethiopia: <https://doi.org/10.1038/s41598-022-18978-z>
14. Women's and health professionals' perceptions, beliefs and barriers to cervical cancer screening

uptake in Southern Ethiopia: a qualitative study: https://doi.org/10.1080/26410397.2023.2258477	
15. Exploring health care providers' engagement in prevention and management of multidrug resistant Tuberculosis and its factors in Hadiya Zone health care facilities: qualitative study:- https://doi.org/10.1186/s12913-024-10911-6	
16. Effectiveness of couple education and counseling on uptake of cervical cancer screening among women in Southern Ethiopia: a cluster randomized trial:- https://doi.org/10.1038/s41598-024-61988-2	
Trainings	
February 2020	• Comprehensive Systematic Review Training Program module 2, JU
February 2020	• Comprehensive Systematic Review Training Program module 1, JU
October 2019	• GLM organized by Jimma University, JU
May-November 2016	• Training Course in Sexual and Reproductive Health Research organized by Geneva Foundation for Medical Education and Research (GFMER)
May 2016	• The evidence based management of post-partum haemorrhage online course organized by University of Oxford and GFMER
June 2016	• Obstetric fistula an e-learning course organized by Global Health Network
June 2016	• Maternal Health infections an e-learning course organized by Global Health Network
December 2016	• Leadership, Management and Governance (LMG) training organized by FMOH in collaboration with MSH-LMG project
Nov 21-26,2016	• Grant Development and Management training organized by FMOH in collaboration with ICAP-Columbia University
August 29- Sep 3, 2016	• National In-service Training Management organized by FMOH and ICAP-Columbia University
January 12-30, 2004	• HIV/AIDS voluntary counselling and testing training course organized by Oromiya Health Bureau and Family Health International Ethiopia
June 10-12, 2015	• Blended Comprehensive HIV Testing and Counselling organized by FMOH in collaboration with ICAP-CUE
August 13- Sept 7, 2007	• Curriculum & teaching/Training and Learning Materials Development on Health Sector Occupations Organized by FMOE in Collaboration with FMOH
June 27- July1, 2011	• Effective teaching skill training organized by MCHIP in collaboration with FMOH and USAID
Sept 19-24, 2011	• Clinical Teaching Skills and Student performance Assessment organized by MCHIP in collaboration with FMOH and USAD
Nov.6- 19, 2011; Jan.22- Feb. 4, 2012	• Curriculum development for Ethiopian Health sciences colleges organized by FMOH and FMOE
April 19-30, 2004	• Case management course on Integrated Management of New Born and Childhood Illnesses organize by Oromiya Health Bureau and Jimma U.
May 31- June 5, 2004	• Facilitation Skill course training on Integrated management of Childhood illness organized by OHB and Jimma University
June 9 th to 10 th ,	• Facilitating training on the new malaria diagnosis and treatment guideline

2005	organized by Arsi Zone Health Department and merlin
February 12-16, 2007	• Training on syndromic management of sexually transmitted infections (STIs) organized by SNNPR regional Bureau and CDC Ethiopia
December 22-27 & March 5 to 10, 2007	• Facilitating training on integrated management of new-born and childhood illnesses organized by save the children Ethiopia, and SNNPR RHB
March 19-24 and June 18-23, 2012	• Facilitating training on integrated management of new-born and childhood illnesses organized by JHU, and SNNPR RHB
Jan25-Feb.21, 2016	• Facilitation of Effective implementation research skills training for researchers organized by Hosanna College of Health Sciences with financial support from WHO-TDR
April 4-6, 2016	• In-service training Data Base Management for health professionals, organized by FMOH in collaboration with Jhpiego Ethiopia
Nov. 14-17, 2014 Feb.28-Mar3, 2015	• Facilitation of Effective Teaching Skills training organized by IST and HSEDC of Hosanna College of Health Sciences
May 02-19, 2006	• TOT course organized for accelerated implementation of Health service extension program on EPI, RH, IMNCI, ENA, Malaria, Hygiene and sanitation, HIV/AIDS, IEC, Monitoring and Evaluation organized by FMOH and SNNPR RHB in collaboration with UNICEF
July 15 th to 19 th , 2003	• Training on PHC facility management organized by Arsi Zone Health Department and Medical Emergency Relief International (merlin)
August 16 th -27 th 2004	• Facilitating training of community malaria agents organized by Arsi Zone Health department and Medical Emergency Relief International.
Febr.28 th to March 10 th , 2000	• Skill development course on emergency surgery, resuscitation, orthopedics, trauma and obstetrics organized by Dilla College of Health Sciences in collaboration with Tropical Health and Education Trust, UK
Languages	• I have the skills to speak and write Kembatisa, Amharic & English
Professional Membership	• Ethiopian Public Health Association; Member since May, 2006
Other contributions	1. Field practicum guideline for health sciences students, HHSC, 2015 2. Supportive supervision guideline development, HHSC, 2021 3. SOP for IRB, HHSC, 2023 4. Research theme formulation, HHSC, 2024 5. Community services guideline development, HHSC, 2024