Optimizing Non-Communicable Disease Screening in Ethiopia:

Development and evaluation of service integration, and behavioral change communication at primary healthcare level

Dissertation

zur Erlangung des akademischen Grades
Doktor der Medizinischen Wissenschaften (Dr. rer. medic.)
für das Fachgebiet Epidemiologie

vorgelegt
der Medizinischen Fakultät
der Martin-Luther-Universität Halle-Wittenberg

von: Bezawit Ketema Dessie

Betreuer*in: Prof. Eva J. Kantelhardt

Gutachter*innen: Prof. Steffi Riedel-Heller, Leipzig
PD Amand Gabriel Führer, Halle (Saale)

Datum der Verteidigung: 28.05.2025

Summary

The overreaching aim of this dissertation is to discuss how to optimize non-communicable disease (NCD) screening in Ethiopia through service integration and behavioral change communication (BCC) at primary healthcare level. First, we conducted three cross-sectional studies among primary health facility (PHF) attendees, which independently reported only around half of the attendees had the intention to undergo clinical breast examination (CBE), cervical cancer screening (CCS), and blood pressure check respectively. Spouse's lack of education, and being female decreased the intention to undergo CBE and blood pressure check respectively. Not having had previous CCS experience decreased the intention to undergo it. Positive attitude and positive normative beliefs towards the screening increased the intention.

Following, we developed seven BCC materials to influence the above identified factors and conducted a mixed-method study to explore the production process and to assess facility attendants' satisfaction on the BCC materials. The study showed that the BCC materials were developed based on evidence, stakeholders' input, and pre-testing. Overall users' satisfaction with the material was high with a mean score of 22.10 (min 14, max 25).

Finally, we did a facility based before-after quasi-experimental study to evaluate the effectiveness of NCD screening service integration with and without usage of our BCC materials. As a routine care at PHFs in Ethiopia, CCS and CBE are offered together, blood pressure checks at the outpatient department, and glucose tests at the laboratory. However, NCDs commonly show comorbidity. Thus at the intervention facilities of our experimental study, four NCD screening services (CCS, CBE, blood pressure check, and blood glucose check) were integrated at a service department. We found that integrating NCD screening services accompanied by BCC efforts significantly increased the uptake of CCS, CBE, blood pressure check, and blood glucose check. However, integrating NCD screening services without usage of BCC could only increase CBE and blood glucose-check service uptakes. Thus, we recommend to integrate the currently scattered NCD screening services and that they promote its uptake through BCC efforts.

Ketema Dessie, Bezawit: Optimizing Non-Communicable Disease Screening in Ethiopia: Development and evaluation of service integration and behavioral change communication at primary healthcare level, Halle (Saale), Univ., Med. Fak., Diss., 24 pages, 2025

Referat

In meiner Dissertation untersuche ich, wie Vorsorgeuntersuchungen für nichtübertragbare Krankheiten (NCDs) in Äthiopien durch Integration und verhaltensändernde Kommunikation (BCC) auf Ebene der primären Gesundheitsversorgung optimiert werden können. Drei Studien, die wir zunächst durchführten, berichteten unabhängig voneinander, dass nur circa die Hälfte der Besucher, die Absicht hatten, sich einer klinischen Brustuntersuchung (CBE), einem Zervixkarzinom-Screening (CCS) bzw. einer Blutdruckmessung zu unterziehen. Der mangelnde Bildungsstand des Ehepartners und das weibliche Geschlecht verringerten die Wahrscheinlichkeit, sich einer CBE bzw. einer Blutdruckmessung zu unterziehen. Das Fehlen früherer CCS-Erfahrungen verringerte die Absicht, sich diesem zu unterziehen. Eine positive Einstellung und positive normative Überzeugungen erhöhten die Absicht, am Screening teilzunehmen.

Um diese Faktoren zu beeinflussen, entwickelten wir sieben verschiedene BCC-Materialien und führten eine weitere Studie durch, um den Produktionsprozess und die Zufriedenheit der Besucher hinsichtlich der BCC-Materialien zu evaluieren. Diese Studie mit einem gemischten Methodenansatz zeigte, dass die BCC-Materialien auf der Grundlage von Evidenz, Stakeholder-Input und Vortests entwickelt wurden. Die durchschnittliche Zufriedenheit der Endnutzer mit dem audiovisuellen Material lag durchschnittlich bei 22,10 (Min. 14, Max. 25).

Abschließend führten wir eine quasi-experimentelle Vorher-Nachher-Studie durch, um die Wirksamkeit der Integration von NCD-Screening-Diensten mit und ohne Nutzung unserer BCC-Materialien zu bewerten. In Äthiopischen Gesundheitseinrichtungen werden CCS und CBE routinemäßig zusammen angeboten, aber Blutdruckmessungen und Blutzuckertests gesondert in der Ambulanz und im Labor. NCDs weisen häufig Komorbiditäten auf. Daher wurden in den Interventionseinrichtungen unserer Studie diese vier NCD-Screening-Dienste in eine Abteilung integriert. Wir stellten fest, dass die Integration von NCD-Screening-Diensten in Verbindung mit BCC-Maßnahmen die Inanspruchnahme von CCS, CBE, Blutdruckmessung und Blutzuckermessung signifikant erhöhte. Die Integration von NCD-Screening-Diensten ohne Nutzung von BCC konnte die Inanspruchnahme von CBE- und Blutzuckerkontrolldiensten jedoch nur gering steigern. Daher empfehlen wir die derzeit verstreuten NCD-Screening-Dienste zu integrieren und ihre Nutzung durch BCC-Bemühungen zu fördern.

Ketema Dessie, Bezawit: Optimizing Non-Communicable Disease Screening in Ethiopia: Development and evaluation of service integration and behavioral change communication at primary healthcare level, Halle (Saale), Univ., Med. Fak., Diss., 24 Seiten, 2025

Table of contents

Abbreviations and Acronyms

AOR – Adjusted odds ratio

BC – Breast cancer

BCC – Behavior change communication

CCS – Cervical cancer screening

CDC – Center for Disease Prevention and Control

CI – Confidence interval

DiD – Difference-in-differences

GDP – Gross domestic product

PhD – Doctor of Philosophy

PHF – Primary healthcare facility

NCD – Non-communicable disease

SBCC – Social and behavioral change communication

SDG – Sustainable development goal

SSA – Sub-Saharan Africa

TPB – Theory of planned behavior

US – United States

VIA – Visual inspection with acetic acid

WHO – World Health Organization

1. Introduction and Objectives

1.1. Description of the problem

Non-communicable diseases (NCDs) are responsible for 41 million deaths annually, representing 74% of all deaths worldwide [1]. The main types of NCDs are cardiovascular diseases, cancers, chronic respiratory diseases and diabetes; these four groups of diseases account for over 80% of all premature NCD deaths in the world. NCDs disproportionately affect people in low-and middle-income countries where more than three quarters of global NCD deaths occur [1]. In Africa, over a third of deaths are due to NCDs [2].

Ethiopia is the second most populous country in Africa, landlocked and bordered by Djibouti, Eritrea, Kenya, Somalia, Sudan and South Sudan [3]. It is a low-income country with a GDP per capita of US$ 890 (2023) [4]. In Ethiopia, NCDs are the leading cause of death, accounted for 42% of the total deaths in the country in 2022 [5]. According to the United Nations NCD task force, NCDs are projected to contribute to 70% of the Ethiopia's disease burden by 2040 [6].

Sustainable Development Goal target 3.4 declares to reduce premature mortality from NCDs by one third by 2030 [7]. In congruence with global commitments, Ethiopia has the overarching aim to achieve a 25% reduction of premature death from NCDs by the end of 2025 [8] . The World Health Organization (WHO) regional office for Africa reported on the need for integrating essential NCD services in primary healthcare to scale up early detection [9]. In line with global strategies, Ethiopian primary healthcare facilities (PHFs), guided by the national NCD prevention guideline, offer cervical cancer screening (CCS), clinical breast exams (CBE), blood pressure and glucose measurement services, but not in an integrated way [8].

Thus, NCD screening service uptake remains low in Ethiopia (3.0% for diabetes, 23.4% for hypertension, and 2.7% for cervical cancer) [10]. Consequently, Ethiopian NCD patients often present late with acute or chronic complications, leading to expensive and prolonged treatment [11]. Moreover, most studies on NCDs in Ethiopia focused on disease prevalence, risk factors, and service uptake. Nevertheless, this PhD project developed and evaluated two different service delivery models to increase NCD screening service uptake among PHF attendees in Ethiopia.

This project consisted of three phases. Phase one comprised three observational studies that assessed PHF attendees' intention and associated factors to undergo CCS (publication I), CBE (publication II), and blood pressure check (publication III). The Theory of Planned Behavior (TPB) provided a framework for all phase one studies. Central to the TPB is the concept of intention, which indicates the likelihood of performing a behavior/the screening. TPB posits that intention is influenced by attitudes (positive or negative evaluations of the behavior), subjective norms (perceived social pressure), and perceived behavioral control (the individual's perceived ability to perform the behavior) [12].

To address such theory-driven (TPB) influencing factors associated with PHF attendees' screening intention, phase two of this project involved the development of behavioral change communication (BCC) materials: an audiovisual presentation and six printed pieces (two leaflets, three posters, and one billboard). For example, recognizing that many participants in phase one studies believed that they are healthy and thus do not get screened. Consequently, the BCC materials we developed highlighted the asymptomatic nature of early-stage NCDs. However, most BCC processes and materials developed to communicate health issues in Ethiopia are not evaluated or not to a satisfactory quality [13, 14]. Thus, we assessed the BCC materials production process, materials' quality, and users' satisfaction in our mixed-method study (publication IV).

Moreover, evidence suggested that NCDs frequently occur together [15-17]. Thus, integration of different NCD screening services, in which individuals can be screened simultaneously for multiple NCDs is recommended in a variety of settings [18, 19]. However, integration of NCD screening services is not yet evaluated in Ethiopia. Thus, in addition to addressing factors affecting PHF attendees' screening intention with our BCC materials, we evaluated the effectiveness of NCD screening service integration with or without usage of our BCC materials towards increasing NCD screening service uptake.

Therefore, in phase three of this project, we did a facility-based quasi-experimental, before-after study over three study arms. We assigned each of the 12 randomly selected PHFs to one of the three arms of the study: 1) *Component Intervention arm* 2) *Single Intervention arm,* and 3) *Control arm.* PHFs in the component intervention arm integrated four NCD screening services; where CCS, CBE, blood pressure check, and blood glucose check are offered under one service

department called “NCDs”. In addition, our BCC materials were distributed within those PHFs in the component intervention arm. The billboard was positioned at the entrance, leaflets were distributed at the triage, posters were posted on the service room walls, and the audiovisual presentation was played via television screens in the waiting area. PHFs in the single intervention arm integrated the four screening services but did not include our BCC. In the control arm, PHFs provided the routine care, which is CCS and CBE (offered together in the same room), blood pressure checks (at the outpatient department), and blood glucose tests (at the laboratory). Neither of this study interventions (integrated NCD screening or our BCC) was offered in the control arm facilities.

Finally, we compared changes in the uptake of CCS, CBE, blood pressure check, and blood glucose check services before- and after-intervention periods across the three study arms with split Difference-in-differences (DiD) analysis (publication V). In conclusion, this study has identified the most effective service delivery model to optimize NCD screening service uptake at the primary healthcare level in Ethiopia. We believe the findings of this project from five original articles will inform policymakers and program developers in Ethiopia and similar settings, enabling them to adapt the most effective service delivery model to optimize NCD screening service uptake and ultimately prevent late NCD presentation, its associated costs, and mortality.

1.2. Research objectives

The general objective of this study is to determine intention & its associated factors to undergo NCD screening, to develop BCC materials on promoting NCD screening, to assess its quality, and users’ satisfaction, and to identify the most effective NCD screening service delivery model to optimize NCD screening service uptake at primary healthcare level.

Specific objectives:

- ✓ To determine intention to undergo cervical cancer screening & its associated factors among women attending primary healthcare facilities (publication I)
- ✓ To determine intention to undergo clinical breast examination & its associated factors among women attending primary healthcare facilities (publication II)
- ✓ To determine intention to undergo blood pressure check & its associated factors among adults attending primary healthcare facilities (publication III)

- ✓ To develop BCC materials on promoting NCD screening, assess its quality, and users' satisfaction (publication IV)
- ✓ To evaluate effectiveness of integrated NCD screening service delivery model with and without BCC towards increasing NCD screening service uptake at primary healthcare level (publication V)

2. Discussion

2.1. Intention and its associated factors to undergo NCD screening among primary healthcare facility attendees (publication I, II, & III) - *Phase One*

This study revealed NCD screening service uptake is suboptimal in the study area. Very few (13%) had ever undergone CBE (publication II), comparable proportion (20%) had ever undergone CCS (publication I), and only one-third (36%) had their blood pressure checked at some point in their life (publication III).

Not only is current NCD screening uptake suboptimal, but majority of this study participants did not intend to undergo the screening in the future. According to our publication I, only 46% of the participants intended to undergo CCS, with the mean score for the intention to undergo CCS 10.3 (SD ± 2.3; min 3, max 15). In our publication II, similar proportion (46%) of the participants intended to undergo CBE with the mean score of intention to undergo CBE 12.6 (SD ± 3.2; min 5, max 20). This percentage is consistent with another similar study that was conducted in Ethiopia [20]; however, it is lower than that found in a study conducted in Ghana, where 82% of women reported that they intended to undergo CCS [21]. This variation might be due to differences in the study populations, as the latter study included HIV-positive women only, and these women may have benefited from counselling about the need for CCS during their follow-up contacts with healthcare providers. Another possible explanation relates to the current study being conducted in a rural area, as there is a lack of health information dissemination to rural Ethiopian populations, who may have limited access to media and other sources of information. In our publication III, 53% of the study participants were intended to undergo blood pressure check. In Ethiopia, even though there are no studies yet that focus on intention to undergo blood pressure check, this finding is consistent with our publication I and II, and with other similar studies done on intention to undergo other NCD screening in Ethiopia [22, 23].

Our publication I showed that women who had never had CCS were 50% less likely (AOR: 0.5; 95% CI 0.3–0.9) to intend to undergo CCS than their counterparts who ever had CCS. Even though, prior screening experience was not significantly associated with intention to undergo either CBE or blood pressure checks in our publication II & III, it is consistent with findings from other studies conducted in southern Ethiopia [24] and China [25]. A mixed-method study conducted in the

United Kingdom also reported a strong association between previous engagement with screening appointments and the intention to undergo CCS [26]. This could be explained by the fact that a person who have had previous screening experience could have received better information about prevention strategies, disease severity, and the advantages of screening due to their contact with healthcare providers.

Publication II showed that the odds of intention to undergo CBE among women whose spouse could not read or write are 80% lower than for women whose spouse attended formal education (AOR = 0.2; 95% CI = 0.0–0.7). Likewise, Indian males who had completed secondary education were more likely to have a positive intention to support their wife's screening than males who had not completed secondary education [27] . This is in line with the WHO recommendation for male education to increase their willingness to encourage and support their partners in screening programs [28]. A study conducted in Addis Ababa, Ethiopia, also revealed that women who attended secondary and tertiary school were two and four times more likely to practice breast cancer screening (AOR = 2.5, 95% CI = 1.1–5.4; AOR = 4.0, 95% CI = 1.5–10.9), respectively, when compared to participants who did not attend formal education [29]. Education showed indirect effect on intention to undergo blood pressure check in our publication III as well, in which female participants in the study are less likely to intend to undergo blood pressure check than male participants, and this disparity was explained by the knowledge gap between the two sexes, as 86% of men, compared to 69% of women in the study, demonstrated good blood pressure knowledge.

All the TPB constructs (attitude, subjective norm, and perceived behavioral control) have shown a significant association with intention to undergo at least one of the screenings targeted in this study (CCS, CBE, or blood pressure check). Our publication II showed that the odds of intention to undergo CBE increased by 2.6-fold per unit increase in the attitude score (AOR = 2.6; 95% CI = 2.0–3.4). Similarly, the odds of intention to undergo blood pressure check increased by 3.7-fold per unit increase in the attitude score (publication III). Our publication II also showed that the odds of intention to undergo CBE increased by 1.4-fold per unit increase in the subjective norm score (AOR = 1.4; 95% CI = 1.2–1.7). However, unlike in other studies—which were conducted in Yirgalem in Ethiopia in 2017 [24] , and in Romania and Bulgaria in 2020 [30] —in this study (publication I), subjective norm was not significantly associated with the intention to undergo

CCS. This disparity could be due to the study time variation, and cultural and contextual differences as specific communities and their social norms might differ significantly.

In addition, a unit of change in the perceived behavioral control of participants equated to an 18% decrease (AOR: 0.82; 95% CI 0.7–0.9) in the intention to undergo CCS (publication I). Similar findings were also reported by studies conducted in different parts of Ethiopia [20, 24, 31, 32] and in Iran [33].

In general, our observational studies, publications (I, II, and III) along with other similar studies [10, 22, 34], indicated suboptimal intention to undergo NCD screening in Ethiopia. In our publications (I, II, and III), the TPB framework facilitated the identification of various factors influencing the intention to undergo the screenings.

Thus, our publications I, II, and III recommended BCC intervention towards addressing the identified factors associated with the suboptimal intention to undergo NCD screening. This recommendation is in line with national strategies, the Ethiopian national strategic action plan for the prevention and control of major NCDs aimed to increase public awareness on NCDs by conducting social and behavioral change communication through print and electronic media[8]. Furthermore, the Ethiopian National Health Promotion and Communication Strategy Framework emphasized that without increased public awareness and behavior change, health improvements in the country would not be achievable [35].

2.2. Behavioral change communication towards promoting NCD screening at primary healthcare level: Production process, quality assessment, and users' satisfaction (publication IV) - *Phase Two*

Though, efforts towards NCD prevention and control in Ethiopia have encompassed development of BCC materials[36-38], NCD communication in particular and health communication in general did not receive priority as other health-related activities in the country [39]. Upon the evidence we generated from our observational studies (publications I, II, and III), we in collaboration with Nathan Multimedia Production Company produced seven BCC materials encompassing an audiovisual presentation and six printed pieces (2 leaflets, 3 posters, and 1billboard) to promote NCD screening.

The main message of our BCC materials was to promote NCD screening. The targeted NCD screening services in the BCC materials were CCS, CBE, blood pressure check, and blood glucose check. The audiovisual component features healthcare professionals encouraging regular screening, along with testimonials from survivors emphasizing the benefits of early detection. Posters stress the ease of NCD screening, the often asymptomatic nature of the target diseases, and the importance of a healthy lifestyle. Leaflets give definitions of NCDs, their risk factors, potential complications, and preventative measures. The billboard visually shows the targeted NCD screening procedures.

However, most BCC processes and materials developed to communicate health issues in Ethiopia are not evaluated or not to a satisfactory quality [13, 14]. But, our mixed-method study (publication IV) assessed the production process, materials' quality, and users' satisfaction of the BCC materials we developed in collaboration with Nathan Multimedia Production Company to promote NCD screening among PHF attendees in Ethiopia.

Key-informants of publication IV, witnessed the presence of prior studies conducted to inform the material production, showcasing factors associated with the low intention to undergo NCD screening, to characterize the target audience, and to understand the setting.

. . .*Before the start of the material development, there was a baseline study, and the result of the baseline study was presented to us. The study indicated different wrongly held beliefs for the low NCD screening behavior in the study area. The health communication materials we developed was aimed towards changing those beliefs. According to the baseline study findings, most of our audiences believe that they are healthy, and that is why they fail to get screened. Thus, through our materials we indicated that NCDs are asymptomatic at their early stage.* . . (BCC materials production team lead)

Key-informants also emphasized the usage of an evidence-based media mix to increase the reach

. . . .*When the baseline study finding was presented to us, we came to know that some of our target audiences can't read and write, then we decided to develop an audiovisual in addition to printed materials. . . For those who can't read the printed materials, they can watch the video.* . . (BCC materials production team lead)

Such an evidence-driven health communication material production and media mixing have been recommended to ensure the take-up of the desired behavior in other literatures as well [35, 40, 41].

Key-informants in our publication IV witnessed the BCC material production involved stakeholders and pre-testing.

. . . *Before we started the actual production, we first presented the storyline to the team and we revised it according to the feedback, then we developed our first draft. The draft materials were revised many times upon feedback from different stakeholders including community representatives; our final evaluation was made before we duplicated the materials, where we did the pretest in the community that resembled our target audience.* . . (Producer)

After visiting selected PHFs where our BCC materials were distributed, participants showed varying levels of exposure to the materials. The vast majority (98.5%) saw the audiovisual presentation during their visit to the PHFs, while exposure to printed materials was considerably lower. Only 26 (6.3%) saw at least one of the two leaflets, while 147 (35.7%) saw the billboard, and 120 (29.1%) saw at least one of the three posters. This could suggest the audiovisual material had the highest reach within the healthcare facilities. In line with this finding, a similar study conducted in Bangladesh assessing the role of print materials and electronic media to improve CCS revealed that television was the best method of awareness creation [42]. Similarly, following the poster campaign where four hundred posters were paced in the streets of Geneva for smoking prevention, only 36% of respondents reported having seen posters about smoking prevention [43]. This may be due to the fact that printed materials primarily reach individuals who can read, and exclude those with visual impairments, whereas, the audiovisual format, displayed on a television screen, can effectively engage both literate and non-literate audiences. Furthermore, background music specifically created for this audiovisual piece has the potential to attract the intended audience. Individuals with visual impairments can benefit from the audio component, making the information more accessible. Evidences also indicated most audiences preferred audiovisuals than print materials [44-46].

While assessing quality of the seven BCC materials, the Center for Disease Prevention and Control (CDC) clear communication index score result showed that, on five of them the main messages were written at the top, beginning, or on the front section of the materials. However, on the two leaflets which were graded lower, the main message was written at the end or at the back of the

material. As per the CDC standard, when the main messages are written at the top or first section of the material, audiences can find them more easily and quickly, and vice versa [47]. However, according to other similar studies conducted in Ethiopia, most of the evaluated health communication materials on cholera [13] and maternal and child health [14] were largely of poor quality and needed improvement due to a lack of pretesting, and community involvement. However, in this study, the placement of the key message was the reason for low quality not the lack of assessment, pretesting, or community engagement.

Good quality BCC material production based on evidence, stakeholders input, and pre-testing will ensure end users' satisfaction (publication IV).In our publication IV, the high mean scores across all satisfaction items of the audiovisual material (22.10 (SD ± 2.34; min 14, max 25)) suggested that target audiences are generally satisfied with the audiovisual material. As per a study done in Addis Ababa, Ethiopia, the received service has to meet or exceed the patients' expectations for the patients to be satisfied [48]. Thus, our study finding could imply the audiovisual material has met or exceeded target audiences' expectation.

The multivariable logistic regression report (publication IV) showed that participants' age and educational status have a positive association with satisfaction with the audiovisual material. Respondents with educational status of university/higher education were 4.4 times (AOR: 4.42, 95% CI: (1.36–14.40)) more likely satisfied with the audiovisual material than those who cannot read and write. A positive association between educational status and satisfaction were observed in studies measuring satisfaction with other healthcare services as well [49, 50]. This may be due to the comparable greater extent of attention and understanding of respondents with educational status of university/higher education. Respondents with educational status of university/higher education are typically more knowledgeable about their medical condition and treatment options, making them more likely to have a better understanding of the care they received and thus be more satisfied with it. A variety of socio-demographic characteristics, including educational status and age, were identified as factors influencing patient satisfaction as these characteristics can provide insight into a patient's expectations and experiences [51-53]. A possible explanation for statistically significant satisfaction with the audiovisual material among 40-49 years was that, in our study (publication IV), compared to older age ranges, respondents in the age range of 40-49

years were mostly with university/higher education; and acquiring higher education has showed significant positive association with the satisfaction.

Thus, policymakers in Ethiopia and similar settings can learn from the production process and could adapt this study BCC materials for promotion of NCD screening.

2.3. Effectiveness of NCD screening service integration and behavioral change communication to increase NCD screening service uptake among primary healthcare facility attendees (publication V) – *Phase Three*

Apart from the identified factors associated with the suboptimal intention to undergo NCD screening (publications I, II, III), which were addressed by our BCC materials (publication IV); it is evidenced that NCDs commonly show comorbidity. A population based prospective cohort study found that type 2 diabetes mellitus was associated with an increased risk of hypertension (AOR = 1.07; 95% CI: 1.04–1.10) [15], and the study recommends regular blood pressure measurement, together with blood glucose measurement. A systematic review and meta-analysis revealed a statistically significant association between hypertension and increased risk of breast cancer (RR = 1.15; 95% CI: 1.08–1.22) [54]. Another systematic review indicated that diabetes was related to poorer overall survival (HR = 1.59, 95% CI: 1.35–1.87) and poorer recurrence-free survival (HR = 1.98, 95% CI: 1.47–2.66) in cervical cancer patients [55]. Given the interrelated nature of NCDs, NCD screening service integration, in which individuals could be screened simultaneously for multiple NCDs, is recommended in a variety of settings [55]. However, integration of NCD screening services is not yet evaluated in Ethiopia.

Therefore, we did a facility based before-after quasi-experimental study over three study arms to evaluate effectiveness of integrated NCD screening service delivery with or without BCC to increase NCD screening service uptake (publication V). Component intervention (integrated NCD screening services plus BCC), and single intervention (integrated NCD screening services without BCC) are the two intervention arms of this study (publication V). In this study, four NCD screening services (CCS, CBE, blood pressure check, and blood glucose check) were integrated under one service department called “NCDs”. In addition, our BCC materials produced by Nathan Multimedia Production Company based up on the findings of our observational studies (publication I, II, III) were distributed within PHFs under the component intervention arm. The

third arm is the control arm with a routine care without integrated NCD screening or BCC of this study. As a routine care at PHFs in Ethiopia, CCS and CBE are offered together in the same room labeled “cervical cancer screening”, blood pressure checks at the outpatient department, and glucose tests at the laboratory.

We independently compared each intervention arm with the control arm, assessing changes in the outcome variables (uptake of CCS, CBE, blood pressure check, and blood glucose check) between before- and after-intervention periods. A split difference-in-differences (DiD) analysis was used to determine the effect of the intervention separately on each of the screening service uptake. The DiD estimates in this study measured the changes in the outcome variables, which resulted from the intervention.

In our experimental study (publication V), compared with the routine care, integrated NCD screening service delivery accompanied by BCC (component intervention) increased NCD screening service uptake. The component intervention significantly increased the uptake of CCS, CBE, blood pressure measurement, and blood glucose measurement by 18, 9, 44, and 23 percent points, respectively. This implies that a component intervention approach is effective in optimizing NCD-screening service uptake. In line with this, a systematic review of twenty studies showed that multicomponent interventions were effective in increasing screening service uptake [41].

In another way, compared with the routine care, integrated NCD screening service delivery without accompanying BCC (single intervention) had effect on increasing CBE service uptake and blood glucose-measurement service uptake. The intervention increased CBE service uptake by 9% point and blood glucose-measurement service uptake by 18% point. Nevertheless, CCS service uptake and blood pressure-measurement service uptake were not affected. This indicates that NCD screening service integration would be more effective when it is accompanied by evidence-based, theory-driven, strategically developed BCC interventions. This is in line with different health-behavior-change theories and models, E.g. the health belief model [56] and the theory of planned behavior [12] showed that BCC interventions would facilitate the occurrence of healthy behaviors. Research also indicated that effective health communication interventions can promote positive behavior change and help to prevent diseases [36, 57].

In contrary to our study, a systematic review and meta-analysis to identify effective interventions to increase the uptake of CCS showed that single interventions may increase the uptake of CCS compared with a control group [58]. This variation could be due to differences in target interventions; in our single intervention, the intervention was NCD screening service integration, However, the interventions in the studies that were included in the systematic review and meta-analysis described above were counseling, health education, reminders, invitations, messaging, economic intervention (e.g. subsidized cost), and procedure provision (e.g. HPV testing, visual inspection with acetic acid (VIA) test, etc.). Moreover, according to a scoping review of the literature and resources for CCS interventions, no associations with effect size were noted for a number of intervention components [59].

The current study showed that the uptake of all NCD-screening services increased in all arms over time from before to after-intervention survey times. The service uptake increment in the control arm could be due to the fact that people are constantly learning, both intentionally and unintentionally, throughout their lives, which naturally increases the uptake of any health service over time. In the control arm of this study, blood pressure-measurement service uptake showed a greater increase (23%) from before to after-intervention survey times compared with the other target NCD-screening services. This could be due to the fact that there was an active effort to improve hypertension prevention and control at the primary health-care level in Ethiopia during the study period. This effort was made by the Federal Ministry of Health of Ethiopia in collaboration with the World Health Organization (WHO) and Resolve to Save Lives [60].

As per the after-intervention survey findings; in the control arm, majority of women who underwent CBE and/or CCS were at a secondary educational level or above, and were mostly employed. Similar to this finding, other studies have also reported positive associations between educational status and CCS service uptake [61]. Another study conducted in Ethiopia also showed that employed women were likely to undergo breast screening [62]. However, in both component-intervention and single-intervention arms of this study, most women who underwent CBE after-intervention survey could not read and write, and were housewives. This implies that the interventions in this study were important in reaching less-educated and non-employed women for better uptake of CBE and/or CCS services.

In this study, most women who underwent CBE or/and CCS across all of the arms were those who were knowledgeable about the disease. This positive association between knowledge and screening service uptake had been reported in many other studies, as well [63]. This indicates that educational interventions may be helpful in increasing NCD-screening service uptake. The majority of the participants who took up screening services (CCS, CBE, and blood glucose measurement) in the intervention arms of this study were those who had not taken it up previously. However, in most other scenarios, people would likely take up the screening service when they had experienced it before [34, 64]. The same was true in the control arm of this study, in which the majority of the women who underwent CCS were those who have taken it up previously. Thus, this study interventions (service integration and BCC) could be recommended to motivate people to take up the screening service, even if they had not had the experience before.

In this study, at the component intervention arm, a total of 293 participants were eligible to take up all the screening services (CCS, CBE, blood pressure measurement, and blood glucose measurement) at the after-intervention survey visit. Among the 293 participants who were eligible for all screening services, 133 (47%) participants had taken up the blood pressure check service by the after-intervention-survey visit. This could be due to the fact that blood pressure measurement is the simplest procedure of the screening procedures used in this study. Among those participants who were eligible for all screening services, very few of them, 12 (4%), had taken up all of the available NCD-screening services by the time they completed the after-intervention-survey visit. This could mean that, even though NCD-screening services are available in an integrated way and promoted with good BCC, their uptake would vary based on the available test strategies and procedures.

In general, in this study, we found that delivering different NCD-screening services in an integrated way together with usage of good BCC efforts at PHFs is the most effective strategy to increase NCD screening service uptake. Our finding was in line with the WHO's package of essential NCD intervention recommendations for PHFs, which endorses the use of an integrated approach to NCD screening for low-resource settings [65].

Thus, we recommend PHFs in Ethiopia and similar low-resource settings to give NCD screening services in an integrated way and to promote it with good BCC interventions to optimize NCD screening service uptake.

2.4. Strength and limitations of the study

This three-phase PhD project possesses several key strengths. In phase one, three distinct studies (Publications I, II, and III) investigated the intention and associated factors to undergo CCS, CBE, and blood pressure checks, respectively. This independent approach enabled precise sample size calculations and targeted study participant recruitment, leading to focused data collection and avoided respondent fatigue from overly long questionnaires. Critically, the consistent application of the TPB across all three studies provided a robust theoretical framework for identifying key influencing factors, a best practice in behavioral health research and BCC intervention design.

Phase two leveraged the findings from phase one to develop seven evidence-based and theory-driven BCC materials (Publication IV). This evidence-based approach is considered crucial for achieving sustainable behavior change. The transparent documentation of the BCC materials development process will confirm replication and adaptation by other researchers. To ensure unbiased reporting and quality assessment, two external individuals, who subsequently became co-authors on publication IV, explored our BCC materials production process and evaluated the materials using the CDC Clear Communication Index. Furthermore, end-user satisfaction with the materials was assessed within the target population.

Finally, phase three employed a quasi-experimental, before-after design (Publication V) to indecently evaluate the two intervention models: integrated NCD screening service delivery with and without BCC. Independent comparison of the two NCD screening service delivery models against the routine care allowed for direct assessment of each model's effectiveness in increasing the screening uptake. This design ultimately facilitated the identification of the optimal service delivery model towards increasing NCD screening service uptake.

Although our studies had many strengths, they also had certain limitations. All of the five studies in this project are facility-based, which might not represent the general population, as facility attendees may have a better health information and understanding than the general population. In addition, in our publication IV, we assessed end users' satisfaction with our audio-visual material only, which might not show satisfaction with the printed materials. Furthermore, we were unable to assess whether those who reported being satisfied actually used the screening service.

2.5. Conclusion and recommendations

Screening towards major NCDs is one of the recommended strategies by the WHO to prevent and control NCDs. However, like other SSA countries, current NCD screening service uptake in Ethiopia is low. Consequently, people with NCDs in Ethiopia come to the health facilities at the late stage of the diseases, where the management is very expensive, or sometimes not available, and with poor prognosis. According to this project, the intention to undergo NCD screening (CCS, CBE, and blood pressure check) is suboptimal among PHF attendees. Age, sex, educational status, previous screening experience, attitude, subjective norm, and perceived behavioral control are among the identified factors significantly associated with the intension to undergo the screenings.

Developing BCC materials based up on scientific evidence, theoretical framework, stakeholders' input, and pre-testing can lead to good quality materials and end users' satisfaction.

Integration of the currently scattered NCD-screening services within the PHFs together with good quality BCC interventions would increase the uptake of NCD screening services among PHF attendees.

Thus, we recommend policy makers and program developers to allocate a specific department within the PHFs to offer integrated NCD screening services targeting the main NCDs by performing the available test procedures, and that they promote its uptake through good quality BCC efforts.

3. References

1. World Health Organization: Non-Communicable Disease Fact Sheet. In. https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases: WHO; 2023.
2. World health Organization: Deaths from noncommunicable diseases on the rise in Africa. In. https://www.afro.who.int/news/deaths-noncommunicable-diseases-rise-africa:WHO Africa; 2022.
3. Worldometer: African Countries by population In. United Nations, Department of Economic and Social Affairs, Population Division; 2024.
4. International Monetary Fund: Ethiopia GDP per capita. In. https://www.imf.org/external/datamapper/NGDPDPC@WEO/ETH; 2024.
5. National Data Managment Center for Health: Burden of Non-communicable diseases in Ethiopia In. https://ndmc.ephi.gov.et/burden-of-non-communicable-diseases-ncd-in-ethiopia/; 2023.
6. World health Organization: The Government of Ethiopia is working jointly with the UN System to strengthen the national NCD response. In. Geneva, Switzerland: UN Task Force on NCDs; 2017.
7. United Nation: Sustainable Development Goals. In: Department of Economic and Social Affairs. https://sdgs.un.org/goals; 2015.
8. Ministry of Health Ethiopia: National Strategic Action Plan for the Prevention and Control of Major Non-communicable diseases (2018-2025). In. https://extranet.who.int/ncdccs/Data/ETH_B3_NSAP%20for%20Prevention%20and%20Control%20of%20Major%20NCDs%20_2018-2025_Version%20April%2011,2019.pdf; 2019.
9. World health Organization: Regional Framework for Integrating Essential Non-communicable Disease Services in Primary H ealth Care. In. Geneva, Switzerland: WHO Regional Committee for Africa; 14 June 2017.
10. Ethiopian Public Health Institute: Ethiopia STEPS report on risk factors for non-communicable diseases and prevalence of selected NCDs. In. https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/data-reporting/ethiopia/steps/ethiopia-2015-steps report.pdf?sfvrsn=254fca06_2&download=true: Ethiopian Public Health Institute; 2016.
11. Saleem A, Bekele A, Fitzpatrick MB, Mahmoud EA, Lin AW, Velasco HE, Rashed MM: Knowledge and awareness of cervical cancer in Southwestern Ethiopia is lacking: A descriptive analysis. PLoS ONE 2019, 14(11).
12. Ajzen I: The theory of planned behavior. Organizational behavior and human decision processes 1991, 50(2):179-211.
13. Adera NG, Ketema B, Girma E: Effectiveness and quality of risk communication process in Ethiopia: The case of risk communication during cholera outbreak in Addis Ababa, Ethiopia. Plos One 2022, 17(8).
14. Tadesse Y, Ketema B, Girma E: The Effect of the “first 1000 days” mass communication intervention on maternal and child feeding practices in Mekelle City, North Ethiopia. Ethiopian Journal of Health Development 2022, 36(1).
15. Abera SF, Gebru AA, Biesalski HK, Ejeta G, Wienke A, Scherbaum V, Kantelhardt EJ: Social determinants of adult mortality from non-communicable diseases in northern Ethiopia, 2009-2015: Evidence from healthand demographic surveillance site. PLoS ONE December 13, 2017, 12(12).
16. Sun D, Zhou T, Heianza Y, Li X, Fan M, Fonseca VA, Qi L: Type 2 Diabetes and Hypertension: A Study on Bidirectional Causality. PMC 2019, 124(6).
17. Han H, Guo W, Shi W, Yu Y, Zhang Y, Ye X, He J: Hypertension and breast cancer risk: a systematic review and meta-analysis. Scientific Reports 2017, 7(44877).
18. Pastakia SD, Ali SM, Kamano JH, Akwanalo CO, Ndege SK, Buckwalter VL, Vedanthan R, Bloomfield GS: Screening for diabetes and hypertension in a rural low income setting in western Kenya utilizing home-based and community-based strategies. Global Health 2013, 9(21).
19. Singh K, Kondal D, Mohan S, Jaganathan S, Deepa M, Venkateshmurthy NS, Jarhyan P, Anjana RM, Narayan KMV, Mohan V et al: Health, psychosocial, and economic impacts of the COVID-

19 pandemic on people with chronic conditions in India: a mixed methods study. BMC Public Health 2021, 685.
20. Getahun T, Kaba M, Derseh BT: Intention to Screen for Cervical Cancer in Debre Berhan Town, Amhara Regional State, Ethiopia: Application of Theory of Planned Behavior. Journal of Cancer Epidemiology 2020, 2020:3024578.
21. Ebu NI, Ogah JK: Predictors of cervical cancer screening intention of HIV-positive women in the central region of Ghana. BMC Womens Health 2018, 18(1):43.
22. Alemnew W, Debalkie G, Azale T: Intention to Screen for Cervical Cancer Among Child Bearing Age Women in Bahir Dar City, North-West Ethiopia: Using Theory of Planned Behavior. International Journal of Women's Health 2020 1215–1222, 12:1215–1222.
23. Wollancho W, Amdissa D, Bamboro S, Wasihun Y, Tareke KG, Gizaw AT: Determining behavioral intention and its predictors towards cervical cancer screening among women in Gomma district, Jimma, Ethiopia: Application of the theory of planned behavior. PLoS ONE 2020, 15(11).
24. Abamecha F, Tena A, Kiros G: Psychographic predictors of intention to use cervical cancer screening services among women attending maternal and child health services in Southern Ethiopia: the theory of planned behavior (TPB) perspective. BMC Public Health 2019, 19(1):434.
25. Bai Y, Liu Q, Chen X, Gao Y, Gong H, Tan X, Zhang M, Tuo J, Zhang Y, Xiang Q et al: Protection motivation theory in predicting intention to receive cervical cancer screening in rural Chinese women. Psychooncology 2018, 27(2):442-449.
26. Wilson R, Quinn-Scoggins H, Moriarty Y, Hughes J, Goddard M, Cannings-John R, Whitelock V, Whitaker KL, Grozeva D, Townson J et al: Intentions to participate in cervical and colorectal cancer screening during the COVID-19 pandemic: A mixed-methods study. Prev Med 2021, 153:106826.
27. Dsouza JP, Broucke SVd, Pattanshetty S, Dhoore W: Factors explaining men's intentions to support their partner's participation in cervical cancer screening. BMC Women's Health 2022, 22(443).
28. World health Organization: Comprehensive Cervical Cancer Control:A guide to essential practice. In. WHO website; 2014.
29. Abeje S, Seme A, Tibelt A: Factors associated with breast cancer screening awareness and practices of women in Addis Ababa, Ethiopia. BMC Women's Health 2019, 19(4).
30. Crăciun IC, Todorova I, Băban A: "Taking responsibility for my health": Health system barriers and women's attitudes toward cervical cancer screening in Romania and Bulgaria. Journal of health psychology 2020, 25(13-14):2151-2163.
31. Wollancho W, Amdissa D, Bamboro S, Wasihun Y, Tareke KG, Gizaw AT: Determining behavioral intention and its predictors towards cervical cancer screening among women in Gomma district, Jimma, Ethiopia: Application of the theory of planned behavior. PloS one 2020, 15(11):e0238472.
32. Alemnew W, Debalkie G, Azale T: Intention to Screen for Cervical Cancer Among Child Bearing Age Women in Bahir Dar City, North-West Ethiopia: Using Theory of Planned Behavior. International Journal of Women's Health 2020, 12:1215-1222.
33. Heidari Sarvestani M, Khani Jeihooni A, Moradi Z, Dehghan A: Evaluating the effect of an educational program on increasing cervical cancer screening behavior among women in Fasa, Iran. BMC Womens Health 2021, 21(1):41.
34. Abamecha F, Tena A, Kiros G: Psychographic predictors of intention to use cervical cancer screening services among women attending maternal and child health services in Southern Ethiopia: the theory of planned behavior (TPB) perspective. BMC Public Health 2019, 19(434).
35. Ministry of Health Ethiopia: National Health Promotion Strategic Plan (2021/2-2025/6). In. http://196.189.110.22/handle/123456789/2672; 2021.
36. Abu SH, Woldehanna BT, Nida1 ET, Tilahun AW, Gebremariam MY, Sisay MM: The role of health education on cervical cancer screening uptake at selected health centers in Addis Ababa. Plos One 2020, 15(10).

37. Lott BE, Yeo S, Bekele E, Birhanu4 F, Hussein R, Muktar S, Mengiste T, Asfaw E, Madhivanan P, Deressa BT: Breast Cancer Education and Empowerment in Ethiopia: Evaluating Community-Based Cancer Prevention Eforts Using the RE-AIM Framework. Journal of Cancer Education May 28, 2024.
38. Berhanu H, Feyissa GT, Geleta D, Sudhakar M: Diabetes mellitus self-management education at Jimma University Medical Center: evidence-based implementation project. JBI Evidence Implementation 2022.
39. Tefera YD, Ali AC, Woldearegay AG: A Study on Communication Practices in Reducing Non-Communicable Diseases in Bahir Dar City, Ethiopia. Risk Managment and Healthcare Policy 2024, 17:827—841.
40. Arkin EB: Making Health Communication Program Work: DIANE; 1992.
41. Rodríguez-Gómez M, Ruiz-Pérez I, Martín-Calderón S, Pastor-Moreno G, Artazcoz L, Escribà-Agüir V: Effectiveness of patient-targeted interventions to increase cancer screening participation in rural areas: A systematic review. International Journal of Nursing Studies 2020, 101.
42. Nessa A, Hussain MA, Rashid MHU, Akhte N, Roy JS, Afroz R: Role of print and audiovisual media in cervical cancer prevention in Bangladesh. Asian Pacific Journal of Cancer Prevention 2013, 14(5).
43. Etter J-F, Laszlo E: Evaluation of a poster campaign against passive smoking for World No-Tobacco Day. Patient Education and Counseling 2005, 57(2):190-198.
44. Singh N, Ramakrishnan, S T, Khera A, Singh G: Impact evaluation of two methods of dental health education among children of a primary school in rural India. Medical Journal of Dr DY Patil University 2016, 9(1):66-71.
45. Gupta R, Ingle NA, Kaur N, Ingle E, Charania Z: Evaluation of the Impact of Different Health Education Methods in Undergraduate Students of Dental College, Mathura City. Journal of Advanced Oral Research 2016, 7(1).
46. Pengpid S, Peltzer K: Prevalence, awareness, treatment and control of hypertension among adults in Kenya: cross-sectional national population-based survey. Eastern Mediterranean Health Journal 2020, 26(8).
47. Center for Disease Control and Prevention: Modified CDC Clear Communication Index Score Sheet. In. https://www.cdc.gov/ccindex/pdf/modified-index-score-sheet.pdf; 2014.
48. Geberu DM, Biks GA, Gebremedhin T, Mekonnen TH: Factors of patient satisfaction in adultoutpatient departments of private wingand regular services in public hospitals ofAddis Ababa, Ethiopia: a comparative cross-sectional study MC Health Services Research 2019, 19(1).
49. Kefale AT, Atsebah GH, Mega TA: Clients' perception and satisfaction toward service provided by pharmacy professionals at a teaching hospital in Ethiopia. Integrated Pharmacy Research and Practice 2016, 14(5):85-94.
50. Melese T, Gebrehiwot Y, Bisetegne D, Habte D: Assessment of client satisfaction in labor and delivery services at a maternity referral hospital in Ethiopia. Pan African Medical Journal 2014 31(17).
51. Ramírez OJG, Carrillo GM, Cárdenas DC: Survey on Satisfaction with Healthcare of Patients with Chronic Disease Enfermeria Global 2016, 15(44).
52. Mengesha S, Mengesha T, Beyene T, Waju S, Salgedo B, Tafese F, Fikru J, Jaleta T: Patient satisfaction and associated factors with outpatient medica services in rural primary healthcare facilities, Ilubabor zone, Oromia region, Ethiopia International Journal of Current Research 2015, 7(9).
53. Jalil A, Zakar R, Zakar MZ: Satisfaction of diabetes patients in public outpatient department: prevalance and determinants. Rawal Medical Journal 2018, 43(1).
54. Almomani MH, Akhu-Zaheya L, Alsayyed M, Alloubani A: Public's Knowledge of Hypertension and its Associated Factors: A Cross-Sectional Study. The Open Nursing Journal 07 Feb 2022, 16.

55. Ethiopian Public Health Institute: Mini Demographic and Health Survey 2019. In. https://www.unicef.org/ethiopia/media/1721/file/The%202019%20Ethiopia%20Mini%20Demographic%20and%20Health%20Survey%20.pdf; 2021.
56. Christina L. Jones, Jakob D. Jensen, Courtney L. Scherr, Natasha R. Brown, Katheryn Christy a, Weaver J: The Health Belief Model as an Explanatory Framework in Communication Research: Exploring Parallel, Serial, and Moderated Mediation. Health Communication 2015, 30(6).
57. Ngigi S, Busolo D: Behaviour Change Communication in Health Promotion: Appropriate Practices and Promising Approaches. International Journal of Innovative Research and Development September 2018, 7(9).
58. Tin KN, Ngamjarus C, Rattanakanokchai S, Sothornwit J, Aue-aungkul A, Paing AK, Pattanittum P, Jampathong N, Lumbiganon P: Interventions to increase the uptake of cervical cancer screening in lowand middle-income countries: a systematic review and meta-analysis. BMC Women's Health 2013, 23(120).
59. Popalis ML, Ramirez SI, Leach KM, Granzow ME, Stoltzfus KC, Moss JL: Improving cervical cancer screening rates: a scoping review of resources and interventions. Cancer Causes Control 2022, 33(11).
60. World Health Organization: Ethiopia Sets to Improve Hypertension Prevention and Control at Primary Health Care Level. In. Geneva, Switzerland: WHO; 2019.
61. Ayalew TL, Wale BG, Zewudie BT: Burden of undiagnosed hypertension and associated factors among adult populations in Wolaita Sodo Town, Wolaita Zone, Southern Ethiopia. BMC Cardiovascular disorders 2022, 22(293).
62. Aubert L, Bovet P, Gervasoni J-P, Rwebogora A, Waeber B, Paccaud F: Knowledge, Attitudes, and Practices on Hypertension in a Country in Epidemiological Transition. Hypertension 1998, 31(5):1136-1145.
63. United Nation: The Millenium Development Goals In: We can End Poverty www.un.org/milleniumgoals: UN Department of Public Information 2000.
64. Solomon K, Tamire M, Kaba M: Predictors of cervical cancer screening practice among HIV positive women attending adult anti-retroviral treatment clinics in Bishoftu town, Ethiopia: the application of a health belief model. BMC Cancer 2019(989).
65. World Health Organization: Integrated management of NCDs. In: WHO Package of Essential Non-communicable (PEN) Disease Interventions for Primary Healthcare 2020.

4. Thesis

1. Sub-optimal proportion of the study participants (45%, 46%, and 53%) had the intention to undergo clinical breast examination (CBE), cervical cancer screening (CCS), and blood pressure check respectively.
2. A husband's lack of education decreased a woman's intention to undergo CBE (AOR = 0.2; 95% CI = 0.0–0.8).
3. Having had CCS in the past made women more likely to intend to undergo it again (AOR: 0.5; 95% CI 0.3–0.9).
4. Females are less likely to intend to undergo blood pressure check than males (AOR: 0.4; 95% CI 0.2–0.8).
5. Positive attitude and positive subjective norm respectively increased the intention to undergo blood pressure check (AOR 3.7; 95% CI = 2.3-6.0) and CBE (AOR: 1.4; 95% CI 1.2–1.7)
6. Perceived behavioral control decreased the intention to undergo CCS (AOR: 0.82; 95% CI 0.73–0.93) and blood pressure check (AOR 0.82; 95% CI=0.69-0.98).
7. Production team members indicated, the behavioral change communication (BCC) materials developed under this study were based on evidence, stakeholders' input, and pre-testing.
8. End users' mean satisfaction score on the audiovisual material was high (22.10 (SD ± 2.34; min 14, max 25)).
9. Integrating NCD screening services accompanied by usage of good quality BCC would significantly increase the uptake of CCS, CBE, blood pressure check, and blood glucose check by 18, 9, 44, and 23 percent points, respectively.
10. Integrating NCD screening services without usage of good quality BCC would increase CBE and blood glucose-check service uptakes by 9 and 18 percent points respectively. Nevertheless, CCS and blood pressure check service uptakes would not be affected.

Publications

This dissertation is based on the following five original articles published in international peer reviewed journals, and the contribution to each of the studies is stated here below.

Publication 1: *Bezawit Ketema*, Adamu Addissie, Sarah Negash, Eva J. Kantelhardt and Mirgissa Kaba. Does Prior Experience Matter? Intention to Undergo Cervical Cancer Screening among Rural Women in South-Central Ethiopia. Current Oncology 31, (2024): 4908–4916.

Contribution as an author: As the principal investigator, I was responsible for the conceptualization of ideas, formulation of the research questions, study design, and conducting the fieldwork. I was responsible for data cleaning and analysis, compiling the results and developing, drafting, and publishing the manuscript. I was also the corresponding author, I was responsible to manage all communication pertaining the publication.

Publication 2: *Bezawit Ketema*, Mirgissa Kaba, Sarah Negash, Adamu Addissie, and Eva J. Kantelhardt. Intention to Undergo Clinical Breast Examination and Its Associated Factors among Women Attending Rural Primary Healthcare Facilities in South Central Ethiopia. Breast Care 18 (2023):466–474.

Contribution as an author: I conceptualized and designed the study, developed the protocol and data collection forms, and organized the study procedures. I was responsible for data management and analysis. I wrote the original draft of the manuscript and as a corresponding author, I actively managed all communication pertaining the publication.

Publication 3: *Bezawit Ketema*, Mirgissa Kaba, Mossissa Bekele, Eva Johanna Kantelhardt, Eric Sven Kroeber, Adamu Addissie. Beyond Intention: Barriers to Undergoing Blood Pressure Check in the South-West Shewa Zone, Ethiopia. Healthcare 12, (2024).

Contribution as an author: I was the principle investigator responsible for the conceptualization of the idea, formulation of the research questions, and design of the study. I actively supervised the data collection, data analysis, development, and publication of the manuscript, together with other investigators.

Publication 4: Heldana Debebe, *Bezawit Ketema*, Sophie Sarah Rossner, Sarah Negash, Adamu Addissie, Mirgissa Kaba, Mulugeta Tamire, Eva Johanna Kantelhardt. The Promotion of Non-Communicable Disease Screening in Gurage Zone, Ethiopia: A Mixed-Method Study. Diseases 12, no. 11 (2024)

Contribution as an author: I was responsible for the conceptualization of the idea, formulation of the research questions, and design of the study. I actively supervised the data collection, data analysis, development, and publication of the manuscript. As a corresponding author, I was responsible for all the communication pertaining the publication of the article.

Publication 5: *Bezawit Ketema*, Adamu Addissie, Sarah Negash, Mosisa Bekele, Andreas Wienke, Mirgissa Kaba, Eva Johanna Kantelhardt. Service Delivery Models to Increase the Uptake of Non-Communicable Disease Screening in South-Central Ethiopia: A Difference-in-Differences Analysis. Diseases 12, no. 11 (2024).

Contribution as an author: I was the principle investigator responsible in conceptualizing the idea, design, and methodology of the study. I was the one who did the data cleaning and analysis together with other co-authors. As a corresponding author, I was responsible for all the communication pertaining the publication of the article.

Current Oncology

MDPI

Article

Does Prior Experience Matter? Intention to Undergo Cervical Cancer Screening among Rural Women in South-Central Ethiopia

Bezawit Ketema [1,2,3,*], Adamu Addissie [1,3], Sarah Negash [2,3], Eva Johanna Kantelhardt [2,3] and Mirgissa Kaba [1,3]

[1] School of Public Health, College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia
[2] Institute for Medical Epidemiology, Biostatistics and Informatics, Martin-Luther-University, 06097 Halle, Germany
[3] Global Health Working Group, Martin-Luther-University, 06097 Halle, Germany
* Correspondence: bezawitketema@gmail.com; Tel.: +25-1911822898

Abstract: Early screening for cervical cancer has substantially reduced the morbidity and mortality attributed to it. This study aimed to assess factors that affect the intention to undergo cervical cancer screening among rural women attending primary healthcare facilities in south-central Ethiopia. A health-facility-based, cross-sectional study design was employed for which the calculated required sample size was 427. An interviewer-administered structured questionnaire was adapted from previously published research and used to collect data. Statistical Package for Social Sciences (SPSS) version 27 was used for the statistical analysis. A logistic regression model was used to determine the factors that influenced the women's intention to undergo cervical cancer screening. A total of 420 women participated in this study, with a response rate of 98%. The mean score from the questionnaire that was used to assess the women's intention to undergo cervical cancer screening was 10.25 (SD ± 2.34; min 3, max 15). The absence of previous screening experience (AOR: 0.498; 95% CI 0.27–0.92) and high degree of perceived behavioural control (AOR, 0.823; 95% CI 0.728–0.930) were significantly negatively associated with women's intention to undergo cervical cancer screening. Previous screening experience and perceived behavioural control significantly influenced the intention to undergo cervical cancer screening. Women in rural areas could, therefore, benefit from awareness-creation programmes that focus on these factors.

Keywords: cervical cancer screening; rural women; primary healthcare; intention; perceived behavioural control; previous screening experience; Ethiopia

Citation: Ketema, B.; Addissie, A.; Negash, S.; Kantelhardt, E.J.; Kaba, M. Does Prior Experience Matter? Intention to Undergo Cervical Cancer Screening among Rural Women in South-Central Ethiopia. *Curr. Oncol.* **2024**, *31*, 4908–4916. https://doi.org/10.3390/curroncol31090363

Received: 12 July 2024
Revised: 22 August 2024
Accepted: 23 August 2024
Published: 24 August 2024

1. Introduction

Approximately 90% of global cervical cancer deaths in 2020 occurred in low- and middle-income countries [1]. In Ethiopia in 2019, 1.6% of total deaths in women were caused by cervical cancer [2].

Cervical cancer can be prevented by effective approaches such as HPV (Human Papillomavirus) vaccination, cervical lesion screening, and the treatment of precancerous lesions [3,4]. However, an estimated 95% of women in developing countries have never been screened for cervical cancer [5]. Most women in developing countries are diagnosed with cervical cancer when they have advanced disease [6,7]; this is related to a poor prognosis as advanced cervical cancer has a lower probability of being cured compared with cervical cancer that is treated at an earlier stage [8].

The government of Ethiopia planned to achieve 80% coverage for cervical cancer screening (CCS) among women aged 30–49 by 2020 [9]. Despite this plan, only approximately 28% (160,290) of the planned number (578,778) were screened for cervical cancer in 2020/2021, which equated to 1.2% of the eligible women in the country [10].

Existing evidence suggests that there is a low level of intent to undergo CCS in Ethiopia [11,12]. Studies conducted in various countries, including Ethiopia, have shown that

the intention to undergo CCS can be affected by various personal and community-level factors; such factors include educational status [13,14], monthly income, age [15], previous screening practice [16], HIV serostatus, HPV vaccination status [17,18], knowledge about cervical cancer, attitude to CCS, subjective norm, and perceived behavioural control [11,12,18–20].

Previous studies, including several that were conducted in Ethiopia, have applied the theory of Planned Behaviour (TPB) to describe 'intention towards CCS' behaviour [11,12,20–22]. TPB is one of the social cognitive theories that is most commonly used to describe relationships between human behaviour and an individual's intention toward the behaviour. As per Ajzen's TPB, intention is affected by favourable or unfavourable attitudes toward the behaviour, the subjective norm, and the individual's perceived behavioural control, which results from behavioural beliefs (beliefs about the likely consequences and experiences related to the behaviour), normative beliefs (beliefs about the normative expectations and behaviours of significant others), and control beliefs (beliefs about the presence of factors that may enable or hinder the performance of this behaviour), respectively [23].

The studies that have previously described women's intention to undergo CCS in Ethiopia were conducted in towns, and therefore did not examine the intention to undergo CCS in rural settings in Ethiopia. Thus, this study was conducted among rural women attending primary healthcare facilities in south-central Ethiopia. The findings of this study can, therefore, be used in designing interventions targeting women's behavioural intention towards CCS in rural settings.

2. Materials and Methods

2.1. Study Design, Study Area, and Study Period

A health-facility-based, cross-sectional study design was employed for this study, which was conducted from 1 to 15 February in 2021 in the Gurage zone and Southwest Shewa zone of south-central Ethiopia. According to a population projection report from the Ethiopian Central Statistics Agency (CSA), the Gurage and Southwest Shewa zones had total populations of 1,791,034 and 1,602,719 million, respectively, in July 2021 [24]. As per the current data from the Ethiopian Ministry of Health's website, there are 75 and 54 primary healthcare facilities, respectively, in the Gurage and Southwest Shewa zones [25].

2.2. Population and Sampling

Twelve primary healthcare facilities in the Gurage and Southwest Shewa zones that had started providing CCS services at least six months before the start of the data collection period were identified based on a previous preliminary assessment. According to the Ethiopian national cancer-control plan, women aged 30–49 years are eligible for CCS [9]. Thus, all women aged 30–49 who visited the selected healthcare facilities during the study period were eligible for inclusion in this study, and any women who had cervical cancer were excluded.

The required sample size for this study was calculated using OpenEpi software version 2.3. Based on a similar study conducted in Debre Berhan, Ethiopia [11], 45.3% of women aged 30–49 years had the intention to undergo CCS. A 5% margin of error and a 95% confidence level were assumed, as was a 12% non-response rate, and the required sample size was determined to be 427 women.

Based on data from the client registry reports of the healthcare facilities that were recorded one month before data collection for this study began, on average, 60 clients visited each of the relevant healthcare facilities per day. According to the CSA report [24], the proportion of these women who were aged 30–49 was around 8.9%, which gave the estimated availability of five women per healthcare facility per day. Thus, during the 15-day data collection period, a total of 900 women aged 30–49 years were expected to visit those 12 healthcare facilities; 427 of these women (the calculated sample size) were selected using a systematic random-sampling method with a skip interval of two.

2.3. Measurement and Data Collection

Ajzen's TPB manual [23] and previous research works [11,22,26] were used for adapting the data collection tool used in this study. Contextual items that were used to measure indirect TPB constructs were identified by an elicitation study before the data collection tool was developed. The elicitation study consisted of 12 in-depth interviews with women who resembled the study's target population. A total of twelve themes emerged from the in-depth interviews that were conducted for the elicitation study (Table S1).

The outcome variable (intention for CCS) was operationalized (recoded in to binary variable as 'Yes' and 'No' based on the observed mean score) by using the composite of three intention-measuring items ('in the next 3 months, how likely is it that you expect to undergo CCS', 'in the next 3 months, how likely is it that you will want to be screened for cervical cancer', and 'how likely is that you will intend to be screened for cervical cancer in the next 3 months') were used to determine each participant's intention to undergo CCS. Each of the TPB constructs (attitude, subjective norm, and perceived behavioural control) were measured on a five-point Likert scale, and possible responses ranged from 'strongly disagree' (1) to 'strongly agree' (5). The following items were used to measure each participant's direct attitude towards CCS: 'CCS is beneficial', 'CCS is good', and 'CCS feels pleasant'. The items that were used to measure each participant's direct subjective norm towards CCS were as follows: 'most people who are important to me think that I should be screened for cervical cancer', 'people who are important to me want me to be screened for cervical cancer', 'it is expected of me to undergo CCS', and 'I feel under social pressure to undergo CCS'. The following items were used to measure direct perceived behavioural control towards CCS: 'I am confident that I could do cervical cancer screening', 'for me cervical cancer screening is easy', 'the decision to take cervical cancer screening is beyond my control', and 'whether or not I take CCS is entirely up to me' (Table S1).

Based on a suggestion from previous studies [11,26], knowledge about cervical cancer was also measured using ten items. The knowledge-assessing items that were used focussed on the risk factors, symptoms, and prevention options of cervical cancer; the mean observed score was computed and knowledge was categorised as 'Good' or 'Poor' according to whether scores were above or below the mean score, respectively.

The structured tool was translated into the local languages known as Amharic and Afan Oromo before the pre-test was conducted. Based on the findings of the pre-test, items were modified for clarity and flow of ideas. The final version of the questionnaire was structured to include ten sections: socio-demographic characteristics, knowledge, past behavioural practice, intention, and direct and indirect (attitude, subjective norm, and perceived behavioural control). The interviewer-administered structured questionnaire was used for data collection, which was conducted by twelve trained personnel using the Open Data Kit (ODK) collect platform.

2.4. Data Analysis

The collected data were exported from ODK to SPSS version 27 for analysis. Frequencies and percentages were computed and presented in tables. The Independent *t*-test was used to test the mean difference of attitude, subjective norm, and perceived behavioural control composite scores among women who did or did not intend to undergo CCS. A binary logistic regression model was used to identify factors that were associated with the intention to undergo CCS. Variables with *p*-values below 0.2 [27] were candidates for inclusion in the final multivariable logistic regression model; although the variables for knowledge and attitude did not satisfy this statistical criterion, they were included in the final regression model due to their importance with respect to the intention to undergo CCS [23]. Statistical significance was set at a 95% confidence level.

3. Results

3.1. Socio-Demographic Characteristics

A total of 420 participants completed the interview, yielding a response rate of 98%. The participants' ages ranged from 30 to 49 years, with a mean age of 40.5 years (SD ± 6.17). More than 40% of the participants were followers of the Orthodox religion. Close to half (193; 46%) of the women were unable to read and write, and more than half (235; 56%) of the participants were housewives. Most of the participants (360; 85.7%) were married and the majority (224; 53.3%) were multiparas. Among the married participants (360), most (262; 62.4%) had spouses who were farmers (Table 1).

Table 1. Socio-demographic characteristics of the study participants.

Variables	Variable Categories	Frequency	Percentage (%)
Religion (no. = 420)	Orthodox	171	40.7
	Muslim	154	36.7
	Protestant/catholic	95	22.6
Educational Status (no. = 420)	Secondary and above	44	10.5
	Primary	85	20.2
	Can only read and write	98	23.3
	Cannot read and write	193	46
Occupational Status (no. = 420)	Employed	185	44
	Housewife	235	56
Parity (no. = 420)	Nulliparous (No birth)	11	2.6
	Primiparous (1 birth)	9	2.1
	Multiparous (2 to 4 births)	224	53.3
	Grand multiparous (more than 4 births)	176	41.9
Marital status (no. = 420)	Married/living together	360	85.7
	Non-married [a]	60	14.3
Spouse's education (no. = 360)	Secondary and above	68	16.2
	Primary	80	19
	Only read and write	122	29
	Cannot read and write	90	21.4
Spouse's occupation (no. = 360)	Employed	98	23.3
	Farmer	262	62.4

[a] Divorced/widowed/separated/never married.

3.2. Knowledge about Cervical Cancer and Previous CCS Practices

Among the 420 study participants, 192 (45.7%) said that cervical cancer is treatable if detected early. In this study, 173 participants (41.2%) mentioned at least one risk factor for cervical cancer. The most common risk factor that was mentioned by participants was having multiple sexual partners (94; 22.4%), followed by having a family history of cervical cancer (81; 19.3%). More than half of the participants (260; 61.9%) revealed at least one symptom of cervical cancer. The most commonly reported symptom was a foul vaginal discharge, which was reported by 163 (38.8%) participants, and the next most common symptom was vaginal bleeding (138; 32.9%). Half of the participants (214; 50.8%) indicated that the reason for having CCS is to detect cervical cancer at an early stage. The majority (392; 93.3%) of the study participants do not know any CCS method.

Each of the knowledge item scores were summed and gave observed values ranging from 1 to 14. The mean knowledge score was 4.70 (SD ± 2.61; min 1, max 14), and few of the study participants (83; 19.8%) had ever had CCS. The majority of the participants who had ever undergone CCS had done so as a result of a health professional's recommendation (70; 84.34%; Table 2).

Table 2. Knowledge about cervical cancer and past CCS practices.

Variables	Variable Categories	Frequency (no. = 420)	Percentage (%)
Cervical cancer is treatable if detected early	No	228	54.3
	Yes	192	45.7
Risk factors for cervical cancer (multiple responses possible)	Having multiple sexual partners	94	22.4
	Family history of cervical cancer	81	19.3
	Uncircumcised sexual partner	30	7.1
	Early onset of sexual intercourse	76	18.1
	Cigarette smoking	48	11.4
Sign or symptom of cervical cancer (multiple responses possible)	Vaginal bleeding	138	32.9
	Foul vaginal discharge	163	38.8
	Pelvic/back pain	111	26.4
	Post-coital bleeding	55	13.1
CCS method you know (multiple responses possible)	VIA	10	2.4
	Pap smear	16	3.8
	HPV test	2	0.5
	'I don't know any'	392	93.3
Purpose of undergoing CCS (multiple responses possible)	To prevent cervical cancer	145	34.4
	To detect cervical cancer earlier	214	50.8
	To treat cervical cancer	143	34.0
	'I don't know'	110	26.2
Previous CCS experience	Has ever had CCS	83	19.8
	Never had CCS	337	80.2
Reasons for having CCS (no. = 83) *	Health professional's recommendation	70	84.34
	Relative's/friend's recommendation	5	6.02
	Campaign or community mobilisation	5	6.02
	Television, radio, magazines, brochures	3	3.61

* Among those participants who had ever had CCS. CCS cervical cancer screening.

3.3. Intention to Undergo CCS

Each of the intention item scores were summed, giving observed values ranging from 3 to 15. The mean intention score of 10.25 (SD ± 2.34; min 3, max 15) was used to dichotomise the intention variable; 195 (46.4%) of the respondents obtained scores that were greater than the mean value and were therefore considered to be intending to undergo CCS.

There was a significant difference between women who did or did not intend to undergo CCS in terms of their perceived behavioural control: the mean score for perceived behavioural control was significantly higher ($p < 0.001$) among women who did not intend to undergo CCS compared with women who did intend to undergo CCS. The mean score for attitude did not significantly differ between women who did or did not intend to undergo CCS (p-value 0.659), and this was also true for the mean subjective norm score (p-value 0.095) (Table 3).

Table 3. TPB construct scores among women who did or did not intend to undergo CCS.

TPB Constructs	Intended to Undergo CCS		Not Intended to Undergo CCS		*p*-Value
	Mean	SD	Mean	SD	
Attitude	13.35	3.12	13.23	3.0	0.659
Subjective norm	12.95	3.9	12.29	4.08	0.095
Perceived behavioural control	11.77	2.05	12.55	1.95	<0.001

3.4. Factors Associated with the Intention to Undergo CCS

Eight variables were selected for inclusion in the multivariable logistic regression model due to having a *p*-value less than 0.2 in the binary logistic regression analysis or due to being considered an important behavioural variable.

In the multivariable logistic regression analysis, the variables of previous CCS experience and perceived behavioural control were significantly associated with the intention to undergo CCS. Women who had never had CCS were 50% less likely (AOR: 0.498; 95% CI 0.27–0.92) to have the intention to undergo CCS than their counterparts who had ever had CCS. Furthermore, a unit of increase in the perceived behavioural control of participants equated to an 18% decrease (AOR: 0.823; 95% CI 0.728–0.930) in the intention to undergo CCS (Table 4).

Table 4. Factors associated with the intention to undergo CCS.

Variables	Variable Categories	Intention		COR	*p*-Value	AOR	95% CI
		Intended to Undergo CCS (n)	Did not Intend to Undergo CCS (n)				
Educational Status	Secondary and above	25	19	3.604	0.058	2.714	0.846–8.707
	Primary	45	40	3.42	0.064	1.324	0.685–2.561
	Only read and write	46	52	0.955	0.328	1.527	0.814–2.863
	Cannot read and write	79	114	Ref		Ref	
Spouses' education	Secondary and above	34	34	1.143	0.678	0.587	0.239–1.442
	Primary	44	36	1.397	0.279	1.068	0.515–2.216
	Only read and write	45	77	0.668	0.153	0.591	0.311–1.125
	Cannot read and write	42	48	Ref		Ref	
Previous CCS experience	Never had	145	192	0.498	0.005	**0.498 ***	**0.27–0.92**
	Ever had	50	33	Ref		Ref	
Wealth quintile	Lowest	40	44	0.826	0.537	1.002	0.440–2.28
	Second	37	47	0.716	0.280	0.733	0.317–1.69
	Middle	39	45	0.788	0.441	1.044	0.463–2.36
	Fourth	35	49	0.649	0.165	0.712	0.309–1.64
	Highest	44	40	Ref		Ref	
Knowledge	Poor	124	137	1.122	0.569	1.314	0.81–2.132
	Good	71	88	Ref		Ref	
Attitude				1.014	0.658	1.006	0.912–1.109
Subjective norm				1.042	0.095	1.043	0.972–1.12
Perceived behavioural control				0.816	<0.001	**0.823 ***	**0.728–0.930**

* Significant with $p < 0.05$; COR, Crude odds ratio; AOR, Adjusted odds ratio.

4. Discussion

In this study, 46.4% of the participants intended to undergo CCS, and the mean score for the intention to undergo CCS was 10.25 (SD ± 2.34; min 3, max 15). This percentage is consistent with another study that was conducted in Ethiopia [11]; however, it is lower than that found in a study conducted in Ghana, where 82% of women reported that they intended to undergo CCS [28]. Similarly, the current finding is lower than findings reported from Taiwan [29], Indonesia [30] and the United Kingdom [31]. This variation might be due to differences in the study populations, as the latter study included HIV-positive women only, and these women may have benefited from counselling about the need for CCS during their follow-up contacts with healthcare providers. Another possible explanation relates to the current study being conducted in a rural area, as there is a lack of health information dissemination to rural Ethiopian populations, who may have limited access to media and other sources of information.

The current study showed that women who had never had CCS were 50% less likely to intend to undergo CCS than their counterparts who had had CCS. This finding is consistent with findings from studies conducted in southern Ethiopia [20] and China [32]. Additionally, a mixed-method study conducted in the United Kingdom reported a strong association between the previous engagement with screening appointments and the intention to undergo CCS [31]. This could be explained by the fact that women who have had previous screening experience could have received better information about prevention strategies, disease severity, and the advantages of screening due to their contact with healthcare providers compared with other women.

In this study, a unit of change in the perceived behavioural control of participants equated to an 18% decrease in the intention to undergo CCS. Similar findings were also reported by studies conducted in different parts of Ethiopia [11,12,20,33] and in Iran [34]. This indicates that communication interventions addressing women's perceived behavioural control are required to bring about social and behavioural change that would increase women's intention to undergo CCS.

Unlike in other studies—which were conducted in Yirgalem in Ethiopia in 2017 [20], and in Romania and Bulgaria in 2020 [35]—in this study, the subjective norm was not significantly associated with the intention to undergo CCS. This variation might be due to the difference in the research periods of the studies, as over time any population could change their subjective norm via direct or indirect exposure to various media.

Although the government of Ethiopia planned to screen nearly 16.5 million women by 2025 [36], only 160,290 women had been screened by 2021 [9]. Thus, to achieve this target in 2025, evidence-based communication interventions targeting behavioural change should be promoted. Educational interventions have already delivered demonstrated improvements in screening intent in African, Chinese-American, and Hispanic women [37–39].

Thus, the findings of this study could inform programmers of the ministry to design appropriate interventions that are contextually relevant for women in rural settings. However, we acknowledge the need for future studies that are supported by a qualitative approach for addressing barriers to CCS in Ethiopia.

Strengths and Limitations of the Study

This study had definite strengths and limitations. The direct measures of TPB constructs were validated with indirect measures that were developed during the elicitation study to explore salient beliefs. However, as this study was a facility-based, cross-sectional study, its findings might not be representative of the general population. Furthermore, this study was unable to assess whether women who reported their intent to undergo the CCS actually did so.

5. Conclusions

We observed a high mean score of 10.25 (SD $\pm$ 2.34; min 3, max 15) for rural women's intention to undergo CCS, and primary healthcare facilities in rural areas need to prepare to meet this demand. The absence of previous CCS experiences and behavioural control beliefs were significantly associated with the intention to undergo CCS. Thus, women in rural areas could benefit from awareness-creation programmes focusing on changing behavioural control beliefs by sharing the stories of women who have already undergone CCS. We recommend that researchers conduct future qualitative studies that explore barriers to CCS.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/curroncol31090363/s1. Table S1: TPB questionnaire towards CCS.

Author Contributions: Conceptualisation, B.K. and M.K.; data curation, S.N.; formal analysis, B.K.; funding acquisition, E.J.K.; investigation, S.N.; methodology, A.A.; project administration, S.N.; resources, E.J.K.; software, S.N.; supervision, E.J.K. and M.K.; validation, A.A., E.J.K. and M.K.; visualisation, A.A.; writing—original draft, B.K.; writing—review and editing, M.K. All authors have read and agreed to the published version of the manuscript.

Funding: This study was funded by the Else-Kroener-Foundation through the Martin-Luther-University, Halle-Wittenberg, Germany, and grant no. 2018_HA31SP. Funding was received through the German Ministry for Economic and Development Cooperation (BMZ) through the Academic Partnership Initiative of German International Cooperation (GIZ), project no. 81281915. The role of the funder in this study was to provide the required budget.

Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki, and it was approved by the Instructional Review Board of the College of Health Sciences, Addis Ababa University (Protocol code: 038/20/SPH; date of approval: 28 May 2020).

Informed Consent Statement: Written informed consent has been obtained from the patient(s) to publish this paper.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: We would like to thank Tesfahun Mulatu and Mosisa Bekele for their administrative and technical support. Our gratitude also goes to the study participants for devoting their time to this study.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Sung, H.; Ferlay, J.; Siegel, R.L.; Laversanne, M.; Soerjomataram, I.; Jemal, A.; Bray, F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA A Cancer J. Clin.* **2021**, *71*, 209–249. [CrossRef] [PubMed]
2. IHME. *Global Burden of Disease Study 2019*; IHME: Seattle, WA, USA, 2019.
3. Lei, J.; Ploner, A.; Elfström, K.M.; Wang, J.; Roth, A.; Fang, F.; Sundström, K.; Dillner, J.; Sparén, P. HPV Vaccination and the Risk of Invasive Cervical Cancer. *N. Engl. J. Med.* **2020**, *383*, 1340–1348. [CrossRef]
4. Ersado, T.L. Cervical Cancer Prevention and Control. In *Cervical Cancer*; Rajamanickam, R., Ed.; IntechOpen: Rijeka, Croatia, 2021; p. Ch. 6.
5. Duclos, P. Human papillomavirus vaccines: WHO position paper. *Biologicals* **2009**, *37*, 338–344.
6. Kantelhardt, E.J.; Moelle, U.; Addissie, A.; Trocchi, P.; Yonas, B.; Hezkiel, P.; Stang, A.; Thomssen, C.; Vordermark, D.; Gemechu, T.; et al. Cervical cancer in Ethiopia: Survival of 1,059 patients who received oncologic therapy. *Oncologist* **2014**, *19*, 727–734. [CrossRef]
7. Tekalign, T.; Teshome, M. Prevalence and determinants of late-stage presentation among cervical cancer patients, a systematic review and meta-analysis. *PLoS ONE* **2022**, *17*, e0267571. [CrossRef] [PubMed]
8. World Health Organization. *Human Papillomavirus (HPV) Vaccine Coverage Monitoring Manual*; WHO: Geneva, Switzerland, 2020.
9. Federal Ministry of Health E. National Cancer Control Plan 2016–2020 of Ethiopia. *This Prev. Control Dir.* **2015**, *2015*, 83.
10. Ethiopian Ministry of Health. *The 2013 EFY Performance Report of the Health Sector of Ethiopia*; Ethiopian Ministry of Health: Addis Ababa, Ethiopia, 2021.
11. Getahun, T.; Kaba, M.; Derseh, B.T. Intention to Screen for Cervical Cancer in Debre Berhan Town, Amhara Regional State, Ethiopia: Application of Theory of Planned Behavior. *J. Cancer Epidemiol.* **2020**, *2020*, 3024578. [CrossRef] [PubMed]
12. Wollancho, W.; Amdissa, D.; Bamboro, S.; Wasihun, Y.; Tareke, K.G.; Gizaw, A.T. Determining behavioral intention and its predictors towards cervical cancer screening among women in Gomma district, Jimma, Ethiopia: Application of the theory of planned behavior. *PLoS ONE* **2020**, *15*, e0238472. [CrossRef]
13. Ebu, N.I. Socio-demographic characteristics influencing cervical cancer screening intention of HIV-positive women in the central region of Ghana. *Gynecol. Oncol. Res. Pract.* **2018**, *5*, 3. [CrossRef]
14. Zhang, J.; Sha, Z.; Gu, Y.; Li, Y.; Yang, Q.; Zhu, Y.; He, Y. Predicting Behavioral Intentions Related to Cervical Cancer Screening Using a Three-Level Model for the TPB and SCT in Nanjing, China. *Int. J. Environ. Res. Public Health* **2019**, *16*, 3575. [CrossRef]
15. Egawa-Takata, T.; Ueda, Y.; Tanaka, Y.; Morimoto, A.; Kubota, S.; Yagi, A.; Terai, Y.; Ohmichi, M.; Ichimura, T.; Sumi, T.; et al. Mothers' attitudes in Japan regarding cervical cancer screening correlates with intention to recommend cervical cancer screening for daughters. *Int. J. Clin. Oncol.* **2016**, *21*, 962–968. [CrossRef] [PubMed]
16. Kakubari, R.; Egawa-Takata, T.; Ueda, Y.; Tanaka, Y.; Yagi, A.; Morimoto, A.; Terai, Y.; Ohmichi, M.; Ichimura, T.; Sumi, T.; et al. A survey of 20-year-old Japanese women: How is their intention to undergo cervical cancer screening associated with their childhood HPV vaccination status? *Hum. Vaccine Immunother.* **2021**, *17*, 434–442. [CrossRef] [PubMed]
17. Anhang Price, R.; Koshiol, J.; Kobrin, S.; Tiro, J.A. Knowledge and intention to participate in cervical cancer screening after the human papillomavirus vaccine. *Vaccine* **2011**, *29*, 4238–4243. [CrossRef] [PubMed]
18. Ogilvie, G.S.; Smith, L.W.; van Niekerk, D.J.; Khurshed, F.; Krajden, M.; Saraiya, M.; Goel, V.; Rimer, B.K.; Greene, S.B.; Hobbs, S.; et al. Women's intentions to receive cervical cancer screening with primary human papillomavirus testing. *Int. J. Cancer* **2013**, *133*, 2934–2943. [CrossRef]

19. Ogilvie, G.S.; Smith, L.W.; van Niekerk, D.; Khurshed, F.; Pedersen, H.N.; Taylor, D.; Thomson, K.; Greene, S.B.; Babich, S.M.; Franco, E.L.; et al. Correlates of women's intentions to be screened for human papillomavirus for cervical cancer screening with an extended interval. *BMC Public Health* **2016**, *16*, 213. [CrossRef] [PubMed]
20. Abamecha, F.; Tena, A.; Kiros, G. Psychographic predictors of intention to use cervical cancer screening services among women attending maternal and child health services in Southern Ethiopia: The theory of planned behavior (TPB) perspective. *BMC Public Health* **2019**, *19*, 434. [CrossRef] [PubMed]
21. Roncancio, A.M.; Ward, K.K.; Fernandez, M.E. Understanding cervical cancer screening intentions among Latinas using an expanded theory of planned behavior model. *Behav. Med.* **2013**, *39*, 66–72. [CrossRef]
22. Roncancio, A.M.; Ward, K.K.; Sanchez, I.A.; Cano, M.A.; Byrd, T.L.; Vernon, S.W.; Fernandez-Esquer, M.E.; Fernandez, M.E. Using the Theory of Planned Behavior to Understand Cervical Cancer Screening Among Latinas. *Health Educ. Behav.* **2015**, *42*, 62162–62166. [CrossRef]
23. Ajzenm, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* **1991**, *50*, 179–211. [CrossRef]
24. Ethiopian Central Statistics Agency. *Population Projection 2021*; Ethiopian Central Statistics Agency: Addis Ababa, Ethiopia, 2021.
25. Ethiopian Ministry of Health. *Master Facility Registry*; Ethiopian Ministry of Health: Addis Ababa, Ethiopia, 2022.
26. Nwabichie, C.C.; Manaf, R.A.; Ismail, S.B. Factors Affecting Uptake of Cervical Cancer Screening Among African Women in Klang Valley, Malaysia. *Asian Pac. J. Cancer Prev.* **2018**, *19*, 825–831.
27. Hosmer, D.W., Jr.; Lemeshow, S.; Sturdivant, R.X. *Applied Logistic Regression*; John Wiley & Sons: Hoboken, NJ, USA, 2013.
28. Ebu, N.I.; Ogah, J.K. Predictors of cervical cancer screening intention of HIV-positive women in the central region of Ghana. *BMC Womens Health* **2018**, *18*, 43. [CrossRef] [PubMed]
29. Huang, H.-C.; Chang, P.-C.; Li, S.-F.; Wang, C.-Y.; Huang, W.-T.; Chen, W.; Fan, S.-Y. The Significant Predictors for Breast, Cervical, Colorectal, or Oral Cancer Screening Intention and Behavior in Taiwan. *Cancer Nurs.* **2023**, *46*, E261–E267. [CrossRef]
30. Sumarmi, S.; Hsu, Y.Y.; Cheng, Y.M.; Lee, S.H. Factors associated with the intention to undergo Pap smear testing in the rural areas of Indonesia: A health belief model. *Reprod. Health* **2021**, *18*, 138. [CrossRef] [PubMed]
31. Wilson, R.; Quinn-Scoggins, H.; Moriarty, Y.; Hughes, J.; Goddard, M.; Cannings-John, R.; Whitelock, V.; Whitaker, K.L.; Grozeva, D.; Townson, J.; et al. Intentions to participate in cervical and colorectal cancer screening during the COVID-19 pandemic: A mixed-methods study. *Prev. Med.* **2021**, *153*, 106826. [CrossRef]
32. Bai, Y.; Liu, Q.; Chen, X.; Gao, Y.; Gong, H.; Tan, X.; Zhang, M.; Tuo, J.; Zhang, Y.; Xiang, Q.; et al. Protection motivation theory in predicting intention to receive cervical cancer screening in rural Chinese women. *Psychooncology* **2018**, *27*, 442–449. [CrossRef] [PubMed]
33. Alemnew, W.; Debalkie, G.; Azale, T. Intention to Screen for Cervical Cancer Among Child Bearing Age Women in Bahir Dar City, North-West Ethiopia: Using Theory of Planned Behavior. *Int. J. Women's Health* **2020**, *12*, 1215–1222. [CrossRef]
34. Heidari Sarvestani, M.; Khani Jeihooni, A.; Moradi, Z.; Dehghan, A. Evaluating the effect of an educational program on increasing cervical cancer screening behavior among women in Fasa, Iran. *BMC Womens Health* **2021**, *21*, 41. [CrossRef]
35. Crăciun, I.C.; Todorova, I.; Băban, A. "Taking responsibility for my health": Health system barriers and women's attitudes toward cervical cancer screening in Romania and Bulgaria. *J. Health Psychol.* **2020**, *25*, 2151–2163. [CrossRef]
36. Ethiopian Ministry of Health. *Reproductive Health Strategic Plan (2021–2025)*; Ethiopian Ministry of Health: Addis Ababa, Ethiopia, 2021.
37. Fleming, K.; Simmons, V.N.; Christy, S.M.; Sutton, S.K.; Romo, M.; Luque, J.S.; Wells, K.J.; Gwede, C.K.; Meade, C.D. Educating Hispanic Women about Cervical Cancer Prevention: Feasibility of a Promotora-Led Charla Intervention in a Farmworker Community. *Ethn. Dis.* **2018**, *28*, 69–76. [CrossRef] [PubMed]
38. Fung, L.C.; Nguyen, K.H.; Stewart, S.L.; Chen, M.S., Jr.; Tong, E.K. Impact of a cancer education seminar on knowledge and screening intent among Chinese Americans: Results from a randomized, controlled, community-based trial. *Cancer* **2018**, *124*, 1622–1630. [CrossRef]
39. Nkwonta, C.A.; Hilfinger Messias, D.K.; Felder, T.; Luchok, K. Increasing Human Papillomavirus Vaccination and Cervical Cancer Screening in Nigeria: An Assessment of Community-Based Educational Interventions. *Int. Q. Community Health Educ.* **2020**, *41*, 89–99. [CrossRef] [PubMed]

Breast Care

Research Article

Breast Care 2023;18:466–474
DOI: 10.1159/000531944

Received: February 18, 2023
Accepted: July 4, 2023
Published online: July 19, 2023

Intention to Undergo Clinical Breast Examination and Its Associated Factors among Women Attending Rural Primary Healthcare Facilities in South Central Ethiopia

Bezawit Ketema[a, b] Mirgissa Kaba[a] Sarah Negash[b] Adamu Addissie[a]
Eva Johanna Kantelhardt[b]

[a]School of Public Health, College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia; [b]Institute for Medical Epidemiology, Biostatistics and Informatics, Martin-Luther-University, Halle, Germany

Keywords
Breast cancer · Clinical breast examination · Breast cancer screening

Abstract
Background: Breast cancer is a global public health problem with higher mortality in developing countries. The Ethiopian National Cancer Control Plan recommends clinical breast examination (CBE) for all women aged >18 years. However, there is low breast examination practice in Ethiopia. Therefore, this study aimed to describe level of intention to undergo CBE and associated factors among women visited selected rural healthcare facilities in south central Ethiopia using Theory of Planned Behavior (TPB). ***Methods:*** This study used facility-based cross-sectional study design. A total of 420 women participated in this study. Interviewer-administered structured questionnaire was adopted from previously published research works and Ajzen's TPB manual. Statistical Package for Social Sciences (SPSS), version 27, was used for analysis. Binary logistic regression model was used to determine factors associated with intention to undergo CBE. ***Results:*** In this study, nine out of ten women had never had CBE. Mean score for intention to undergo CBE was 12.55 (SD ± 3.22; min 5, max 20). Intention to undergo CBE was negatively associated with being in the second and middle wealth quantiles compared to the highest wealth quantile, and with the spouse not being able to read or write compared to having attended formal education. Positive attitude and higher subjective norm had relevant association with intention to undergo CBE. ***Conclusion:*** The high score for intention to undergo CBE should encourage primary healthcare facilities to offer CBE. Behavioral change communication interventions could address women's attitude, subjective norm, and spouse's education associated with intention to undergo CBE.

Introduction

Breast cancer is a global public health problem, representing one in four cancers diagnosed among women. There were an estimated 2.3 million new cases and 684,996 deaths from breast cancer worldwide in 2020 [1]. Breast cancer mortality is higher in developing countries, whereas incidence is greatest in developed countries [2]. In Ethiopia, breast cancer is the leading cancer type, accounting for 20.9% of new cancer diagnoses and 17.5% of cancer deaths in the country in 2020 [1]. Similarly, according to the Addis Ababa population-based cancer registry report, breast cancer is the most frequently diagnosed malignant tumor, accounting for 31.5% of cancer cases in women [3].

The global breast cancer initiative highlighted timely diagnosis of breast cancer to improve the survival rate [4]. Ethiopia developed the National Cancer Control Plan in 2016 to improve the early diagnosis of cancer. The plan

karger@karger.com
www.karger.com/brc

Correspondence to:
Bezawit Ketema, bezawitketema@gmail.com

indicated, all women aged >18 years coming to health institutions for any health complaints are expected to undergo clinical breast examination (CBE). According to the plan, healthcare professionals (nurses, health officers, and doctors) at primary, secondary, and tertiary health facilities should offer CBE. However, the time interval for taking CBE is not revealed in the plan [5].

Despite having the CBE service available at all levels of health facilities for asymptomatic women in Ethiopia, different studies in the country showed low breast examination practice [6–8] and diagnosis at an advanced stage of the disease [9, 10]. Advanced-stage diagnosis may lead to an unsatisfactory treatment outcome because it needs to involve multiple treatment modalities, including surgery, radiotherapy, and chemotherapy, and there is only one radiotherapy center (Addis Ababa, Tikur Anbessa Hospital) in the country [9].

According to the qualitative study conducted in south and southwestern Ethiopia, patient-related barriers to early diagnosis of breast cancer were lack of knowledge and awareness of breast cancer, belief in traditional medicine and religious practices for treatment, and lack of social and financial support to seek care at a medical facility, and health system-related barriers were misdiagnosis of breast cancer, long distance to referral facilities, high cost of diagnostic services, long waiting time for diagnostic tests, and lack of screening and diagnostic tests in local facilities [11]. Thus, determining women's intention to undergo CBE and its associated factors will be an evidence base for designing interventions to increase the practice of early breast cancer detection, thereby increasing early diagnosis and improving the survival rate.

This study used the *Theory of Planned Behavior* (TPB). According to the TPB, an individual's attitude, subjective norm, and perceived behavioral control determine an individual's intention to undergo a particular behavior [12]. The TPB has been applied in a wide variety of health behaviors, such as in cervical cancer screening [13–15]. However, to our knowledge, studies that focus on intention to undergo CBE have not been carried out in this study area. Thus, there is an information gap among study subjects, stakeholders, and policymakers. This study therefore aims to determine the intention to undergo CBE and its associated factors among women attending primary healthcare facilities (PHFs) in south and southwest Ethiopia using the TPB.

Methods

Study Design, Area, and Period

This study employed a health facility-based cross-sectional study design in 12 health centers in south central Ethiopia. Selection of health centers was based on the formative assessment findings on CBE service availability. These health centers were found in the Southwest Shewa zone of the Oromia region and the Gurage zone of the Southern Nations, Nationalities, and Peoples' Region (SNNPR) of Ethiopia. Data were collected from 10 October to 10 November 2020.

Study Population

All women aged >18 years who visited the selected PHFs during the time of data collection were eligible for this study. However, women with confirmed breast cancer were excluded.

Sample Size Determination

Sample size was determined according to the formula for estimation of a single population proportion, using OpenEpi software version 2.3. We followed the assumptions of a 1.96 critical value at 95% confidence interval (CI) of certainty, a 5% (0.05) margin of tolerated sampling error, a 50% probability (*P*) of intention toward CBE (there is no similar prior study) and a 10% nonresponse rate. The sample size was determined to be 422.

Sampling Procedures

A systematic random sampling technique was used to select actual study participants from the 12 PHFs. Ten days before actual data collection, the client's flow rate to each of the 12 PHFs was calculated, and no difference in the flow rate for the next 10 days of the data collection period was assumed. An average flow rate of 60 adults per day was calculated for each PHF, as observed during the preceding period. From the Ethiopian Demographic Health Survey 2019, there is a 1:1 male-to-female ratio in the general population [16]. Thus, we expected a flow rate of 30 adult females per day for the actual 10 days of data collection. The total sample size was proportionally allocated between 12 PHFs (422/12 = 36). Thus, 36 women over 10 days of data collection amounts to four women per day for each facility. The sample size interval (*K*th value) is computed as 30/4 = 8. Therefore, every other eighth adult woman visiting each of the PHFs was approached and interviewed at exit from the PHF.

Measurements and Data Collection

A structured, interviewer-administered questionnaire was used to collect the information. To measure the TPB constructs, an elicitation study was conducted using 16 in-depth interviews with participants like the target population to explore locally available salient behavioral, normative, and control beliefs toward CBE. In measuring TPB constructs, a total of twelve themes have emerged from the in-depth interviews. Themes emerged in measuring behavioral beliefs toward CBE are CBE detects breast cancer at early stage, CBE is painful, CBE has side effect/s, and CBE invades privacy. Themes emerged in measuring normative beliefs toward CBE are my husband/partner would approve CBE, my father/mother would approve CBE, other community members would approve CBE, and healthcare professionals would approve CBE. Themes emerged in measuring perceived behavioral control beliefs toward CBE are I don't think I am at risk of acquiring breast cancer, CBE is expensive, CBE service is not easily available, and fear of positive result after CBE (online Suppl. material 1; for all online suppl. material, see https://doi.org/10.1159/000531944).

Thereafter, a structured questionnaire was prepared according to Ajzen's TPB manual [12]. Other sections of the questionnaire were adapted from previously published studies [6, 17] on breast cancer awareness and CBE practice studies in Ethiopia, with minor changes to fit the objectives of this study and the local context.

The structured questionnaire was developed in the English language, translated into local languages (Amharic and Afan Oromo) and then back translated into English to maintain consistency in

meaning and sense by language experts. The first draft questionnaire was pilot tested and appropriate modifications were made. The final version of the questionnaire was structured into 10 sections: intention, both direct and indirect attitude, subjective norm and perceived behavioral control, past CBE practice, sociodemographic characteristics, and knowledge. Intention and direct TPB constructs (attitude, subjective norm, and perceived behavioral control) were each measured with four items on a five-point Likert scale. Responses ranged from 'strongly disagree' (1) to 'strongly agree' (5) for items measuring the TPB constructs, with responses ranging from "very unlikely" (1) to "very likely" (5) for items measuring intention. According to Ajzen's TPB manual [12], the items used to measure direct attitude toward CBE were CBE is beneficial, CBE is good, undertaking CBE feels pleasant, and CBE is important. Items used to measure direct subjective norm toward CBE were most of those who are important to me think that I should take CBE, I am not feeling under social pressure to take CBE, people who are important to me want me to take CBE, and it is expected of me to take CBE. Items used to measure direct perceived behavioral control toward CBE were I am confident that I could take CBE, for me taking CBE is easy, the decision to take CBE is under my control and whether I take CBE or not is entirely up to me. Items used to measure intention in the coming 6 months were how likely is it that you will think to take CBE, how likely is it that you will need CBE services, how likely is it that you will look for and request CBE services, and how likely is it that you will take CBE?

Each of the intention item scores was summed and gave observed values ranging from 5 to 20. The mean intention score was calculated and was used to dichotomize the intention variable. Respondents who answered above the mean were considered to be intended to undertake CBE. Each of the direct perceived behavioral control item scores, direct subject norm item scores, and direct attitude item scores were separately summed and gave observed values of 4–20, 4–20, and 5–20, respectively. All the direct TPB constructs were treated as continuous variables.

The data were collected by trained data collectors using an online data collection kit (ODK). During the data collection time, data collectors repeat same question twice and keep both responses whenever they observe any internal or external condition that might affect respondents' ability to respond accurately. Thus, during the data cleaning, correlations were calculated between the two sets of responses for test-retest reliability check, and all interclass correlation (ICC) results were above 0.894. Lowest ICC (0.894) was for one direct attitude item scores, and highest ICC (0.94) was for one of the intention item scores.

All negatively stated items were reversed before analysis. Analysis of the items related to direct TPB constructs was conducted to establish internal consistency. A Cronbach's alpha value of >0.7 confirmed the internal consistency of the dimension: 0.802 for direct attitude, 0.765 for direct subjective norm, and 0.789 for direct perceived behavioral control. Simple bivariate correlations between direct and indirect measures of the same TPB construct were made to confirm the validity of the measures. The TPB constructs (attitude, subjective norm, and perceived behavioral control) were treated as continuous variables. The intention variable was dichotomized using a mean split between intending and not intending to undergo CBE [12].

Normality of the data, homogeneity of variance, and multicollinearity were checked before running any kind of analysis. The existence of multicollinearity between each of the TPB constructs was checked and there was no multicollinearity among them (variance inflation factor <10).

Data Processing and Analysis

The responses in the completed ODK were exported to the Statistical Package for the Social Sciences (SPSS, version 27) for analysis. Descriptive statistics were used to describe frequency distribution, proportion, measures of central tendency, and dispersion. A series of independent sample *t* tests were used to determine whether mean differences existed for attitude, subjective norm, and perceived behavioral control toward CBE between women who are and are not intending to undergo CBE.

A binary logistic regression model was used to determine factors associated with intention to undergo CBE. Based on a p value of <0.25 in bivariate analysis [18], consideration of multicollinearity, clinical significance, and the maximum number of variables considered reasonable to enter into the model, 12 variables were included in the multivariable logistic regression analysis. Statistical significance for the multivariable logistic regression analysis was set at $p \leq 0.05$. The Hosmer and Lemeshow goodness-of-fit tests showed that $p = 0.298$, which confirmed the model's adequacy to fit the data in this study.

Results

Sociodemographic Characteristics of Study Participants

From a total of 422 women identified as eligible for this study, 420 responded to the survey question, giving a 99.5% response rate. Close to half (194; 46.2%) of the participants were below the age of 35 years. Most of the participants, 175 (41.7%), were followers of the Orthodox religion. The majority (300; 71.4%) were married and 159 (37.9%) were multiparous. One-third of the participants (158; 37.6%) did not read or write and 217 (51.7%) were unemployed/student. Among the spouses of the 300 (71.4%) married respondents, 144 (48.0%) attended formal education and 179 (59.7%) were farmers (Table 1).

Knowledge about Breast Cancer and Past CBE Practice

Among the 420 study participants, 263 (62.6%) said that breast cancer is noncommunicable. The majority of 298 (71%) mentioned pain in the breast as a breast cancer sign and symptom. Absence of breast-feeding and obesity were recognized as major risk factors for developing breast cancer by 288 (68.6%) and 269 (64%) of participants, respectively. Likewise, 297 (70.7%) and 271 (64.5%), respectively, gave breast-feeding and physical activity as breast cancer prevention measures. Only 185 (44%) of the respondents put CBE as breast cancer prevention method. In addition, each of the knowledge item scores were summed and gave observed values ranging from 6 to 22. The mean knowledge score is computed as 14.73 (SD ± 3.19), with 209 (49.8%) respondents answering above the mean (Table 2).

Few of the study participants (55; 13.1%) had ever undergone CBE. Among those who had, most of them (35; 63.6%) underwent CBE because of a health professional's recommendation (Table 2).

Table 1. Sociodemographic characteristics of study participants

Variable	Frequency (n = 420)	Percentage
Age		
<35 years	194	46.2
35–49 ears	172	41.0
≤50 years	54	12.8
Educational status		
Could not read or write	158	37.6
Could read and write but no formal education	71	16.9
Attended formal education	191	45.5
Occupational status		
Government/non-government/self-employed	203	48.3
Unemployed/student	217	51.7
Religion		
Orthodox	173	41.2
Muslim	129	30.7
Protestant/Catholic	118	28.1
Parity		
0 (nullipara)	71	16.9
1	36	8.6
2–4 (multipara)	159	37.9
>4 (grand multipara)	154	36.7
Marital status		
Married/living together	300	71.4
Divorced/separated	21	5.0
Widowed	35	8.3
Never married/never lived together	64	15.2
Spouse's educational status (n = 300)		
Could not read or write	83	27.7
Could read and write but no formal education	73	24.3
Attended formal education	144	48.0
Spouse's occupational status (n = 300)		
Government/non-government employee	62	20.7
Self-employed	52	17.3
Farmer	179	59.7
Unemployed	7	2.3

Intention to Undergo CBE

The mean intention score was calculated as 12.55 (SD ± 3.22) and 192 (45.7%) of the respondents considered to be intended to undergo CBE. There was a significant difference between women who intended and women who did not intend to take CBE in terms of their attitude, subjective norm, and perceived behavioral control. Women who intended to take CBE had a significantly favorable attitude (t = 19.363; p < 0.001), higher subjective norm (t = 12.044; p < 0.001), and higher perceived behavioral control (t = 7.271,836; p < 0.001) than women who did not intend to take CBE (Table 3).

Factors Associated with Intention to Undergo CBE

In the bivariable logistic regression analysis, 12 variables were included with the outcome variable. In the multivariable logistic regression analysis, among the sociodemographic variables, the participant's wealth index and spouse's educational status had a statistically significant association with intention to undergo CBE. Among the TPB constructs, attitude and subjective norm had a statistically significant association with intention to undergo CBE.

The adjusted odds ratio (AOR) of intention to undergo CBE among the second wealth quantile is 70% lower than in the highest wealth quantile (AOR = 0.265; 95% CI: 0.085–0.828). The AOR of intention to undergo CBE among the middle wealth quantile is 80% lower than for the highest wealth quantile (AOR = 0.154; 95% CI = 0.039–0.602). The AOR of intention to undergo CBE among women whose spouse could not read or write is 80% lower than for women whose spouse attended formal education (AOR = 0.170; 95% CI = 0.036–0.797). In addition, per unit increase in the attitude score, the AOR

Table 2. Knowledge about breast cancer and past CBE practice

Variable	Frequency (n = 420)	Percentage
Breast cancer is a noncommunicable disease		
No	24	5.7
Yes	263	62.6
Do not know	133	31.7
Signs and symptoms		
Pain in the breast	298	71.0
Change in breast size	289	68.8
Change in breast shape	283	67.4
Swelling in the armpit	280	66.7
Discoloration of the breast	254	60.5
Nipple discharge	253	60.2
Dimpling of the breast	249	59.3
Itching	228	54.3
Risk factors		
Not breast-feeding	288	68.6
Obesity	269	64.0
Alcoholism	259	61.7
Late menopause	255	60.7
Positive family history	237	56.4
Early menarche	230	54.8
Smoking	200	47.6
Preventive measures		
Breast-feeding	297	70.7
Being physically active	271	64.5
Avoiding exposure to radiation	271	64.5
Controlling weight	270	64.3
Breast self-examination	269	64.0
Limiting hormonal therapy dose	267	63.6
Not smoking	254	60.5
Limiting alcohol	229	54.5
CBE	185	44.0
CBE practice		
Ever had CBE	55	13.1
Never had CBE	365	86.9
Reasons for having CBE (n = 55)		
Health professional's recommendation	35	63.6
Relative/friend's recommendation	4	7.3
Standard of care at the clinic	10	18.2
Television, radio, magazine, brochure	6	10.9

Table 3. The TPB constructs among women intending and not intending to undergo CBE

Sr. no.	TPB construct	Intending to undergo CBE		Not intending to undergo CBE		t	p value	95% CI
		mean	SD	mean	SD			
1	Attitude	15.1823	2.03197	11.1754	2.17817	19.363	<0.001	3.600096–4.413610
2	Subjective norm	14.0938	2.48167	11.0526	2.65603	12.044082	<0.001	2.544792–3.537444
3	Perceived behavioral control	14.5729	2.95426	12.2193	3.57243	7.271836	<0.001	1.717410–2.989827

Table 4. Factors associated with intention to undergo CBE

Variable	Intention		COR (95% CI)	*P*	AOR (95% CI)	*p* value
	yes (*n*)	no (*n*)				
Age						
<35 years	97	97	1.250 (0.862–2.292)	0.471	0.329 (0.086–1.254)	0.103
35–49 years	101	71	0.879 (0.474–1.628)	0.681	0.321 (0.096–1.078)	0.066
≥50 years	30	24	Ref		Ref	
Wealth index						
Lowest	43	41	0.679 (0.368–1.252)	0.215	0.553 (0.169–1.807)	0.327
Second	39	45	0.561 (0.304–1.035)	0.064	0.265 (0.085–0.828)	0.022*
Middle	26	58	0.290 (0.153–0.548)	0.001	0.154 (0.039–0.602)	0.007*
Fourth	33	51	0.419 (0.225–0.778)	0.006	0.552 (0.173–1.756)	0.314
Highest	51	33	Ref		Ref	
Educational status						
Could not read or write	63	95	0.670 (0.437–1.027)	0.066	1.662 (0.356–7.767)	0.518
Could read and write but no formal education	34	37	0.929 (0.538–1.602)	0.790	1.193 (0.316–4.504)	0.795
Attended formal education	95	96	Ref		Ref	
Occupational status						
Govt./non-govt./self-employed	105	98	1.601 (1.088–2.357)	0.017	1.982 (0.859–4.568)	0.109
Unemployed/student	87	130	Ref		Ref	
Religion						
Orthodox	59	114	0.500 (0.310–0.807)	0.005	1.092 (0.434–2.749)	0.852
Muslim	73	56	1.260 (0.763–2.081)	0.366	2.898 (0.985–8.522)	0.053
Protestant/Catholic	60	58	Ref		Ref	
Spouse's educational status						
Could not read or write	27	56	0.357 (0.203–0.628)	0.001	0.170 (0.036–0.797)	0.025*
Could read and write but no formal education	35	41	0.633 (0.363–1.104)	0.107	0.338 (0.096–1.191)	0.092
Attended formal education	85	63	Ref		Ref	
Knowledge						
Poor	95	116	0.946 (0.644–1.388)	0.775	0.972 (0.427–2.211)	
Good	97	112	Ref		Ref	0.946
CBE						
Never undertake CBE	166	199	0.930 (0.527–1.642)	0.803	1.215 (0.366–4.038)	
Ever undertake CBE	26	29	Ref		Ref	0.750
Attitude per unit increase[a]			2.589 (2.154–3.111)	0.001	2.636 (2.013–3.451)	0.001*
Subjective norm per unit increase[a]			1.587 (1.436–1.754)	0.001	1.418 (1.166–1.724)	0.001*
Perceived behavioral control per unit increase[a]			1.244 (1.165–1.329)	0.001	1.087 (0.945–1.251)	0.242

COR, crude odds ratio; AOR, adjusted odds ratio. *Significant at $p < 0.05$. [a]Continuous variable.

of intention to undergo CBE increased 2.6-fold (AOR = 2.636; 95% CI = 2.013–3.451). The AOR of intention to undergo CBE increased 1.4-fold per unit increase in the subjective norm score (AOR = 1.418; 95% CI = 1.166–1.724) (Table 4).

Discussion

In this study, the mean score of intention to undergo CBE was 12.55 (SD ± 3.22), with minimum and maximum values of 5 and 20, respectively. In Ethiopia, even though there are no studies yet that focus on intention to undergo breast screening, there are some studies on intention to undergo cervical cancer screening. However, the mean score for intention to undergo CBE in our study was a little lower than the mean score of intention to undergo cervical cancer screening (14.52; SD = 4.012) in a study conducted in the Gomma district, Jimma, Ethiopia [15]. This might be due to the greater attention and effort given to cervical cancer screening than CBE in Ethiopia: for example, the availability of separate national cervical cancer prevention and control guidelines; cervical cancer being included in the national Health Management Information System (HMIS) for reporting; and CBE and cervical cancer screening being given together in a "cervical cancer screening" room at PHFs in Ethiopia.

Our study showed that the odds of intention to undergo CBE among women whose spouse could not read or write are 80% lower than for women whose spouse attended formal education (AOR = 0.155; 95% CI = 0.033–0.722). Likewise, Indian males who had completed secondary education were more likely to have a positive intention to support their wife's screening than males who had not completed secondary education [19]. This is in line with the WHO recommendation for male education to increase their willingness to encourage and support their partners in screening programs [20]. A study conducted in Addis Ababa, Ethiopia, also revealed that women who attended secondary and tertiary school were two and four times more likely to practice breast cancer screening (AOR = 2.46, 95% CI = 1.12–5.38; AOR = 4.00, 95% CI = 1.48–10.86), respectively, when compared to participants who did not attend formal education [6]. This could indicate that education in general is an important factor in breast cancer screening. That is why, the Millennium Development Goals [21] and the Sustainable Development Goals [22] prioritize universal primary education as a foundation to improving people's lives.

The present study showed that the odds of intention to undergo CBE increased by 2.6-fold per unit increase in the attitude score (AOR = 2.621; 95% CI = 2.005–3.426) and increased by 1.4-fold per unit increase in the subjective norm score (AOR = 1.399; 95% CI = 1.154–1.696). Likewise, according to a study carried out in Nepal, women with a positive attitude, high subjective norm, and high perceived behavioral control were more likely to have intention to undergo CBE [23]. Perceived behavioral control and subjective norms also demonstrated a significant association with intention to undergo breast cancer screening in a study conducted in European countries [24]. This indicates that TPB constructs (attitude, subjective norm, and perceived behavioral control) should be emphasized when developing interventions to increase CBE or breast cancer screening. The reason for not having a significant relationship between perceived behavioral control and intention to CBE in this study while other studies mentioned above showed that could be due to the sociodemographic variations between this study and the above studies, as the above studies are in Europe and Asia.

This study revealed that 13.1% (95% CI = 10–16) of women ever had CBE. Similarly, a systematic review conducted on studies in sub-Saharan Africa showed that the lifetime prevalence of CBE ranged from 2% among rural women in Nigeria to 28.9% among nurses in Lagos, Nigeria [25]. Even though our results fall in the range of the findings from different studies, any differences might be due to the difference in sociodemographic characteristics and population segment (e.g., nurses in Lagos). The practice of CBE in this study (13.1%) is higher than for a similar study in urban settings of the SNNPR in Ethiopia (6.1%) [8]. However, this variation might be because the current study assessed women who had ever undergone CBE, but the SNNPR study assessed regular engagement in CBE practice. Additionally, it must be noted that in such an unscreened population, the results found that 3.4% of 7,573 adult women with breast abnormalities needed further diagnostic services. Of these, eventually 5 were newly found to have breast cancer [26].

In our study, among those who ever had CBE, the majority (63.6%) underwent CBE on the recommendation of a health professional. This finding is consistent with a study carried out in urban settings of the SNNPR in Ethiopia [8]. In Ethiopia, a health professional's recommendation for cancer screening practice is also observed when recommending for breast self-examination [27]. This indicates that health professionals' recommendation is a good approach in increasing breast cancer screening practice. As shown elsewhere, CBE can be promoted successfully and performed by lower level health workers if sufficiently supported in the wider health system [28].

Among the 420 study participants, 263 (62.6%) said that breast cancer is noncommunicable. This finding is lower than the study conducted among women in Addis Ababa, Ethiopia (77.1%) [6] and higher than the study conducted among women of reproductive age in Bale Zone, Southeast Ethiopia (12.4%) [17]. This variation would be due to urban-rural variation, where urban residents are expected to have a better knowledge than rural residents; and study time difference, where knowledge level is expected to show relative increment over time. Majority of this study participants, 298 (71%), mentioned pain in the breast as a breast cancer sign and symptom. Likewise, in similar studies conducted in Addis Ababa [6] and in Bale Zone, Ethiopia [17], pain in the breast was mentioned by 50.6% and 20.5% of the respondents, respectively. Absence of breast-feeding and obesity were recognized as major risk factors for developing breast cancer by 288 (68.6%) and 269 (64%) of participants, respectively. However, smoking was recognized as a common risk factor for breast cancer by 44.6% of similar study participants [6].

In this study, only 185 (44%) of the respondents put CBE as breast cancer prevention method. In contrary, majority (78.6%) of participants in a study conducted in Bale Zone, Southeast Ethiopia [17] put CBE as a most breast cancer prevention method they know. This informs that priorities should be given to train health professionals at all levels of the health system to promote and offer CBE. The findings of this study could provide an evidence base for designing interventions to increase the intention to undergo CBE among women visiting rural healthcare facilities, thereby facilitating early breast cancer detection and increasing survival.

Strengths and Limitation of the Study

This study has certain strengths and limitation. To validate the direct measures of TPB constructs, indirect measures were developed up on the elicitation study, for

which, in-depth interviews were conducted to explore salient beliefs. However, since this study is a cross-sectional study, it fails to assess whether whose intended women would undergo the CBE or not after 3 months as they reported. Thus, researchers of this study suggest follow-up study for the future.

Conclusion

Intention to undergo CBE is lower in this study compared to other settings. Participant's higher wealth index, higher spouse educational status, positive attitude, and higher subjective norm had a relevant association with intention to undergo CBE. We recommend expansion of the formal education program and social and behavioral change communication interventions to improve self-efficacy and community activation to demand cancer screening services must go hand in hand with provider readiness to provide such services. Improving attitudes and subjective norms toward CBE by itself could also increase the uptake. Certainly, health facilities need to be prepared for the procedure, referral, diagnostic service, and patient navigation. Training "cancer nurses" could facilitate this process.

Acknowledgments

We would like to thank Addis Ababa University for reviewing the proposal, giving feedback, and ensuring ethical clearance, and the Else-Kroener-Foundation, Martin-Luther-University, the German Ministry for Economic and Development Cooperation (BMZ), and the Academic Partnership Initiative of German International Cooperation (GIZ) for securing funds. Our deepest gratitude also goes to the study participants for devoting their time to the study.

Statement of Ethics

This study proposal was submitted to the Instructional Review Board (IRB) of the College of Health Sciences, Addis Ababa University. The study was checked for any ethical issues and an official letter of ethical clearance was obtained (meeting on 28 May 2020: Ref. no. 038/20/SPH). Participation in this study was completely voluntary, and an informed written consent was obtained from each study participant. Before the administration of any survey question, consent was asked in private once the interviewers share information related to the study objective and potential benefits and risks of participating in the study, confidentiality of the data, anonymous data collection procedure and, their full right to skip a particular question or total refusal of participation. Consent forms were prepared and read to the participants in the language they understand.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Funding Sources

This work was supported by the Else-Kroener-Foundation through Martin-Luther-University, Halle-Wittenberg, Germany, grant No. 2018_HA31SP. Funding was received through the German Ministry for Economic and Development Cooperation (BMZ) through the Academic Partnership Initiative of German International Cooperation (GIZ), project No. 81281915. The role of the funder in this study was to provide the required budget for the study.

Author Contributions

Bezawit Ketema contributed to the conception, proposal writing, data cleaning, analysis, and drafting of the manuscript. Mirgissa Kaba contributed to the methodological design and reviewing of the manuscript. Sarah Negash contributed to the reviewing of the manuscript. Adamu Addissie contributed to the analysis and reviewing of the manuscript. Eva Kantelhardt contributed to the interpretation of findings and reviewing of the manuscript. All authors read and approved the final manuscript.

Data Availability Statement

Data will be available for readers upon email request to the corresponding author, Bezawit Ketema via bezawitketema@gmail.com.

References

1 WHO. International. Agency for research on cancer, Globocan 2020. 2020.
2 Ghoncheh M, Pournamdar Z, Salehiniya H. Incidence and mortality and epidemiology of breast cancer in the world. Asian Pac J Cancer Prev. 2016;17(S3):43–6.
3 Timotewos G, Solomon A, Mathewos A, Addissie A, Bogale S, Wondemagegnehu T, et al. First data from a population based cancer registry in Ethiopia. Cancer Epidemiol. 2018;53:93–8.
4 Global WHO. Breast cancer initiative highlights renewed commitment to improve survival; 2021.
5 Ethiopia FMoh. National cancer control plan, 2016-2020. In: directorate Dpac, editor. 2015.
6 Abeje S, Seme A, Tibelt A. Factors associated with breast cancer screening awareness and practices of women in Addis Ababa, Ethiopia. BMC Women Health. 2019;19(1):4.
7 Dibisa TM, Gelano TF, Negesa L, Hawareya TG, Abate D. Breast cancer screening practice and its associated factors amongwomen in Kersa District, Eastern Ethiopia. Pan Afr Med J. 2019;33(144):144.
8 Assefa AA, Abera G, Geta M. Breast cancer screening practice and associated factors among women aged 20–70 Years in urban settings of SNNPR, Ethiopia. Breast Cancer. 2021;13:9–19.
9 Wondemagegnhu T, Molla A, Abreha A, Assefa M. Pattern of cancer in Tikur anbessa specialized hospital oncology center in Ethiopia from 1998 to 2010. Int J Cancer Res Mol Mech. 2015;1.

10 Tesfaw A, Getachew S, Addissie A, Jemal A, Wienke A, Taylor L, et al. Late-stage diagnosis and associated factors among breast cancer patients in south and southwest Ethiopia: a multicenter study. Clin Breast Cancer. 2021;21(1):e112–9.
11 Getachew S, Tesfaw A, Kaba M, Wienke A, Taylor L, Kantelhardt EJ, et al. Perceived barriers to early diagnosis of breast Cancer in south and southwestern Ethiopia: a qualitative study. BMC Womens Health. 2020; 20(1):38.
12 Ajizen L. The Theory of planned behavior.
13 Abamecha F, Tena A, Kiros G. Psychographic predictors of intention to use cervical cancer screening services among women attending maternal and child health services in Southern Ethiopia: the theory of planned behavior (TPB) perspective. BMC Public Health. 2019;19(1):434.
14 Getahun T, Kaba M, Derseh BT. Intention to screen for cervical cancer in debre berhan town, amhara regional state, Ethiopia: application of theory of planned behavior. J Cancer Epidemiol. 2020;2020:3024578.
15 Wollancho W, Amdissa D, Bamboro S, Wasihun Y, Tareke KG, Gizaw AT. Determining behavioral intention and its predictors towards cervical cancer screening among women in Gomma district, Jimma, Ethiopia: application of the theory of planned behavior. PLoS One. 2020;15(11):e0238472.
16 Ababa EPHIA, Ababa FMHA. Mini demographic and health survey; 2019. p. 2021.
17 Hussen A, Kumbi M, Lette A, Nuriye S. Knowledge of breast cancer and associated factors among women reproductive age in Bale zone, Southeast Ethiopia: a community based cross sectional study. Emerg Med. 2019;9(2).
18 Hosmer DW Jr, Lemeshow S, Sturdivant RX. Applied logistic regression. John Wiley & Sons; 2013.
19 Dsouza JP, Van den Broucke S, Pattanshetty S, Dhoore W. Factors explaining men's intentions to support their partner's participation in cervical cancer screening. BMC Womens Health. 2022;22(1):443.
20 WHO. Comprehensive Cervical Cancer Control. A guide to essential practice. WHO website; 2014.
21 Nation U. The millennium development Goals we can END POVERTY 2015. UN Department of Public Information; 2000.
22 NATIONS U. Transforming our world: the 2030 agenda for sustainable development. 2015.
23 Bhandari D, Shibanuma A, Kiriya J, Hirachan S, Ong C, Jimba M. Factors associated with breast cancer screening intention in Kathmandu Valley, Nepal. PLoS One. 2021;16(1): e0245856.
24 Ritchie D, Van Hal G, Van den Broucke S. Factors affecting intention to screen after being informed of benefits and harms of breast cancer screening: a study in 5 European countries in 2021. BMC Public Health. 2022;80(1):143.
25 Black E, Richmond R. Improving early detection of breast cancer in sub-Saharan Africa: why mammography may not be the way forward. Glob Health. 2019;15(1):3.
26 Ayele W, Addissie A, Wienke A, Unverzagt S, Jemal A, Taylor L, et al. Breast awareness, self-reported abnormalities, and Breast-Cancer in rural Ethiopia: a survey of 7,573 women andPredictions of the national burden. The Oncologist. 2021;26(6):e1009–17.
27 Azage M, Abeje G, Mekonnen A. Assessment of factors associated with breast self-examination among health extension workers in west gojjam zone, northwest Ethiopia. Int J Breast Cancer. 2013;2013:814395.
28 O'Donovan J, Newcomb A, MacRae MC, Vieira D, Onyilofor C, Ginsburg O. Community health workers and early detection of breast cancer in low-income and middle-income countries: a systematic scoping review of the literature. BMJ Glob Health. 2020; 5:e002466.

healthcare

MDPI

Article

Beyond Intention: Barriers to Undergoing a Blood Pressure Check in the South-West Shewa Zone, Ethiopia

Bezawit Ketema [1,2,3,*], Mirgissa Kaba [1,3], Mosisa Bekele [3], Eva Johanna Kantelhardt [2,3], Eric Sven Kroeber [2,3,†] and Adamu Addissie [1,3,†]

[1] School of Public Health, College of Health Sciences, Addis Ababa University, Addis Ababa 9086, Ethiopia; mirgissa.kaba@aau.edu.et (M.K.); adamuaddissie@gmail.com (A.A.)
[2] Institute for Medical Epidemiology, Biostatistics and Informatics, Martin Luther University, 06097 Halle, Germany; eva.kantelhardt@uk-halle.de (E.J.K.); eric.kroeber@uk-halle.de (E.S.K.)
[3] Global Health Working Group, Martin Luther University, 06097 Halle, Germany; mosisabe31@gmail.com
* Correspondence: bezawitketema@gmail.com
† These authors contributed equally to this work.

Abstract: Background/Objectives: Hypertension is often asymptomatic, progresses slowly, and leads to multiple secondary diseases. Thus, a regular blood pressure check is recommended. The objective of this study is to assess the intention to undergo a blood pressure check and its associated factors among adults in Southwest Shewa Zone, Ethiopia. Methods: A healthcare-facility-based cross-sectional design was utilized. A standardized questionnaire, adapted from previous research, was administered by trained interviewers. Binary logistic regression analysis was used to determine the factors the intention to undergo blood pressure checks is associated with, utilizing SPSS version 27. Results: Four hundred twenty-one participants provided a complete response, yielding a 99.7% response rate. Of these participants, 153 (36%) had had their blood pressure checked at some point. The vast majority of the study participants (387, 91.9%) did not know the normal blood pressure range. The median score for intention to undergo blood pressure check was 11 (interquartile range 10–13). Female participants were 59% less likely (adjusted odds ratio [AOR] 0.408, 95% confidence interval 0.208–0.801) to intend to undergo a blood pressure check than male participants. Participants in the poorest wealth quintile were 82% less likely (AOR 0.183, 95% CI = 0.063–0.533) to intend to undergo a blood pressure check than those in the richest quintile. Participants who intended to undergo a blood pressure check had a significantly favorable attitude (t = 10.801, $p < 0.001$) and lower perceived behavioral control (t = −2.865, $p < 0.001$) compared with those who had no intention of checking. Conclusion: A high intent to undergo a blood pressure check should prompt healthcare facilities to offer regular blood pressure check-up services. Behavioral change communication interventions should address the attitude and perceived behavioral controls of individuals associated with the intention to undergo a blood pressure check. In doing so, special attention should be given to female and economically disadvantaged populations.

Keywords: hypertension; blood pressure; screening; rural health; Ethiopia; public health; intention

Citation: Ketema, B.; Kaba, M.; Bekele, M.; Kantelhardt, E.J.; Kroeber, E.S.; Addissie, A. Beyond Intention: Barriers to Undergoing a Blood Pressure Check in the South-West Shewa Zone, Ethiopia. *Healthcare* **2024**, *12*, 2417. https://doi.org/10.3390/healthcare12232417

Academic Editor: Ines Aguinaga-Ontoso

Received: 30 October 2024
Revised: 21 November 2024
Accepted: 26 November 2024
Published: 2 December 2024

1. Introduction

Hypertension, or high blood pressure, is a grave medical condition that can cause brain, heart, kidney, and additional health problems. Globally, an estimated 1.28 billion adults have hypertension, and around two-thirds of these individuals live in low- and middle-income countries [1]. In Africa, the estimated number of people with hypertension is projected to rise to 216.8 million by 2030 (a 66% rise from 2010) [2]. A systematic review and meta-analysis of 38 studies showed a 21.81% hypertension prevalence in Ethiopia [3].

Hypertension may be asymptomatic and progresses very slowly, so it is called a "silent killer" [4,5]. Thus, the World Health Organization (WHO) recommends undergoing a regular blood pressure check. Early detection of high blood pressure through screening

can lead to timely treatment, decreasing associated costs and reducing the risk of serious health complications like heart attacks, strokes, and premature death [1]. The United States Preventive Services Task Force (USPST) recommends annual hypertension screening for adults >40 years old and a screening timeframe of 3–5 years for adults aged between 18 and 39 years [6]. In line with international recommendations, the National Guidelines of Ethiopia regarding clinical and programmatic management of major non-communicable diseases also recommend regular hypertension screening for adults ≥ 30 years [7].

Despite the recommendations for hypertension screening, throughout the world, an estimated 46% of adults with hypertension are oblivious to their status [1]. The burden of undiagnosed hypertension is 28.8% in Southern Ethiopia [8] and 21.2% in Southwest Ethiopia [9]. Therefore, the aim of this research is to assess the intention to undergo a blood pressure check and its associated factors among adult primary healthcare facility attendants in the Southwest Shewa zone, Ethiopia, using the theory of planned behavior (TPB). This approach has been applied to a wide variety of health behaviors, including the intention to undergo screening for cervical cancer [10–13] and clinical breast examination [14]. According to Ajzen's TPB, intention is influenced by favorable or unfavorable attitudes, subjective norms, and perceived behavioral control, which are shaped by behavioral, normative, and control beliefs, respectively [15]. Even though a target population's intention to undergo a recommended behavior is a key factor for policy planning and program design, to our knowledge, there have been no studies focusing on the intention to undergo a blood pressure check in this area. Thus, our findings will contribute to filling a knowledge gap among researchers, policymakers, and program designers.

2. Materials and Methods

2.1. Study Design, Area, and Period

A health-facility-based cross-sectional study was conducted in the Southwest Shewa zone, Oromia, Ethiopia. Southwest Shewa is found 114 km from the capital city, Addis Ababa. Ethiopia's healthcare system is a three-tier structure. At the primary level, services are delivered through a network of health posts (village-level facilities), health centers, and primary hospitals. Health centers oversee health posts, deliver mainly preventive healthcare services, and do referrals to primary hospitals. Southwest Shewa has 54 health centers, and this study collected data from 12 of them from 10 January 2021 to 10 February 2021.

2.2. Study Population

All adults ≥ 30 years, old who were visitors to the selected healthcare facilities during the data collection time were eligible for this study. The rationale for the age cutoff of ≥30 years is based on the Ethiopian National Guidelines on Clinical and Programmatic Management of Major NCDs [7]. Pregnant women and patients diagnosed with hypertension were excluded.

2.3. Sample Size Determination

The sample size was calculated using the single population proportion formula with Epi-Info software (version 7). Based on the assumptions of a 95% confidence interval (CI) and a 5% margin of sampling error tolerance (hence there being no similar previous study), we assumed a 50% probability of an intention to undergo a blood pressure check and a 10% non-response rate, and the sample size was calculated at 422.

2.4. Sampling Procedures

A total of 12 facilities were chosen randomly from 54 PHFs in Southwest Shewa. The sample was equally distributed among each healthcare facility based on the patient flow in each facility over the previous 10 days, which was similar for each facility and was assumed to be similar throughout the period of data collection. The actual study participants were chosen from the 12 healthcare facilities using systematic random sampling. The sample

size interval was computed, and every other nine adults visiting each healthcare facility were approached and interviewed when they exited the facility.

2.5. Questionnaire Design and Data Collection

The TPB manual by Ajzen [15] and previous research [16,17] were used to develop this study questionnaire. An elicitation study was conducted prior to developing this study tool in order to identify items for measuring indirect TPB constructs. Sixteen in-depth interviews with participants similar to the target population have generated 11 themes (Table S1).

The outcome variable, the intention to undergo a blood pressure check, was measured using the following items: "How likely is it that you will need blood pressure check service in the next 3 months?"; "In the coming 3 months, how likely is it that you will be checked for blood pressure?"; and "In the next 3 months, how likely is it that you will look for and request blood pressure check service?". A median split between intending and not intending to undergo a blood pressure check was considered to dichotomize the intention variable [15].

Each TPB construct (attitude, subjective norm, and perceived behavioral control) was measured on a 5-point Likert scale: 1, strongly disagree; 2, disagree; 3, neutral; 4, agree; and 5, strongly agree. Items were clear and unambiguous, each statement addressed only one issue, and appropriate language was used. The items used to measure the direct attitude towards blood pressure check included "a blood pressure check is good", "a blood pressure check is useful", and "a blood pressure check feels pleasant." The items used to measure the direct subjective norm towards blood pressure check were "most people who are important to me think that I should have my blood pressure checked", "I feel social pressure to have my blood pressure checked", and "people who are important to me want me to have my blood pressure checked." The items used to measure direct perceived behavioral control towards a blood pressure check were "a blood pressure check service is easily available", "a blood pressure check service is easily accessible", "a blood pressure check is likely expensive", "I don't think I am at risk of acquiring high blood pressure", and "I am aware about hypertension screening service". We handled TPB dimensions (attitude, subjective norm, and perceived behavioral control) as continuous variables (Table S1).

Considering previous studies [16–19], knowledge of blood pressure was measured by using nine items. The knowledge-assessing items focused on risk factors, symptoms, and prevention options. The median score was computed, and knowledge was categorized as good or poor (above and below the median score, respectively).

In order to maintain consistency in meaning and content, the structured questionnaire was developed in English, translated by language experts into Afan Oromo, the local language, and then back translated into English. Pilot testing was done on the initial questionnaire draft among a sample of 50 individuals similar to the study population, as per the inclusion criteria of the study. Pilot participants were recruited using the same sampling technique used in this study: systematic random sampling. All demographic categories were represented. Pilot data were analyzed to determine the statistical rigor, identify ambiguities and confusion, assess question order and flow, evaluate response options, estimate time to complete, identify technical issues, and refine the questionnaire. The final questionnaire comprised 10 sections: sociodemographic variables, knowledge about hypertension, past practice of blood pressure checking, intention to undergo a blood pressure check, and direct and indirect TPB constructs. The data were collected by trained data collectors using a structured questionnaire and the Open Data Collection Kit (ODK).

2.6. Data Cleaning and Processing

The data gathered using the ODK were verified and exported to SPSS Statistics version 27 for analysis. Items that were negatively specified were inverted prior to analysis. An analysis was conducted to assess the internal consistency of the items measuring the direct theory of planned behavior (TPB) constructs. Cronbach's alpha was >0.7 for each TPB

dimension—0.708 for direct attitude, 0.756 for direct subjective norm, and 0.762 for direct perceived behavioral control—confirming the internal consistency of the questionnaire. Simple correlations among the direct and indirect measures of the similar TPB constructs were calculated to verify the validity. Prior to performing any type of analysis, the normality, homogeneity of variance, and multicollinearity of the data were examined. The variance inflation factor was <10, indicating a lack of multicollinearity.

2.7. Data Analysis

Data were summarized utilizing frequency, proportion, central tendency, and dispersion. Independent-sample t-tests were employed to compare the TPB constructs of individuals who intend to and do not intend to undergo a blood pressure check. The Holm-Bonferroni method was used to adjust for significance levels to 0.0167, 0.025, and 0.05 for multiple comparisons and to reduce the risk of type I error.

To identify factors associated with the intention to undergo a blood pressure check, a binary logistic regression model was employed. A *p*-value of less than 0.25 in the bivariate analysis [20], multicollinearity, clinical significance, and maximum number of variables a model can tolerate were considered to enter variables in the multiple logistic regression model. Statistical significance for the multivariable logistic regression analysis was set at $p < 0.05$. The Hosmer–Lemeshow goodness-of-fit test was run to confirm that the model adequately fit the data.

3. Results

3.1. Sociodemographic Characteristics of Study Participants

In this study, 421 participants provided a complete response, yielding a 99.7% response rate. Study participants' ages ranged from 30 to 81 years, with a mean of 44.7 years and a standard deviation of 10.2 years. More than half (n = 247, 58.7%) of the study participants were women. Most of the participants (n = 364, 86.5%) were married. Almost half (n = 184, 43.7%) were Orthodox Christians. In terms of education and occupation, 153 (36.3%) participants could not read or write, and 221 (52.5%) participants were farmers. The majority of spouses (n = 266, 63.2%) were farmers and could mostly read and write without formal education (n = 123, 29.5%; Table 1).

Table 1. Sociodemographic characteristics of the study participants.

Characteristics	Response Category	Frequency (N = 421)	Percent (%)
Sex	Female	247	58.7
	Male	174	41.3
Religion	Orthodox	184	43.7
	Muslim	108	25.7
	Protestant	129	30.6
Marital status	Married	364	86.5
	Widowed	41	9.7
	Never married	16	3.8
Educational status	Cannot read and write	153	36.3
	Read and write without formal education	105	24.9
	Primary education	117	27.8
	Secondary education and above	46	10.9

Table 1. *Cont.*

Characteristics	Response Category	Frequency (N = 421)	Percent (%)
Occupation	Government/non-governmental organization employee	17	4.0
	Housewife	127	30.2
	Merchant	56	13.3
	Farmer	221	52.5
Spouse occupation	Government/non-governmental organization employee	36	8.6
	Merchant/housewife	62	14.7
	Farmer	266	63.2
Spouse educational status	Cannot read and write	106	25.2
	Read and write without formal education	123	29.2
	Primary education	84	20.0
	Secondary education and above	51	12.1

3.2. Knowledge About Blood Pressure and Past Blood Pressure Check Practice

Most of the participants (n = 278, 66%) stated that high blood pressure cannot be transmitted. Moreover, most of the participants (279, 66%) knew at least one risk factor: 156 (37%) mentioned high fat and 102 (24%) mentioned heredity. The majority of the participants (n = 300, 71%) correctly mentioned at least one sign and symptom; 266 (63%) participants mentioned headache as a sign and symptom of high blood pressure, while 121 (28.7%) participants said they were unsure. Very few of the study participants (34, 8.1%) knew the normal range of blood pressure, while most of them (376, 89%) said they did not know it (Figure 1). When asked about the consequences of untreated high blood pressure, 383 (91%) participants were aware of at least one complication. Death was mentioned as a common complication by 258 (61%) participants.

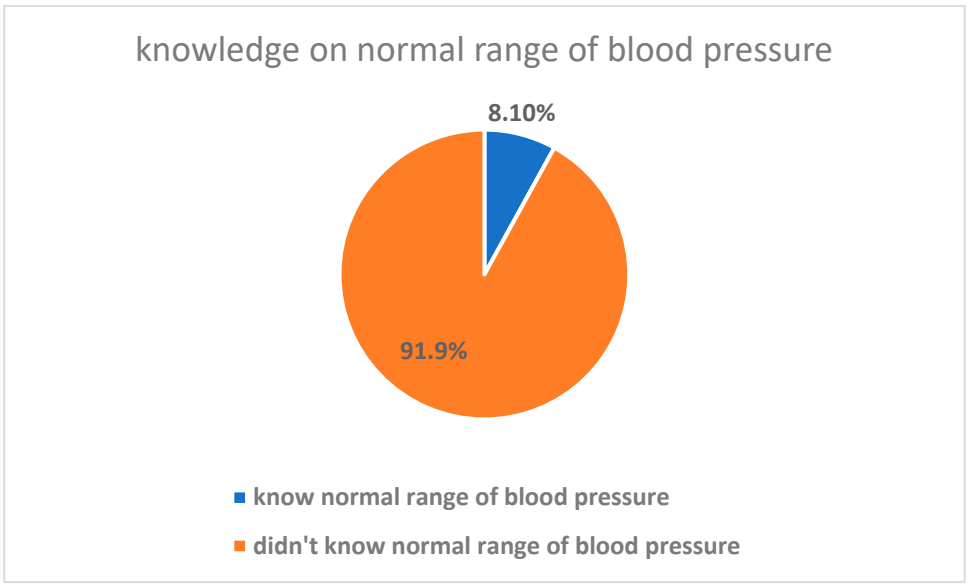

Figure 1. Knowledge of normal range of blood pressure among study participants.

Regarding prevention of high blood pressure, 336 (80%) participants correctly mentioned at least one prevention method. Half of the study participants mentioned reduced fatty food intake as one of the high blood pressure prevention measures. Furthermore, minimizing salt intake and taking antihypertensive were mentioned by 185 (44%) and 128 (30%) participants, respectively. Regarding the aim of blood pressure screening for healthy individuals, slightly more than half of the participants mentioned detecting hypertension early, while more than a quarter of the participants did not know the aim.

Overall, the majority of the participants (n = 321, 76%) had good knowledge about blood pressure. Moreover, 153 (36%) participants had their blood pressure checked at some point. The two most common justifications were that it was the usual practice at the clinic (93%) and that it was a health professional's recommendation (58%; Table 2).

Table 2. Knowledge about blood pressure and past blood pressure check practices (n = 421).

Characteristics	Response Category	Frequency (N = 421)	Percent (%)
High blood pressure can be transmitted	Yes	52	12.4
	No	278	66
	Don't know	91	21.6
Risk factors for high blood pressure (multiple responses are possible)	Hereditary/genetic background	102	24.23
	Smoking	84	19.95
	Obesity	7	1.7
	High fat intake	156	37
	Excess alcohol intake	72	17.1
	Don't know	142	33.7
	Other	19	4.5
Signs and symptoms of high blood pressure (multiple responses are possible)	Asymptomatic	53	12.6
	Headache	266	63.2
	Palpitations	123	29.2
	Poor vision	66	15.7
	Dizziness	57	13.5
	Don't know	121	28.7
	Other	7	1.68
Normal blood pressure range	Less than 120/80 mmHg	34	8.1
	Less than 130/90 mmHg	9	2.14
	Less than 160/100 mmHg	2	0.48
	Don't know	376	89.31
Complications if blood pressure remains untreated (multiple responses are possible)	Stroke	139	33
	Heart failure	131	31.1
	Kidney failure	69	16.4
	Loss of sight	34	8.1
	Death	258	61.3
	Don't know	38	9

Table 2. *Cont.*

Characteristics	Response Category	Frequency (N = 421)	Percent (%)
Prevention/control measures for high blood pressure (multiple responses are possible)	Minimize salt intake	185	43.9
	Reduce fatty foods	211	50.1
	Avoid excess alcohol	123	29.2
	Avoid smoking	84	20
	Regular exercise	49	11.6
	Taking antihypertensive	128	30.4
	Measuring blood pressure	39	9.3
	Don't know	85	20.2
	Other	16	3.84
Aims of a blood pressure check for a healthy individual (multiple responses are possible)	To detect hypertension at an early stage	224	53.2
	To prevent complication	182	43.2
	Don't know	115	27.3
	Other	4	0.96
Have had a blood pressure check	No	268	66.7
	Yes	153	36.3
Reasons to undergo blood pressure check (multiple responses are possible) (n = 153)	Health professional's recommendation	88	57.5
	It is a standard care at the clinic	93	61
	Other	4	2.6

3.3. Intention to Undergo Blood Pressure Check

The median intention to undergo a blood pressure check score was 11 (interquartile range [IQR] 10–13). Among the study participants, 224 (53%, 95% CI 48%–58%) intended to undergo a blood pressure check in the next 3 months. The participants who intended to undergo a blood pressure check had significantly favorable attitudes (t = 10.801, $p < 0.001$) and lower perceived behavioral control (t = −2.865, $p < 0.001$). However, there was no difference in subjective norms (Table 3).

Table 3. The theory of planned behavior (TPB) constructs among the participants intending or not intending to undergo a blood pressure check.

TPB Construct	Intend to Undergo a Blood Pressure Check		Do Not Intend to Undergo a Blood Pressure Check		*t*	*p*	95% Confidence Interval
	Mean	SD	Mean	SD			
Attitude	4.372	0.671	3.819	0.541	10.801	<0.001	−0.314 0.050
Perceived behavioral control	8.268	1.715	8.934	1.329	−2.865	<0.001	−0.963 −0.369
Subjective norm	2.789	1.129	2.921	0.684	−2.529	0.155	0.435 0.671

3.4. Associated Factors with Intention to Undergo Blood Pressure Check

Female participants were 59% less likely (adjusted odds ratio [AOR] 0.408, 95% CI = 0.208–0.801) to intend to undergo a blood pressure check than male participants. Housewives were 3.4 times more likely (AOR 3.400, 95% CI 1.653–6.992) to intend to undergo a blood pressure check than farmers. The participants in the poorest wealth quintile were 82% less likely (AOR 0.183, 95% CI 0.063–0.533) to intend to undergo a blood pressure check than those in the richest quintile. A favorable attitude and lower perceived

behavioral control would increase the intention to undergo a blood pressure check. Each unit increase in the attitude score would increase the odds of intending to undergo a blood pressure check by 3.7-fold (AOR 3.711, 95% CI 2.315–5.947). The odds of intending to undergo a blood pressure check would decrease by 18% (AOR 0.822, 95% CI 0.690–0.981) per unit increase in perceived behavioral control (Table 4).

Table 4. Factors associated with the intention to undergo a blood pressure check.

Characteristic	Response Category	Intention		Crude Odds Ratio (95% Confidence Interval)	*p*	Adjusted Odds Ratio (95% Confidence Interval)	*p*
		No (n)	Yes (n)				
Sex	Female	131	116	0.541 (0.364–0.803)	0.002	0.408 (0.208–0.801)	0.009
	Male	66	108	1		1	
Educational status	Cannot read and write	79	74	0.369 (0.180–0.755)	0.006	0.848 (0.254–2.828)	0.789
	Read and write only	55	50	0.358 (0.170–0.756)	0.007	1.072 (0.336–3.417)	0.907
	Primary education	50	67	0.528 (0.252–1.105)	0.090	1.235 (0.410–3.716)	0.707
	Secondary and above	13	33	1		1	
Occupation	Government/non-governmental organization employee	6	11	1.600 (0.572–4.479)	0.371	1.620 (0.314–8.375)	0.565
	Housewife	55	72	1.143 (0.736–1.773)	0.552	3.400 (1.653–6.992)	0.001
	Merchant	33	23	0.608 (0.336–1.102)	0.101	1.000 (0.395–2.536	0.999
	Farmer	103	118	1		1	
Spouse's occupation	Government/non-governmental organization employee	12	24	1.827 (0.878–3.805)	0.107	0.396 (0.139–1.133)	0.084
	Merchant/housewife	34	28	0.752 (0.432–1.311)	0.315	0.539 (0.234–1.241)	0.146
	Farmer	127	139	1		1	
Spouse's educational status	Cannot read and write	43	63	0.501 (0.239–1.050)	0.067	1.353 (0.452–4.048)	0.589
	Read and write only	71	52	0.251 (0.121–0.517)	<0.001	0.657 (0.236–1.830)	0.422
	Primary education	46	38	0.283 (0.132–0.606)	0.001	0.529 (0.196–1.432)	0.210
	Secondary and above	13	38	1		1	
Wealth quintile	Poorest	45	39	0.395 (0.210–0.744)	0.004	0.183 (0.063–0.533)	0.002
	Q2	50	33	0.301 (0.159–0.570)	0.000	0.150 (0.053–0.425)	<0.001
	Q3	43	41	0.435 (0.231–0.817)	0.010	0.169 (0.058–0.487)	0.001
	Q4	33	50	0.691 (0.365–1.309)	0.257	0.271 (0.101–0.729)	0.010
	Richest	26	57	1		1	
Ever had blood pressure checked	No	142	126	0.498 (0.331–0.749)	0.001	0.787 (0.454–1.363)	0.392
	Yes	55	98	1		1	
Attitude per unit increase [a]				4.160 (2.914–5.940)	<0.001	3.711 (2.315–5.947)	<0.001
Subjective norm per unit increase [a]				0.863 (0.703–1.058)	0.155	1.141 (0.826–1.577)	0.424
Perceived behavioral control per unit increase [a]				0.757 (0.665–0.861)	<0.001	0.822 (0.690–0.981)	0.029

[a] Continuous variable.

4. Discussion

In this study, 53% of the participants intended to undergo a blood pressure check in the next 3 months. Though there are no prior studies that have focused on the intention to undergo a blood pressure check/hypertension screening in Ethiopia, this finding is consistent with studies done on the intention to undergo screening for other non-communicable diseases in the same country [12–14,21].

Female participants in this study were less likely to intend to undergo a blood pressure check than male participants. This disparity might be explained by the knowledge gap between the two sexes, as 86% of men, compared to 69% of women in this study, demonstrated good blood pressure knowledge. The lower intention to undergo blood pressure checks among females than males may lead to the high prevalence of undiagnosed hypertension among women. Thus, interventions targeting women to increase their intention to undergo a blood pressure check are required. This study found that participants in the poorest wealth quintile were 82% less likely (AOR 0.183, 95% CI = 0.063–0.533) to intend to undergo a blood pressure check than those in the richest quintile. This difference could be attributed to the knowledge disparity, as 94% of the wealthiest group and 75% of the poorest group exhibited good blood pressure knowledge. The reason behind more housewives intending to undergo a blood pressure check could also be the difference in blood pressure knowledge among the two demographic groups; a higher percentage of housewives (79%) possessed good blood pressure knowledge compared to farmers (71%).

In this study, we found that the odds of intending to undergo a blood pressure check increased by 3.7 fold per unit in the attitude score. This significant relationship between attitude and intention has been repeatedly indicated in different health behavior studies, mainly those that have focused on non-communicable disease screening behaviors, including the intention to undergo clinical breast examination [22] and cervical cancer screening [10].

Relatively few of this study's participants (13%) knew that hypertension could be asymptomatic, and only 36% of the participants had had their blood pressure checked at some point in their life. This percentage is lower than that found in studies in Lebanon [23], Kenya [24], and Nigeria [19], where 45%, 65%, and 42% of the study participants, respectively, had had their blood pressure checked at some point. The low blood pressure check-up practice in this study setting indicates that a higher prevalence of undiagnosed hypertension among the study population is more likely. Consistently, the authors of a systematic review on the epidemiology of hypertension in Ethiopia found that 37%–78% of patients with hypertension in Ethiopia were not aware of their blood pressure condition [25]. Thus, behavior change communication interventions are highly required to increase the knowledge and practice of blood pressure checks in the study setting, thereby lowering the high proportion of undiagnosed hypertension in the country at large.

The two most common justifications for having hypertension screening were that it was the usual practice at the clinic (93%) and a recommendation by a health professional (58%). Likewise, a study conducted in the Arsi zone, Oromia, Ethiopia, indicated that receiving a health professional's recommendation was significantly associated with self-monitoring of blood pressure [26]. In Ethiopia, a health professional's recommendation is also an influencing factor for performing a breast self-examination [27]. Hence, recommendations by health professionals represent a good approach to increasing any screening practice. Thus, we encouraged involving healthcare professionals to give behavioral recommendations like NCD screening in behavioral change communication interventions for promoting NCD screening.

Almost all of the study participants (91.9%) did not know the normal blood pressure range. According to a study done in Gondar Comprehensive Specialized Hospital in Ethiopia, among patients with hypertension, who are likely to know better than the undiagnosed population, 38% of the respondents did not know the normal blood pressure level [8]. In terms of risk factors, only 37% and 24% of the study participants mentioned high fat intake and heredity/genetic background, respectively, as risk factors for hypertension, and

34% did not know any risk factors. However, in the Gondar study, most of the respondents were aware of the negative impact of cigarette smoking and alcohol drinking (79% and 88%) respectively; [8].

This study's findings, in general, showed a gap in knowledge and practice regarding blood pressure and blood pressure checks, which indicates a need for educational intervention. Moreover, the findings of this study can be used to inform the design of interventions that promote the intention to undergo blood pressure checks. The policy implications of this study can also be relevant for other low-income countries that have similar contextual factors to this study setting.

Strengths and Limitations

The strengths of this study include the use of validated measures and the exploration of salient beliefs through elicitation. Looking at the participants' backgrounds, all groups represented eco-epidemiological settings. Therefore, we assumed the findings could be generalized beyond the specific context of this study, considering the limitations of a facility-based cross-sectional design. Additionally, we were unable to determine whether the reported intention to undergo a blood pressure check translated into actual procedures.

5. Conclusions

Although there have been very limited studies focusing on the intention to undergo a blood pressure check, we found a lower intention to undergo a blood pressure check compared with other NCD screening services in this study setting. A higher wealth index, the male sex, a positive attitude, and low perceived behavioral control had a positive association with the intention to undergo a blood pressure check. We recommend expanding blood pressure check-up services together with social and behavioral change communication (SBCC) interventions to ensure health facilities have trained nurses who can check blood pressure. In doing so, special attention should be given to female and economically disadvantaged populations. Thus, the SBCC intervention should ensure its accessibility, understandability, and usability by these populations.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/healthcare12232417/s1. Table S1: The theory of planned behavior constructs and the intention to undergo a blood pressure check.

Author Contributions: Conceptualization, B.K. and M.K.; data curation, M.B.; formal analysis, E.S.K. and B.K.; funding acquisition, E.J.K.; investigation, M.B.; methodology, A.A.; project administration, E.S.K.; resources, E.J.K.; software, A.A.; supervision, E.J.K. and M.K.; validation, A.A., E.J.K. and M.K.; visualization, A.A. and E.S.K.; writing—original draft, B.K.; writing—review and editing, M.K, A.A, E.S.K. and E.J.K. All authors have read and agreed to the published version of the manuscript.

Funding: The project on which this publication is based was in part funded by the German Federal Ministry of Education and Research 01KA2220B to the NORA Programme. This research was funded in part by Science for Africa Foundation to the Programme Del-22-008 with support from Wellcome Trust and the UK Foreign, Commonwealth & Development Office and is part of the EDCPT2 programme supported by the European Union. This study was also supported by Else Kroener-Fresenius-Foundation Grant No. 2018_HA31SP. The study was also supported by a grant from Hospital Partnership through Deutsche Gesellschaft für Internationale Zusammenarbeit funded by the Ministry for Economic Cooperation and Development (ID 81281915). We acknowledge the financial support of the Open Access Publication Fund of the Martin-Luther-University Halle-Wittenberg.

Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki. The study protocol was approved by the Instructional Review Board of the College of Health Sciences, Addis Ababa University (protocol code: 038/20/SPH; date of approval: 28 May 2020).

Informed Consent Statement: Written informed consent has been obtained from the patients to publish this paper.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: Our gratitude goes to the study participants for devoting their time to this study. We acknowledge Samson Wakuma and Michael Zerihun for the administrative and technical support.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

References

1. WHO. *Hypertension in Key Facts*; World Health Organization: Geneva, Switzerland, 2021.
2. Adeloye, D.; Basquill, C. Estimating the Prevalence and Awareness Rates of Hypertension in Africa: A Systematic Analysis. *PLoS ONE* **2014**, *8*, e0104300. [CrossRef] [PubMed]
3. Tiruneh, S.A.; Bukayaw, Y.A.; Yigizaw, S.T.; Angaw, D.A. Prevalence of hypertension and its determinants in Ethiopia: A systematic review and meta-analysis. *PLoS ONE* **2020**, *15*, e0244642. [CrossRef] [PubMed]
4. FDA. *High Blood Pressure–Understanding the Silent Killer*; The Who, What, Why, and How of High Blood Pressure; FDA: Washington, DC, USA, 2021.
5. CDC. *High Blood Pressure Symptoms and Causes*; High Blood Presure; CDC: Atlanta, GA, USA, 2021.
6. US Preventive Services Task Force. Screening for Hypertension in Adults US Preventive Services Task Force Reaffirmation Recommendation Statement. *JAMA* **2021**, *325*, 1650–1656. [CrossRef]
7. Federal Democratic Republic of Ethiopia, Ministry of Health. Guidelines on Clinical and Programmatic Management of Major Non Communicable Diseases. 2016. Available online: https://extranet.who.int/ncdccs/Data/ETH_D1_National%20NCD%20Guideline%20June%2010,%202016%20for%20print.pdf (accessed on 22 August 2024).
8. Ayalew, T.L.; Wale, B.G.; Zewudie, B.T. Burden of undiagnosed hypertension and associated factors among adult populations in Wolaita Sodo Town, Wolaita Zone, Southern Ethiopia. *BMC Cardiovasc. Disord.* **2022**, *22*, 293. [CrossRef]
9. Mogas, S.B.; Tesfaye, T.; Zewde, B.; Tesfaye, Y.; Kebede, A.; Tadesse, M.; Gudina, E.K.; Tamiru, D.; Dadi, L.S. Burden of Undiagnosed Hypertension among Adults in Urban Communities of Southwest Ethiopia. *Integr. Blood Press. Control* **2021**, *14*, 69–76. [CrossRef] [PubMed]
10. Getahun, T.; Kaba, M.; Derseh, B.T. Intention to Screen for Cervical Cancer in Debre Berhan Town, Amhara Regional State, Ethiopia: Application of Theory of Planned Behavior. *Hindawi J. Cancer Epidemiol.* **2020**, *2020*, 3024578. [CrossRef]
11. Abamecha, F.; Tena, A.; Kiros, G. Psychographic predictors of intention to use cervical cancer screening services among women attending maternal and child health services in Southern Ethiopia: The theory of planned behavior (TPB) perspective. *BMC Public Health* **2019**, *19*, 434. [CrossRef]
12. Wollancho, W.; Amdissa, D.; Bamboro, S.; Wasihun, Y.; Tareke, K.G.; Gizaw, A.T. Determining behavioral intention and its predictors towards cervical cancer screening among women in Gomma district, Jimma, Ethiopia: Application of the theory of planned behavior. *PLoS ONE* **2020**, *15*, e0238472. [CrossRef]
13. Ketema, B.; Addissie, A.; Negash, S.; Kantelhardt, E.J.; Kaba, M. Does Prior Experience Matter? Intention to Undergo Cervical Cancer Screening among Rural Women in South-Central Ethiopia. *Curr. Oncol.* **2024**, *31*, 4908. [CrossRef]
14. Ketema, B.; Kaba, M.; Negash, S.; Addissie, A.; Kantelhardt, E.J. Intention to Undergo Clinical Breast Examination and Its Associated Factors among Women Attending Rural Primary Healthcare Facilities in South Central Ethiopia. *Breast Care* **2023**, *18*, 464–472. [CrossRef]
15. Ajizen, L. The Theory of Planned Behavior. Available online: https://people.umass.edu/~aizen/ (accessed on 10 October 2023).
16. Popalis, M.L.; Ramirez, S.I.; Leach, K.M.; Granzow, M.E.; Stoltzfus, K.C.; Moss, J.L. Improving cervical cancer screening rates: A scoping review of resources and interventions. *Cancer Causes Control* **2022**, *33*, 1325–1333. [CrossRef] [PubMed]
17. Almomani, M.H.; Akhu-Zaheya, L.; Alsayyed, M.; Alloubani, A. Public's Knowledge of Hypertension and its Associated Factors: A Cross-Sectional Study. *Open Nurs. J.* **2022**, *16*. [CrossRef]
18. Aubert, L.; Bovet, P.; Gervasoni, J.-P.; Rwebogora, A.; Waeber, B.; Paccaud, F. Knowledge, Attitudes, and Practices on Hypertension in a Country in Epidemiological Transition. *Hypertension* **1998**, *31*, 1136–1145. [CrossRef]
19. Aghoja, O.C.; Okinedo, P.O.; Odili, V.U. Knowledge, Attitude and Practice of Hypertensive Patients towards Hypertension in a Secondary Health Care Facility in Delta State. *Pharm. Biosci. J.* **2017**, *5*, 24–33. [CrossRef]
20. Hosmer, D.W., Jr.; Lemeshow, S.; Sturdivant, R.X. *Applied Logistic Regression*; John Wiley & Sons: Hoboken, NJ, USA, 2013; Volume 398.
21. Alemnew, W.; Debalkie, G.; Azale, T. Intention to Screen for Cervical Cancer Among Child Bearing Age Women in Bahir Dar City, North-West Ethiopia: Using Theory of Planned Behavior. *Int. J. Women's Health* **2020**, *12*, 1215–1222. [CrossRef]
22. Bhandari, D.; Kiriya, A.S.; Hirachan, S.; Ing, K.; Ong, C.; Jimba, M. Factors associated with breast cancer screening intention in Kathmandu Valley, Nepal. *PLoS ONE* **2021**, *16*, e0245856. [CrossRef]
23. Machaalani, M.; Seifeddine, H.; Ali, A.; Bitar, H.; Briman, O.; Chahine, M.N. Knowledge, Attitude, and Practice Toward Hypertension Among Hypertensive Patients Residing in Lebanon. *Vasc. Health Risk Manag.* **2022**, *18*, 541–553. [CrossRef] [PubMed]

24. Pengpid, S.; Peltzer, K. Prevalence, awareness, treatment and control of hypertension among adults in Kenya: Cross-sectional national population-based survey. *East. Mediterr. Health J.* **2020**, *26*, 923–932. [CrossRef]
25. Legese, N.; Tadiwos, Y. Epidemiology of Hypertension in Ethiopia: A Systematic Review. *Integr. Blood Presure Control* **2020**, *13*, 135–143. [CrossRef]
26. Wake, A.D.; Bekele, D.M.; Tuji, T.S. Knowledge and Attitude of Self-Monitoring of Blood Pressure among Adult Hypertensive Patients on Follow-Up at Selected Public Hospitals in Arsi Zone, Oromia Regional State, Ethiopia: A Cross-Sectional Study. *Integr. Blood Presure Control* **2020**, *13*, 1–13. [CrossRef]
27. Azage, M.; Abeje, G.; Mekonnen, A. Assessment of Factors Associated with Breast Self-Examination among Health Extension Workers in West Gojjam Zone, Northwest Ethiopia. *Int. J. Breast Cancer* **2013**, *2013*, 814395. [CrossRef] [PubMed]

diseases

Article

The Promotion of Non-Communicable Disease Screening in Gurage Zone, Ethiopia: A Mixed-Method Study

Heldana Debebe [1,†], Bezawit Ketema [1,2,3,*,†], Sophie Sarah Rossner [1,2], Sarah Negash [1,2], Adamu Addissie [1,3], Mirgissa Kaba [1,3], Mulugeta Tamire [3,‡] and Eva Johanna Kantelhardt [1,2,‡]

[1] Global Health Working Group, Martin Luther University, 06097 Halle, Germany; eva.kantelhardt@uk-halle.de (E.J.K.)
[2] Institute for Medical Epidemiology, Biostatistics and Informatics, Martin-Luther-University, 06097 Halle , Germany
[3] School of Public Health, College of Health Sciences, Addis Ababa University, 9086 Addis Ababa, Ethiopia
* Correspondence: bezawit.ketema@aau.edu.et; Tel.: +251-911822898
† These authors contributed equally to this work.
‡ These authors contributed equally to this work.

Abstract: Background: Despite the high non-communicable disease (NCD) mortality in Ethiopia, NCD screening in the country remains suboptimal. This study assessed the health communication process and materials designed to promote NCD screening among adult primary healthcare facility attendants in the Gurage Zone, Ethiopia. Methods: A parallel mixed-methods approach was employed. Seven health communication materials were evaluated using the Modified Clear Communication Index Score by the Center for Disease Control and Prevention (CDC). Seven key informants who were involved in the production were interviewed to explore the process. Users' satisfaction with the materials was assessed through a cross-sectional survey (N = 412). We used multivariable logistic regression with SPSS version 27 software to determine the factors associated with users' satisfaction. Thematic analysis was applied for the qualitative data analysis using Open-code 4.03 software. Results: Qualitative interviews indicated that the production process relied on evidence, involved stakeholders, and included pretesting. The CDC index score revealed that five of the seven materials were considered clear and user-friendly, whereas two required improvement. Overall users' satisfaction with the material was high with a mean score of 22.10 (SD ± 2.34; min: 14, max: 25). Age and educational status had significant positive association with users' satisfaction. Conclusions: Developing health communication materials on promoting NCD screening based on evidence, stakeholders' input, and pretesting can lead to good quality material and user satisfaction. We recommend future research works to measure changes in NCD screening service uptake as a result of using the health communication materials considered in this study.

Keywords: health communication; screening; satisfaction; non-communicable disease; behavioral change; primary healthcare facility

Citation: Debebe, H.; Ketema, B.; Rossner, S.S.; Negash, S.; Addissie, A.; Kaba, M.; Tamire, M.; Kantelhardt, E.J. The Promotion of Non-Communicable Disease Screening in Gurage Zone, Ethiopia: A Mixed-Method Study. *Diseases* **2024**, *12*, 294. https://doi.org/10.3390/diseases12110294

Academic Editor: Maurizio Battino

Received: 25 October 2024
Revised: 11 November 2024
Accepted: 15 November 2024
Published: 17 November 2024

1. Introduction

Globally, non-communicable diseases (NCDs) are the primary causes of death [1]. Of all global NCD deaths, 77% are in low- and middle-income countries [2]. The main types of NCDs are cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes [2]. In Ethiopia, every hour, an estimated 25 Ethiopians are dying of NCDs, with an estimated rate of 554 (95% UI: 502–605) per 100k population [3]. In Ethiopia, disability-adjusted life years (DALYs) due to NCDs have increased from 20% in 1990 to 69% in 2015 [4]. However, though the shift in NCD burden has been the most rapid, Ethiopia is among the countries least prepared for this transition [5]; NCD screening service uptake in the country is still very low [6–8], and NCD communication, in particular, and health communication, in general, did not receive as much priority as other health-related activities in the country [9].

International entities such as the World Health Organization (WHO) and the United Nations (UN) have identified the prevention and control of NCDs as an increasingly important discussion item on the global health agenda [10,11]. In congruence with global commitments, the Ethiopian national guideline on major NCDs aims to reduce their increasing burden in Ethiopia through primary (vaccinations), secondary (screening), and tertiary (diagnosis, treatment, and care) levels of prevention [12]. In addition, the Ethiopian national strategic action plan for the prevention and control of major NCDs aimed to increase public awareness on NCDs by conducting social and behavioral change communication through print and electronic media [13]. Furthermore, the Ethiopian National Health Promotion and Communication Strategy Framework emphasized that without increased public awareness and behavior change, health improvements in the country would not be achievable [14].

Thus, efforts towards NCD prevention and control in Ethiopia have encompassed the development of health communication materials to promote NCD screening [15–17]. The NCD working group at the School of Public Health, Addis Ababa University, exemplifies this approach of promoting NCD screening, creating seven different materials encompassing an audiovisual presentation and six printed pieces (leaflets, posters, and a billboard). The main message of these materials was about NCD screening. The targeted NCD screening services in this study were clinical breast examination, cervical cancer screening, blood pressure measurement, and blood glucose measurement. The audiovisual component features healthcare professionals encouraging regular screening, along with testimonials from survivors emphasizing the benefits of early detection. Posters stress the ease of NCD screening, the often asymptomatic nature of these diseases, and the importance of a healthy lifestyle. Leaflets give definitions of NCDs, their risk factors, potential complications, and preventative measures. The billboard visually shows the targeted NCD screening procedures (Materials S1).

However, most behavioral change communication processes and materials developed to communicate health issues in Ethiopia are not evaluated or not to satisfactory quality [18,19]. Thus, this study assessed the production process, materials' quality, and the user satisfaction of the NCD screening communication materials developed by the School of Public Health, Addis Ababa University, for adult primary healthcare facility (PHF) attendees in Gurage Zone, Ethiopia. Thus, policymakers in Ethiopia and similar settings can learn from the process and adopt the materials for promoting NCD screening for the prevention and control of NCDs.

2. Materials and Methods

2.1. Study Design, Area, and Period

A facility-based parallel mixed-method approach was used in this study. A qualitative descriptive program evaluation study approach was applied to explore the material production process. To measure the level of satisfaction with the audiovisual material among PHF attendants, a facility-based cross-sectional study design was used. This study took place at two PHFs in Gurage Zone, Ethiopia. These are the sites where the health communication materials developed by the NCD working group at Addis Ababa University's School of Public Health were disseminated. Gurage Zone is located in the regional state of Central Ethiopia, which is the third most populous region in the country with an estimated population of 9.3 million in 2024 [20]. This study's data were collected from 1 to 30 January 2022.

2.2. Sample Size and Sampling Procedures

For the quantitative data, a sample size was determined using a single population proportion formula. With the assumption that there are no prior national or local data used in a similar setting on satisfaction with the health communication materials among adult PHF attendants, a sample proportion of 50% was used to maximize the sample size. Considering a 95% confidence interval, a 5% margin of error, and a 10% anticipated non-response rate, the sample size (N) was calculated at 422.

Participants were selected using the systematic random sampling method among adults attending the two PHFs where the health communication materials considered in this study were disseminated. At those PHFs, the audiovisual was being played at the waiting areas, posters were posted outside the service room walls, billboard was placed inside the facilities at the entrance next to the internal navigation sign, and leaflets were being given by the healthcare professionals for all attendants in all service rooms. Ten days before the actual data collection, clients' flow rate to each of the facilities was calculated, and no difference in the flow rate for the next one month of data collection was assumed. The flow rate was 60 adults per facility per day. The sample size from each facility/date of data collection (211/30 = 7) was the sample size from each facility per day. The sample size interval was computed as (60/7 = 8). Therefore, the other eight adults visiting each of those PHFs were approached and interviewed.

For the qualitative data, seven key informants who participated in the production, evaluation, or dissemination of materials were selected using the critical-case purposive sampling method. Participant recruitment was stopped at the saturation level. Moreover, all seven health communication materials on NCD screening produced by the NCD working group at the School of Public Health, Addis Ababa University, were evaluated in this study.

2.3. Measurements and Data Collection

Quantitative data were collected at the exit gate of those selected PHFs once respondents finished their stay at the facility. An interviewer-administered questionnaire, adapted from a satisfaction assessment literature, was used to collect the quantitative data [21]. A structured questionnaire was developed in the English language, translated into the local language (Amharic), and then translated back into English by language experts. The first draft questionnaire was pilot-tested and appropriate modifications were made.

The final version of the questionnaire was structured into three sections: socio-demographic characteristics; exposure to the materials; and satisfaction with the audio-visual materials. Satisfaction was measured with five items on a five-point Likert scale, with responses ranging from 'very dissatisfied' (1) to 'very satisfied' (5), with a minimum possible score of '5' and a maximum possible score of '25'. Satisfaction items assessed the overall presentation/appearance, attractiveness, understandability, and appropriateness of the material in terms of culture, as well as its ability to offer new information (Table S1). Each of the satisfaction item scores were summed up and the mean satisfaction score was calculated. The mean value was used to dichotomize the satisfaction variable. Respondents who scored above the mean were considered satisfied with the material.

The qualitative data were collected using a semi-structured key informant interview guide to explore the production process of the health communication materials. Most of the qualitative interviews took place at the respondent's office. Each interview took 30 min on average. The quality of the materials was evaluated using the modified CDC clear communication index score [22]. The modified index has a total of 13 items under 4 sections. The number of items scored depends on the type of material. The four sections are core, behavioral recommendations, numbers, and risk. The 'core' includes the main message, call to action, and language (Table S2). A four-day intensive training on quantitative and qualitative data collection was given for the data collectors prior to the actual data collection.

2.4. Data Processing and Analysis

The quantitative data were checked for completeness, coded, and entered into SPSS version 27 for analysis. Descriptive statistics were used to describe the frequency distribution, proportion, measures of central tendency, and dispersion. The association between single explanatory variables and dependent variables was examined through bivariable analysis by computing the odds ratio at a 95% confidence level. A multivariable logistic regression model was used to determine factors associated with the satisfaction and to control confounding variables. Crude and adjusted odds ratios with 95% confidence intervals were calculated. Six variables were included in multi-variable logistic regression analysis based

on p-values less than 0.25 in bivariate analysis [23], the consideration of multi-collinearity, clinical significance, and the maximum number of variables that is sufficient to enter the model. For all statistical significance tests, independent and dependent variables were declared at $p < 0.05$.

Thematic analysis was used to understand the qualitative data and is presented with quotations. According to the CDC clear communication index score, the overall score is out of 100%. A material with a score of 90 or higher is considered good, easily understandable, and usable by the audience. A material with a score of 89 or lower is considered for improvement [22].

3. Results

3.1. Health Communication Material Production Process

3.1.1. Characteristics of Key Informant Interview Participants

Seven purposely selected individuals gave a key informant interview in this study. These individuals took different roles in the production process of the health communication materials considered in this study. Key informants were aged 29 to 52 years, two of the seven participants were females, and they had a range of professions (e.g., one clinician, one musician, two producers, one graphic designer, one photographer, and one health communication expert) (Table 1).

Table 1. Characteristics of key informant interview participants.

KII Participant	Age and Sex	Profession	Role in Material Production
01	38-year-old female	Internist and clinical oncologist	Content revision and edition
02	40-year-old male	Musician	Sound development
03	34-year-old male	Health professional, head of Woreda Health Office	Material review
04	52-year-old male	Producer	Audiovisual content development and production
05	45-year-old male	Producer	Print material content development
06	29-year-old female	Graphic designer	Graphic design and photography
07	40-year-old male	Health communication expert	Leader, content edition

3.1.2. Bases for Developing the Materials: Evidence-Driven?

This study's participants articulated that producing the health communication materials considered in this study was set to be a valuable response to the results of an earlier baseline study, which showed different factors associated with the low NCD screening practice among the target audience.

> *. . .Before the start of the material development, there was a baseline study, and the result of the baseline study was presented to us. The study indicated different wrongly held beliefs for the low NCD screening behavior in the study area. The health communication materials we developed was aimed towards changing those beliefs. . .* (KII 07)

> *. . .According to the baseline study findings, most of our audiences believe that they are healthy, and that is why they fail to get screened. . . thus, through our materials we indicated that NCDs are asymptomatic at their early stage. . .* (KII 01)

Key informants also emphasized the usage of an evidence-based media mix to increase the reach.

> *. . .When the baseline study finding was presented to us, we came to know that some of our target audiences can't read and write, then we decided to develop an audiovisual in*

addition to printed materials… For those who can't read the printed materials, they can watch the video… (KII 03)

Key informants indicated that, in addition to the baseline study, they drew upon various guidelines and manuals during the development of these health communication materials.

…When we developed these materials, we used the CDC guidelines, the USAID video-shooting guide, and the Ethiopian national health promotion and communication strategy… (KII 05)

3.1.3. Strategies Used in Developing the Materials

Developers of these communication materials used different strategies to command attention, to clarify the message, to convey benefit, and to build trust among target audiences. The use of local language, including sign language translation in the audiovisual field, the linking of art and science, media mixing, the involvement of community representatives, and stakeholder engagement were some of the strategies mentioned by the key informants.

…Our photographer first went to the field and took some photos that could reflect the target population. Then, individual actors in these materials designed following a dress code, age group and sex that best fits to the culture and topic… (KII 06)

…We developed and produced a new music track for this purpose, and we used it as a background in audiovisual… that is to attract attention… (KII 02)

3.1.4. Pretesting and Evaluation of the Materials

The key informants reflected that the materials underwent evaluations at different phases of the production process. The evaluations were concept-tested before the first draft, the stakeholders' review after first draft, and field testing after the final draft. The evaluations resulted in the changing of wordings, slogans, colors, and signs.

…Before we started the actual production, we first presented the storyline to the team and we revised it according to the feedback, then we developed our first draft… the draft materials were revised many times upon feedback from different stakeholders including community representatives; our final evaluation was made before we duplicated the materials, where we did the pretest in the community that resembled our target audience… (KII 05)

…In a similar vein, a key informant who developed the music lyrics stated that, because of comments from various stakeholders, some parts of the music lyrics had been completely cut down and replaced with other words. Not only was that, but the addition of a female vocalist required to balance male and female participation and create a more engaging environment for both sexes… (KII 02)

The key informants emphasized several challenges that were faced during the production of the material. Finding real patients willing to participate in the video recording was the main difficulty. The team also encountered challenges in script development, with the aim of expressing cultural touches and using appropriate language for all four NCDs in common.

…It was difficult to make the storyline based on all the four target NCDs in a single material. However, after having repeated discussion with the team, we managed to address all of the targeted NCDs by presenting them one by one in the audiovisual, by producing two different leaflets according to the disease type, and by focusing on the common features on the rest of the materials… (KII 05)

Moreover, the creative team leader acknowledged encountering various challenges related to COVID-19 restrictions, though they highlighted that those obstacles were successfully managed through dedicated efforts.

3.2. Quality of the Health Communication Materials: CDC Clear Communication Index Scores

The main message of the disseminated materials was about NCD screening. The majority of materials explained NCD risk factors and the benefits of adopting other NCD preventive behaviors.

In all the materials, the main messages and calls to action were presented in the active voice using audience-friendly language. On the two leaflets, the main message was written at the end or on the back of the material. On all other materials, the main message was written at the top, the beginning, or at front section. Calls to action, such as getting screened and reducing NCD risk factors, were consistently covered within the materials. Moreover, visuals and images reinforced the recommended behaviors. To enhance readability, some printed materials employed bulleted lists to break up the text. In addition, decimals, fractions, and percentages were avoided for clarity.

The CDC clear communication index score results revealed that five of the seven materials scored above 90%. This indicates they are good materials and have addressed most of the items that make materials easier to understand and use. However, the two leaflets scored below 89%, suggesting they have areas for improvement (Table 2).

Table 2. Quality health communication materials: CDC clear communication index score.

Materials	Core (Main Message, Call to Action, Language)	Behavioural Recommendations	Numbers	Risk	Total Score
Leaflet 1	4/6	2/2	2/2	2/2	83.3
Leaflet 2	4/6	2/2	NA	2/2	80.0
Billboard	6/6	1/1	NA	NA	100.0
Poster 1	6/6	1/1	NA	NA	100.0
Poster 2	6/6	1/1	NA	NA	100.0
Poster 3	6/6	1/1	NA	NA	100.0
Audiovisual	6/6	2/2	NA	2/2	100.0

3.3. Users' Exposure and Satisfaction with the Health Communication Materials

3.3.1. Socio-Demographic Characteristics of Survey Participants

Complete responses for the quantitative survey were obtained from 412 participants, with a 97.6% response rate. Most of the participants (176; 42.7%) were in the age range of 30–39 years, and a few (27; 6.6%) were between 60 and 69 years. More than half (238; 57.8%) of participants were females. Most of the participants (340; 82.8%) were married. The majority of the respondents (190; 46.1%) could not read or write. With regard to the respondents' occupations, most of them (141; 34.2%) were farmers (Table 3).

3.3.2. Exposure to the Health Communication Materials

After the completion of the visits to those facilities, exposure to the health communication materials differs among the 412 participants in this study. The majority (406; 98.5%) saw the audiovisual presentation during their visit to the PHFs. However, exposure to printed materials was lower; only 26 (6.3%) saw at least one of the two leaflets, while 147 (35.7%) saw the billboard, and 120 (29.1%) saw at least one of the three posters (Figure 1).

Table 3. Socio-demographic characteristics.

Variables	Response	Frequency (N = 412)	Percentage (%)
Age in years	30–39	176	42.7
	40–49	147	35.7
	50–59	62	15
	60–69	27	6.6
Sex	Male	174	42.2
	Female	238	57.8
Religion	Orthodox	237	57.5
	Muslim	125	30.3
	Other *	50	12.1
Marital status	Single	41	10.0
	Married	340	82.8
	Divorced	10	2.4
	Widowed	21	5.1
Educational status	Cannot read and write	190	46.1
	Can read and write without primary school	24	5.8
	Primary school	80	19.4
	Secondary school	51	12.4
	Technical	11	2.7
	University/higher education	56	13.6
Occupation	Farmer	141	34.2
	Merchant	89	21.6
	Private employee	35	8.5
	Government employee	58	14.1
	Other **	89	21.6

* (Protestant, Catholic, or Adventist); ** (housewife, pensioner, or daily laborer).

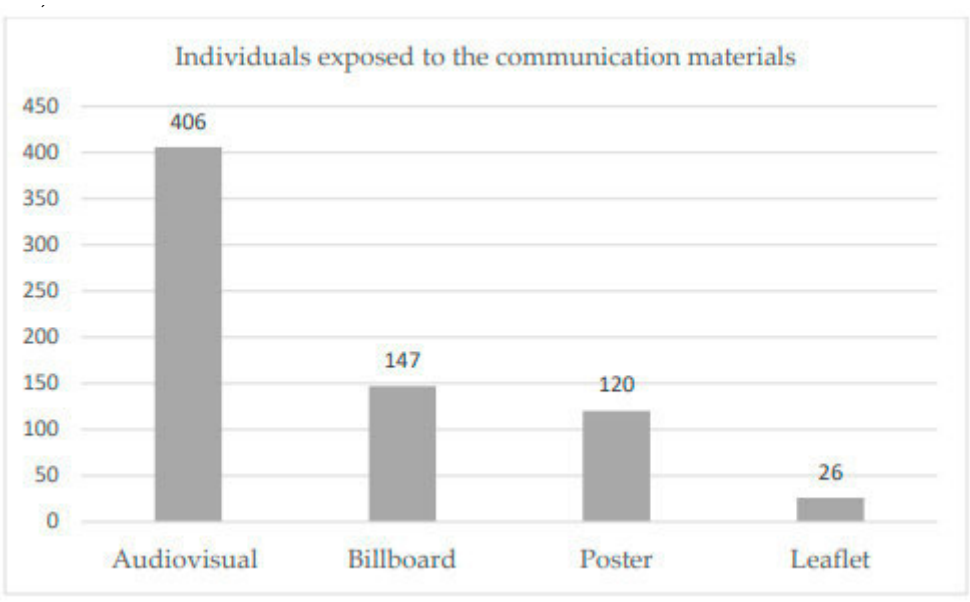

Figure 1. Number of individuals who were exposed to the health communication materials (N = 412).

3.3.3. Satisfaction with the Audiovisual

Satisfaction with the audiovisual was assessed among the 406 participants who had seen it. Participants found the presentation, attention-grabbing aspects, and ease of understanding to be the most satisfactory aspects, with mean scores of 4.50 (SD ± 0.54; min: 2, max: 5), 4.48 (SD ± 0.60; min: 2, max: 5), and 4.41 (SD ± 0.68; min: 1, max: 5), respectively. Scores for cultural appropriateness and providing new information were slightly lower at

4.37 (SD ± 0.69; min: 2, max: 5) and 4.33 (SD ± 0.76; min: 2, max: 5), respectively. Each satisfaction item score was summed up and gave observed values ranging from 14 to 25, and mean satisfaction score was computed as 22.10 (SD ± 2.34) (Table 4).

Table 4. Level of satisfaction towards the audiovisual material (N = 406).

Satisfaction category	Minimum	Maximum	Mean	Standard Deviation
Presentation of the audiovisual	2	5	4.50	0.539
Attracting attention	2	5	4.48	0.595
Easiness to understand	1	5	4.41	0.679
Appropriateness of the audiovisual in terms of culture	2	5	4.37	0.690
Giving new/different information	2	5	4.33	0.761
Overall satisfaction towards the audiovisual material	14.00	25.00	22.10	2.340

3.3.4. Factors Associated with Satisfaction with the Audiovisual

From the multivariable logistic regression analysis, respondents' age and educational status were significantly associated with satisfaction with the audiovisual material. The association showed that respondents aged 40–49 years were twice as likely to be satisfied with the audiovisual than respondents aged 30–39 years (AOR: 2.20, 95% CI: 1.33–3.63). Respondents who went through university/higher education were 4.4 times (AOR: 4.42, 95% CI: 1.36–14.40) more likely to be satisfied with the audiovisual material than those who cannot read and write (Table 5).

Table 5. Factors associated with satisfaction with the audiovisual.

Variables	Response	Satisfaction		COR(CI)	*p*-Value	AOR(CI)	*p*-Value
		Yes	No				
Age in years	30–39 (ref)	70	104	1		1	
	40–49	76	67	1.69 (1.09–2.64)	0.022	2.199 (1.33–3.63)	0.002 *
	50–59	27	35	1.15 (0.64–2.06)	0.648	1.49 (0.77–2.87)	0.237
	60–69	11	16	1.02 (0.45–2.33)	0.960	1.10 (0.42–2.90)	0.853
Sex	Male (ref)	73	99	1		1	
	Female	111	123	1.22 (0.82–1.82)	0.318	1.447 (0.89–2.37)	0.141
Religion	Orthodox (ref)	101	134	1		1	
	Muslim	53	69	1.02 (0.66–1.59)	0.933	1.131 (0.71–1.81)	0.609
	Other &	30	19	2.10 (1.12–3.93)	0.021	1.916 (0.98–3.74)	0.056
Marital status	Single (ref)	21	18	1		1	
	Married	147	189	0.667 (0.34–1.30)	0.232	0.668 (0.31–1.46)	0.311
	Divorced	6	4	1.286 (0.31–5.28)	0.727	1.167 (0.26–5.32)	0.842
	Widowed	10	11	0.779 (0.27–2.26)	0.646	0.769 (0.22–2.67)	0.679
Educational status	Cannot read and write (ref)	79	111	1		1	
	Can read and write	10	13	1.081 (0.45–1.59)	0.862	1.082 (0.43–2.74)	0.867
	Primary school	30	49	0.860 (0.50–1.74)	0.584	0.990 (0.54–1.80)	0.975
	Secondary school	25	26	1.351 (0.73–2.51)	0.342	1.802 (0.81–4.00)	0.148
	Technical	5	5	1.401 (0.39–5.02)	0.600	2.178 (0.452–10.52)	0.333
	University/higher education	35	18	2.732 (1.44–5.17)	0.002	4.424 (1.36–14.40)	0.014 *
Occupation	Farmer (ref)	57	84	1		1	
	Merchant	33	55	0.884 (0.51–1.53)	0.659	0.682 (0.37–1.26)	0.225
	Private employee	16	19	1.241 (0.59–2.62)	0.570	0.591 (0.21–1.65)	0.316
	Government employee	32	21	2.246 (1.18–4.28)	0.014	0.674 (0.21–2.22)	0.516
	Other ¶	46	43	1.576 (0.92–2.69)	0.095	1.273 (0.68–2.40)	0.454

& (Protestant, Catholic, or Adventist), ¶ (daily laborer or housewife), * (*p*-value < 0.05), COR (crude odds ratio), AOR (adjusted odds ratio), CI (95% confidence interval).

4. Discussion

This study evaluated the health communication process, materials disseminated, and users' satisfaction on the health communication materials developed by the School of Public

Health, Addis Ababa University, for increasing NCD screening service uptake among PHF attendants in Gurage Zone, Ethiopia.

After visiting the facilities where the study communication materials were distributed, participants showed varying levels of exposure to the materials. The vast majority (98.5%) saw the audiovisual presentation during their visit to the PHFs, while exposure to printed materials was considerably lower. This could suggest that the audiovisual material had the highest reach within the healthcare facilities. In line with this finding, a similar study conducted in Bangladesh, assessing the role of print materials and electronic media to improve cervical cancer screening, revealed that television was the best method of awareness creation [24]. This may be due to the fact that printed materials primarily reach literate individuals and exclude those with visual impairments, whereas the audiovisual format, displayed on a television screen, can effectively engage both literate and non-literate audiences. Moreover, individuals with visual impairments can benefit from the audio component, making the information more accessible. Evidences also indicated that most audiences preferred audiovisuals than print materials [25–27]. By the time they finished their visit to those PHFs, only 29% of the study participants reported seeing the posters targeted in this study. Similarly, following the poster campaign where four hundred posters for smoking prevention were placed in the streets of Geneva, only 36% of respondents reported seeing posters about smoking prevention [28]. This may indicate the possible lower reach of printed materials, especially posters, compared to audiovisuals.

In this study, the high mean scores across all audiovisual material satisfaction items (22.10 (SD $\pm$ 2.34; min: 14, max: 25)) suggest that target audiences are generally satisfied with the audiovisual material. As per a study conducted in Addis Ababa, Ethiopia, the received service has to meet or exceed the patients' expectations for the patients to be satisfied [29]. Thus, our study findings could imply that audiovisual material has met or exceeded target audiences' expectations.

The multivariable logistic regression report of this study showed that participants' age and educational status have a positive association with satisfaction with the audiovisual material. Respondents who went through university/higher education were 4.4 times (AOR: 4.42, 95% CI: 1.36–14.40) more likely to be satisfied with audiovisual material than those who cannot read and write. A positive association between educational status and satisfaction was observed in studies measuring satisfaction with other healthcare services as well [30,31]. This may be due to the comparably greater extent of attention and understanding of respondents who went through university/higher education. Respondents who went through university/higher education are typically more knowledgeable about their medical condition and treatment options, making them more likely to have a better understanding of the care they received and thus be more satisfied with it. Moreover, respondents in the age range of 40–49 years were 2.2 times more likely to be satisfied with the audiovisual material than those who are in the age range of 30–39 years. This could be due to the fact that older people are more likely to pay more attention to NCDs than younger people. In other similar studies, a variety of socio-demographic characteristics, including educational status and age, were identified as factors influencing patient satisfaction, as these characteristics can provide insight into a patient's expectations and experiences [21,32,33]. Another possible explanation for statistically significant satisfaction with the audiovisual material among those aged 40-49 years was that, in this study, compared to older age ranges, respondents in the age range of 40-49 years were mostly those who went through university/higher education, and acquiring higher education has showed to be significantly positively associated with the satisfaction.

In this study, the CDC clear communication index score result showed that, from the total of seven materials, on five of them, the main messages were written at the top, beginning, or on the front section of the materials. However, on the two leaflets, the main message was written at the end or at the back of the material. As per the CDC standard, when the main messages are written at the top or in first section of the material, audiences can find them more easily and quickly, and vice versa [22]. However, according

to other similar studies conducted in Ethiopia, most of the evaluated health communication materials on cholera [18] and maternal and child health [19] were largely of poor quality and needed improvement due to a lack of pretesting, the requirement of assessments, and community involvement. However, in this study, the placement of the key message was the reason for low quality not the lack of assessment, pretesting, or community engagement.

As evidenced by the key informants of this study, there was a baseline assessment conducted prior to the material production to identify factors associated with NCD screening behavior, to characterize the target audience, and to understand the setting. Furthermore, this intervention package encompasses both printed and audiovisual channels to promote NCD screening among the target audience. Such evidence-driven health communication material production and media mixing have been recommended to ensure the take-up of the desired behavior in other literature studies as well [34–36]. Thus, policymakers in Ethiopia and similar settings can learn from the process and adopt the materials for promoting NCD screening in the prevention and control of NCDs.

Limitations of the Study

As this study is a facility-based cross-sectional study, its findings might not be representative of the general population. Furthermore, this study was unable to assess whether those who reported being satisfied actually used the screening service. In addition, as respondents were exposed to the different communication materials in different ways, we only assessed satisfaction with the audio-visual material, which might not show satisfaction with printed materials.

5. Conclusions

This study assessed the health communication process and materials designed to promote NCD screening among adults who attended a primary healthcare facility in Gurage Zone, Ethiopia. The material production process was based on evidence, stakeholders' input, and pretesting. Most of the materials were considered clear and user-friendly. There was higher end-user satisfaction with the materials considered in this study. Developing health communication materials based on evidence, stakeholders' input, and pretesting can lead to good quality material and higher end-user satisfaction. Thus, we recommend future research works to measure the effectiveness of these health communication materials in increasing NCD screening service uptake.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/diseases12110294/s1, Materials S1: Health communication materials developed to promote NCD screening in Ethiopia (https://doi.org/10.5281/zenodo.12765170); Table S1: Questionnaire for satisfaction assessment towards the health communication materials on promoting NCD screening among primary health facility attendants; Table S2: Modified clear communication index score sheet.

Author Contributions: Conceptualization, H.D. and B.K.; methodology, M.T. and M.K.; software, S.S.R. and S.N.; validation, A.A. and E.J.K.; formal analysis, H.D. and B.K.; investigation, M.T. and S.N.; resources, E.J.K. and A.A.; data curation, S.N.; writing—original draft preparation, H.D., B.K. and S.S.R.; writing—review and editing, S.N., A.A., M.K. and E.J.K.; visualization, E.J.K., M.K. and M.T.; supervision, A.A., E.J.K., M.T. and M.K.; project administration, S.N.; funding acquisition, E.J.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Hospital Partnership through Deutsche Gesellschaft für Internationale Zusammenarbeit funded by the Ministry for Economic Cooperation and Development (ID 81281915). The project on which this publication is based was in part funded by the German Federal Ministry of Education and Research (01KA2220B). This study was also supported by Else Kroener-Fresenius-Foundation (Grant No. 2018_HA31SP). Wellcome Trust, UK Foreign, Commonwealth & Development Office part of EDCTP2 supported by Eueopean Union Del-22008. We acknowledge the financial support of the Open Access Publication Fund of the Martin-Luther-University Halle-Wittenberg. The role of the funders in this study was to provide the required budget for the study.

Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of the School of Public Health, College of Health Sciences, Addis Ababa University (protocol code: SPH/1119/1; date of approval: 8 October 2021).

Informed Consent Statement: Written informed consent was obtained from the key informant interview participants to publish this paper.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: Our gratitude goes to the study participants for devoting their time to this study. We appreciate the health facilities involved in this study.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of the data; in the writing of the manuscript; or in the decision to publish the results.

References

1. WHO. *World Health Statistics 2023: Monitoring Health for the SDGs, Sustainable Development Goals*; WHO: Geneva, Switzerland, 2023.
2. WHO. *World Health Organization Non-Communicable Disease Fact Sheet*; WHO: Geneva, Switzerland, 2018.
3. Burden of Non-Communicable Diseases (NCD) in Ethiopia. Available online: https://ndmc.ephi.gov.et/download/burden-of-non-communicable-diseases-ncd-in-ethiopia/ (accessed on 20 October 2024).
4. Shiferaw, F.; Letebo, M.; Misganaw, A.; Feleke, Y.; Gelibo, T.; Getachew, T.; Defar, A.; Assefa, A.; Bekele, A.; Amenu, K.; et al. Non-Communicable Diseases in Ethiopia: Disease Burden, Gaps in Health Care Delivery and Strategic Directions. *Ethiop. J. Health Dev.* **2018**, *32*. Available online: https://www.ajol.info/index.php/ejhd/article/view/178817 (accessed on 18 October 2024).
5. Bollyky, T.J.; Templin, T.; Cohen, M.; Dieleman, J.L. Lower-Income Countries That Face The Most Rapid Shift In Noncommunicable Disease Burden Are Also The Least Prepared. *Health Aff. (Proj. Hope)* **2017**, *36*, 1866–1875. [CrossRef] [PubMed]
6. Ethiopia Public Health Institute. *Ethiopia Steps Report on Risk Factors for Non-Communicable Diseaes and Prevalence of Selected NCDS*; Ethiopia Public Health Institute: Addis Ababa, Ethiopia, 2016.
7. Ketema, B.; Kaba, M.; Negash, S.; Addissie, A.; Kantelhardt, E.J. Intention to Undergo Clinical Breast Examination and Its Associated Factors among Women Attending Rural Primary Healthcare Facilities in South Central Ethiopia. *Breast Care* **2023**, *18*, 464–472. [CrossRef] [PubMed]
8. Ketema, B.; Addissie, A.; Negash, S.; Kantelhardt, E.J.; Kaba, M. Does Prior Experience Matter? Intention to Undergo Cervical Cancer Screening among Rural Women in South-Central Ethiopia. *Curr. Oncol.* **2024**, *31*, 4908–4916. [CrossRef] [PubMed]
9. Tefera, Y.D.; Ali, A.C.; Woldearegay, A.G. A Study on Communication Practices in Reducing Non-Communicable Diseases in Bahir Dar City, Ethiopia. *Risk Manag. Healthc. Policy* **2024**, *17*, 827–841. [CrossRef]
10. Programme United Nations Development Programme. *Sustainable Development Goals*; Programme UND. Available online: https://www.undp.org/sustainable-development-goals (accessed on 20 October 2024).
11. WHO. *Regional Framework for Integrating Essential Non-Communicable Disease Services in Primary Healthcare*; Regional Committee for Africa. Available online: https://www.afro.who.int/health-topics/noncommunicable-diseases (accessed on 20 October 2024).
12. Federal Democratic Republic of Ethiopia, Ministry of Health. *Guidelines on Clinical and Programmatic Management of Major Non Communicable Diseases*; Federal Democratic Republic of Ethiopia, Ministry of Health: Addis Ababa, Ethiopia, 2016.
13. Federal Democratic Republic of Ethiopia, Ministry of Health. *National Strategic Action Plan for the Prevention and Control of Major Non-Communicable Diseases 2011–2017 EFY (2018–2025)*; Federal Democratic Republic of Ethiopia, Ministry of Health: Addis Ababa, Ethiopia, 2019.
14. National Health Promotion and Communication Strategy 2016–2020. Available online: https://www.medbox.org/document/national-health-promotion-and-communication-strategy-2016-2020 (accessed on 10 October 2024).
15. Abu, S.H.; Woldehanna, B.T.; Nida1, E.T.; Tilahun, A.W.; Gebremariam, M.Y.; Sisay, M.M. The role of health education on cervical cancer screening uptake at selected health centers in Addis Ababa. *PLoS ONE* **2020**, *15*, e0239580. [CrossRef]
16. Lott, B.E.; Yeo, S.; Bekele, E.; Birhanu, F.; Hussein, R.; Muktar, S.; Mengiste, T.; Asfaw, E.; Madhivanan, P.; Deressa, B.T. Breast Cancer Education and Empowerment in Ethiopia: Evaluating Community-Based Cancer Prevention Eforts Using the RE-AIM Framework. *J. Cancer Educ.* **2024**, *39*, 698–705. [CrossRef]
17. Berhanu, H.; Feyissa, G.T.; Geleta, D.; Sudhakar, M. Diabetes mellitus self-management education at Jimma University Medical Center: Evidence-based implementation project. *JBI Evid. Implement.* **2022**, *20*, 280–288. [CrossRef]
18. Adera, N.G.; Ketema, B.; Girma, E. Effectiveness and quality of risk communication process in Ethiopia: The case of risk communication during cholera outbreak in Addis Ababa, Ethiopia. *PLoS ONE* **2022**, *17*, e0265203. [CrossRef]
19. Tadesse, Y.; Ketema, B.; Girma, E. The Effect of the "first 1000 days" mass communication intervention on maternal and child feeding practices in Mekelle City, North Ethiopia. *Ethiop. J. Health Dev.* **2022**, *36*, 1–12.
20. Electronic Commerce Solutions Agency. *Population Projection 2021*; Electronic Commerce Solutions Agency: Ethiopia, 2021.

21. Ramírez, O.J.G.; Carrillo, G.M.; Cárdenas, D.C. Survey on Satisfaction with Healthcare of Patients with Chronic Disease. *Enferm. Glob.* **2016**, *15*, 331.
22. Centers for Disease Control and Prevention. *Modified CDC Clear Communication Index Score Sheet*; Centers for Disease Control and Prevention: Atlanta, GA, USA, 2014.
23. Hosmer, D.W., Jr.; Lemeshow, S.; Sturdivant, R.X. *Applied Logistic Regression*; John Wiley & Sons: Hoboken, NJ, USA, 2013; Volume 398.
24. Nessa, A.; Hussain, M.A.; Rashid, M.H.U.; Akhte, N.; Roy, J.S.; Afroz, R. Role of print and audiovisual media in cervical cancer prevention in Bangladesh. *Asian Pac. J. Cancer Prev.* **2013**, *14*, 3131–3137. [CrossRef] [PubMed]
25. Singh, N.; Ramakrishnan, S.T.; Khera, A.; Singh, G. Impact evaluation of two methods of dental health education among children of a primary school in rural India. *Med. J. Dr DY Patil Univ.* **2016**, *9*, 66–71. [CrossRef]
26. Gupta, R.; Ingle, N.A.; Kaur, N.; Ingle, E.; Charania, Z. Evaluation of the Impact of Different Health Education Methods in Undergraduate Students of Dental College, Mathura City. *J. Adv. Oral Res.* **2016**, *7*, 7–11. [CrossRef]
27. Hasanica, N.; Ramic-Catak, A.; Mujezinovic, A.; Begagic, S.; Galijasevic, K.; Oruc, M. The Effectiveness of Leaflets and Posters as a Health Education Method. *Mater. Sociomed.* **2020**, *32*, 135–139. [CrossRef]
28. Etter, J.-F.; Laszlo, E. Evaluation of a poster campaign against passive smoking for World No-Tobacco Day. *Patient Educ. Couns.* **2005**, *57*, 190–198. [CrossRef]
29. Geberu, D.M.; Biks, G.A.; Gebremedhin, T.; Mekonnen, T.H. Factors of patient satisfaction in adultoutpatient departments of private wingand regular services in public hospitals ofAddis Ababa, Ethiopia: A comparative cross-sectional study. *BMC Health Serv. Res.* **2019**, *19*, 869. [CrossRef]
30. Kefale, A.T.; Atsebah, G.H.; Mega, T.A. Clients' perception and satisfaction toward service provided by pharmacy professionals at a teaching hospital in Ethiopia. *Integr. Pharm. Res. Pract.* **2016**, *14*, 85–94.
31. Melese, T.; Gebrehiwot, Y.; Bisetegne, D.; Habte, D. Assessment of client satisfaction in labor and delivery services at a maternity referral hospital in Ethiopia. *Pan Afr. Med. J.* **2014**, *17*, 76. [CrossRef]
32. Mengesha, S.; Mengesha, T.; Beyene, T.; Waju, S.; Salgedo, B.; Tafese, F.; Fikru, J.; Jaleta, T. Patient satisfaction and associated factors with outpatient medical services in rural primary healthcare facilities, ilubabor zone, oromiya region, south west ethiopia. *Int. J. Curr. Res.* **2015**, *7*, 20245–20251.
33. Jalil, A.; Zakar, R.; Zakar, M.Z. Satisfaction of diabetes patients in public outpatient department: Prevalance and determinants. *Rawal Med. J.* **2018**, *43*, 8–13.
34. Arkin, E.B. *Making Health Communication Program Work*; Diane Publishing: Darby, PA, USA, 1992.
35. Ministry of Health Ethiopia. *National Health Promotion Strategic Plan (2021/2–2025/6)*; Ministry of Health E: Ethiopia, 2021.
36. Durkin, S.; Broun, K.; Guerin, N.; Morley, B.; Wakefield, M. Impact of a mass media campaign on participation in the Australian bowel cancer screening program. *J. Med. Screen.* **2020**, *27*, 18–24. [CrossRef] [PubMed]

diseases

MDPI

Article

Service-Delivery Models to Increase the Uptake of Non-Communicable Disease Screening in South-Central Ethiopia: A Difference-In-Differences Analysis

Bezawit Ketema [1,2,3,*], Adamu Addissie [1,3], Sarah Negash [2,3], Mosisa Bekele [3], Andreas Wienke [2,3], Mirgissa Kaba [1,3] and Eva Johanna Kantelhardt [2,3]

[1] School of Public Health, College of Health Sciences, Addis Ababa University, 9086 Addis Ababa, Ethiopia
[2] Institute for Medical Epidemiology, Biostatistics and Informatics, Martin Luther University, 06112 Halle, Germany
[3] Global Health Working Group, Martin Luther University, 06097 Halle, Germany
* Correspondence: bezawit.ketema@aau.edu.et; Tel.: +251-911822898

Abstract: Background: Screening for non-communicable diseases (NCDs) is a critical step for early detection and the prevention of consequent morbidity and mortality. To facilitate NCD screening, the Ethiopian Ministry of Health has developed screening guidelines. However, like other low- and middle-income countries, interventions to increase the uptake of NCD-screening services in Ethiopia remain ineffective. Thus, this study aimed to determine the effectiveness of service delivery models to increase NCD-screening service uptake in south-central Ethiopia. Method: A health-facility-based quasi-experimental study design was employed to determine the effectiveness of providing a multiple-NCD-screening service in addition to social- and behavioral-change communication (SBCC) intervention to increase the uptake of NCD-screening services. The interviewer-administered structured questionnaire was adapted from previously published research and used to collect data during the baseline and end-line survey periods. A difference-in-differences analysis was used to determine the effectiveness of the intervention. Results: Compared with routine care, the availability of a multiple-NCD-screening service, together with SBCC intervention, was found to significantly increase the uptake of cervical cancer screening, clinical breast examination, blood pressure measurement, and blood glucose-measurement services, by 18, 9, 44 and 23 percent points, respectively. However, the availability of a multiple-NCD-screening service without SBCC intervention increased clinical breast-examination service uptake by 9% point and blood glucose-measurement service uptake by 18% point without increasing the uptake of cervical cancer-screening or blood pressure-measurement services. Conclusion: The integration of multiple-NCD-screening services accompanied by SBCC intervention that promotes them is an important approach for improving the uptake of NCD-screening services.

Keywords: non-communicable disease; difference-in-differences; social- and behavioral-change communication; screening; effectiveness

Citation: Ketema, B.; Addissie, A.; Negash, S.; Bekele, M.; Wienke, A.; Kaba, M.; Kantelhardt, E.J. Service-Delivery Models to Increase the Uptake of Non-Communicable Disease Screening in South-Central Ethiopia: A Difference-In-Differences Analysis. *Diseases* **2024**, *12*, 278. https://doi.org/10.3390/diseases12110278

Academic Editor: Christos Lionis

Received: 27 August 2024
Revised: 14 October 2024
Accepted: 28 October 2024
Published: 5 November 2024

1. Introduction

Non-communicable diseases (NCDs) kill 41 million people each year, which is equivalent to 74% of all deaths globally [1]. Every 2 s, someone aged 30 to 69 dies prematurely from an NCD [2]. The main types of NCDs are cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes. These diseases disproportionately affect people in low- and middle-income countries, where more than three quarters of global NCD deaths occur [3]. In Ethiopia, NCDs accounted for 42% of the total deaths in the country in 2022 [4].

The aim of Sustainable Development Goal Target 3.4 is to reduce premature mortality from NCDs by one third by 2030 [5]. In 2017, the 70th World Health Assembly endorsed an updated list of interventions for NCD prevention and control, which included screening as

a key strategy [6]. Likewise, the Ethiopian national guidelines on NCDs aim to limit the rising burden of NCDs through a three-tiered prevention strategy: primary prevention via vaccinations; secondary prevention through screening; and tertiary prevention through diagnosis, treatment, and care [7].

However, evidence indicates that NCD-screening service uptake is lower in low- and middle-income countries [8], including in Ethiopia [9–12], compared with high-income nations [13]. A national survey conducted in Ethiopia in 2015 revealed that only 3%, 23.4%, and 2.65% of the eligible population had ever undergone blood glucose measurement, blood pressure measurement, and cervical cancer screening, respectively [14].

Various factors contributed to the low NCD-screening service uptake in Ethiopia. One qualitative study found that a lack of awareness, poor health-seeking behaviors, profound social consequences and exclusion, and limited access to services were reasons behind the poor uptake of cervical cancer screening [15]. Similar reasons have been identified as barriers to the early diagnosis of breast cancer [16].

Moreover, there is evidence that NCDs commonly show comorbidity. A population-based prospective cohort study found that genetically instrumented type 2 diabetes mellitus was associated with an increased risk of hypertension (AOR = 1.07; 95% CI: 1.04–1.10) [17]. This study recommends regular blood pressure measurement, together with blood glucose measurement. A systematic review and meta-analysis revealed a statistically significant association between hypertension and increased risk of breast cancer (RR = 1.15; 95% CI: 1.08–1.22) [18]. Another systematic review indicated that diabetes was related to poorer overall survival (HR = 1.59, 95% CI: 1.35–1.87) and poorer recurrence-free survival (HR = 1.98, 95% CI: 1.47–2.66) in cervical cancer patients [19]. Given the interrelated nature of these NCDs, a multiple-screening approach, in which individuals are screened simultaneously for multiple NCDs, is recommended in a variety of settings [20,21].

However, studies on multiple-NCD screening in Ethiopia are limited. Thus, this study aimed to determine the effectiveness of service delivery models of multiple-NCD screening to increase the uptake of NCD-screening services in south-central Ethiopia using a difference-in-differences (DiD) analysis. Findings from this study could inform policy makers and enable program planners to develop optimal strategies to increase the uptake of NCD-screening services in Ethiopia and similar settings.

2. Materials and Methods

2.1. Study Design and Study Area

A health-facility-based quasi-experimental study design was employed to determine the effectiveness of service delivery models to increase NCD-screening service uptake. This study was conducted at primary healthcare facilities (PHFs) in the southwest Shewa zone of the Oromia region, and in the Hadiya and Gurage zones of the Central Ethiopia region. Ethiopia is a federation that is subdivided in to ethno-linguistically based regional states and chartered cities. There are 12 regional states and 2 chartered cities in Ethiopia. According to the Ethiopian Central Statistical Agency Population Projection of 2024, Oromia and Central Ethiopia are the first and third most populous regions in the country [22]. Each region in Ethiopia is subdivided into zones, which are the next smallest administrative structures.

2.2. Study Process and Study Period

This study was conducted in two phases: baseline and endline phases. The current uptake of NCD-screening services (cervical cancer screening, clinical breast examination, blood pressure measurement, and blood glucose measurement) was measured during the baseline- and endline-survey times. The baseline survey was administered before the commencement of this study intervention, between 10 October and 10 November 2020. The endline survey took place from 20 December 2021, to 20 January 2022, after the intervention was introduced within the intervention facilities.

There were three arms in this study; the component-intervention arm, the single-intervention arm, and the control arm. Each healthcare facility included in this study was allocated to one of the three arms. Healthcare facilities allocated to the component-intervention arm engaged with two intervention components: a multiple-NCD-screening service, in addition to social–behavioral change communication (SBCC) promoting the NCD screening. Healthcare facilities allocated to the single-intervention arm engaged in a single intervention: the multiple-NCD-screening service. Arm three was the control arm of the study, consisting of the routine NCD-screening service; neither the multiple-NCD screening nor the SBCC intervention of this study was delivered to the healthcare facilities in the control arm.

2.3. Descriptions of Routine Care and Intervention Care

Routine care: based on the National NCD Prevention and Control Guideline of Ethiopia, PHFs are expected to provide cervical cancer screening, clinical breast examination, blood pressure measurement, and blood glucose measurement within the available screening services. In addition, PHFs are required to provide awareness-creation programs on NCDs via SBCC, mainly through mass communication [23]. As standard care at PHFs, cervical cancer screening and clinical breast examination are being offered together, in a room labeled "Cervical Cancer Screening Unit" [24]. A blood pressure (BP)-measurement service is being offered at the out-patient department, and blood glucose measurement is performed in the laboratory [7]. Cervical cancer screening, clinical breast examination, and BP measurement are provided free of charge, but patients are required to pay USD 0.5 for the blood glucose-measurement service that is part of the routine care at PHFs [7,24].

Intervention care: for this study, a multiple-NCD-screening service is defined as providing an NCD-screening corner at the healthcare facilities at which all NCD screening assessments—for cervical cancer, clinical breast examination, BP, and blood glucose—are offered. Thus, based on their eligibility, participants could take up multiple NCD-screening services at once. All four screening services in the intervention facilities were free of charge. For this study, SBCC is defined as promoting NCD screening via different channels within the healthcare facility. The channels considered for this purpose were audiovisual and print media, which included posters, leaflets, and a billboard. The audiovisual component shows healthcare professionals encouraging regular NCD screening, along with testimonials from survivors emphasizing the benefits of early detection. Posters stress the ease of NCD screening, the often asymptomatic nature of NCDs, and the importance of a healthy lifestyle. Leaflets give definitions of NCDs, their risk factors, potential complications, and preventative measures. The billboard visually shows the NCD-screening procedures being targeted.

2.4. Population

Eligible adults who visited selected healthcare facilities in the study period formed the study population. All sampled adults who attended the selected healthcare facilities during the study period and fulfilled the inclusion criteria were included as participants in the study. The inclusion criteria were as follows: female aged 30–49 years for cervical cancer screening, female aged $\geq$ 18 years for clinical breast examination, male or female aged $\geq$ 30 years for BP measurement, and male or female $\geq$ 45 years for blood glucose measurement. The criteria was set according to the Ethiopian national NCD-screening guidelines [7]. However, individuals with any type of confirmed NCD, admitted patients, and emergency case patients were all excluded from this study.

2.5. Sample-Size Determination

The required sample size was determined independently for the four outcome variables (cervical cancer screening, clinical breast examination, BP measurement, and blood glucose measurement) using the double-population proportion formula in OpenEpi version 7 software. The following assumptions were made: a proportion of 2.65% was

considered independently for cervical cancer-screening and clinical breast-examination service uptakes. A proportion of 3% was considered independently for BP measurement and blood glucose-measurement service uptakes [14]. Proportions of 2.65% and 3% were assumed for the control arm. A difference in proportions with the component-intervention arm and the control arm was assumed to be 20%, and for the single-intervention and control arm it was assumed to be 10%; it was supposed that the intervention would increase the screening uptake by 20% point in the component-intervention arm and by 10% point in the single-intervention arm. The ratio of unexposed to exposed group was considered to be 3. A level of confidence of 95%, a 15% lost to follow-up, and a design effect of 2 were considered.

The calculated sample size for cervical cancer screening was the following: for component-intervention arm to control-arm analysis it was 69, 206 (N = 274), and for single-intervention arm to control-arm analysis it was 174, 523 (N = 697). The calculated sample size for BP measurement was the following: for component-intervention arm to control-arm analysis it was 70, 210 (N = 280), and for single-intervention arm to control-arm analysis it was 181, 543 (N = 724). Sample size for clinical breast examination was considered similar to that for cervical cancer screening, and sample size for blood glucose measurement was considered similar to that for blood pressure measurement.

2.6. Sampling Technique

Locations of the three arms of this study were selected by considering market areas, physical access, population movement, and buffer areas to protect the sharing of information between the study arms. PHFs that ensured the availability of routine cervical cancer-screening, clinical breast examination, BP-measurement, and blood glucose-measurement services during the data collection period were considered for inclusion in this study. Four PHFs were selected per study arm, yielding a total of 12 PHFs in this study. After the PHFs had been selected, individual study participants from each PHF were selected, using a systematic random-sampling technique.

2.7. Measurements and Data Collection

The study data were collected using an online data collection kit (ODK), at the exit gate of selected healthcare facilities after participants completed their stay at the facility. A structured interviewer-administered questionnaire was adapted from previous studies [25–27]. The questionnaire was developed in the English language, translated into local languages (Amharic and Afan Oromo), and then translated back into English to maintain consistency in meaning and sense, as determined by language experts. The first draft of the questionnaire was pilot-tested and appropriate modifications were made to improve clarity, question ordering, and the nature of the questions.

As an outcome variable for this study, participants were asked yes/no questions about whether they had taken up NCD-screening services during their current facility visit. The following explanatory variables were included: socio-demographic variables (age, sex, marital status, educational status, and occupation); knowledge about cervical cancer, breast cancer, hypertension, and diabetes mellitus; and previous uptake of cervical cancer screening, clinical breast-examination, BP-measurement, and blood glucose-measurement services.

Knowledge about cervical cancer was assessed by 12 items (5 items about risk factors, 4 items about signs and symptoms, and 3 items about prevention). Knowledge about breast cancer was assessed by 26 items (7 items about risk factors, 9 items about signs and symptoms, and 10 items about prevention). Knowledge about hypertension was assessed by 16 items (6 items about risk factors, 5 items about signs and symptoms, and 5 items about prevention). Knowledge about diabetes mellitus was assessed by 17 items (5 items about risk factors, 6 items about sign and symptoms, and 6 items about prevention) (Table S1). Scores from knowledge-measuring items addressing a specific NCD were summed and treated as a continuous variable. Then, the mean scores were computed to determine the overall knowledge status of the participants for each NCD. Average and above-average

scores were defined as knowledgeable about the relevant NCD, whereas below-average scores were defined as not knowledgeable. Each participant's previous uptake of screening services for the different NCDs was assessed separately, using questions requiring yes/no answers.

2.8. Data Processing and Analysis

The responses in the completed ODK were exported to STATA version 17 for analysis. Descriptive statistics were calculated for the intervention and control groups at baseline. A split DiD analysis was used to determine the effect of the intervention separately on cervical cancer-screening, clinical breast-examination, BP-measurement, and blood glucose-measurement service uptakes. We employed the DiD analysis using variables describing socio-demographic characteristics, knowledge, and previous screening service uptake as covariates using a t-statistical test. The DiD estimates in this study measured the changes in the outcome variables (uptake of cervical cancer screening, clinical breast examination, BP measurement, and blood glucose measurement), which resulted from the intervention. Unadjusted and adjusted DiD estimates were calculated to account for differences in participant characteristics between groups.

3. Results

3.1. Socio-Demographic Characteristics of Study Participants

In this study, at baseline, 681, 559, and 835 participants participated in the component-intervention arm, single-intervention arm, and control arm, respectively, which gave an adequate power of greater than 80%.

The mean (±SD) age in years of study participants was 43.4 (±11.1), 45.1 (±8.8), and 44.8 (±10), respectively, in the component-intervention arm, single-intervention arm, and control arm. Across all of the study arms, the majority of participants were females, most of whom were married. The majority of study participants in the component-intervention arm, single-intervention arm, and control arm could not read and write. Regarding occupation, the majority of participants were housewives in the component-intervention arm (364; 53%) and the control arm (516; 62%), whereas the majority of participants in the single-intervention arm (384; 69%) were farmers (Table 1).

Table 1. Socio-demographic characteristics of study participants at baseline.

Variable	Response Categories	Component-Intervention Arm	Single-Intervention Arm	Control Arm
		(n = 681)	(n = 559)	(n = 835)
Age in years	(mean ± SD)	43.4 (±11.1)	45.1 (±8.8)	44.8 (±10)
Sex	Female	558 (82%)	417 (75%)	727 (87%)
	Male	123 (18%)	142 (25%)	109 (13%)
Marital status	Married	555 (82%)	507 (91%)	534 (64%)
	Non-married	126 (19%)	52 (9%)	301 (36%)
Educational status	Secondary and above	131 (19%)	82 (15%)	85 (10%)
	Primary	125 (18%)	72 (13%)	56 (7%)
	Only read and write	129 (19%)	86 (15%)	136 (16%)
	Cannot read and write	196 (44%)	319 (57%)	558 (67%)

Table 1. *Cont.*

Variable	Response Categories	Component-Intervention Arm	Single-Intervention Arm	Control Arm
		(n = 681)	**(n = 559)**	**(n = 835)**
Occupation	Employed	157 (23%)	89(16%)	138 (17%)
	Housewife	364 (53%)	80 (14%)	516 (62%)
	Farmer	133 (20%)	384 (69%)	146 (17%)
	Unemployed	28 (4%)	6 (1%)	35 (4%)

3.2. NCD-Screening Service Uptake Measured in Baseline and Endline Surveys

The proportion of cervical cancer-screening service uptake among the study participants in the component-intervention arm increased from 19% at baseline to 33% at endline. Similarly, in the single-intervention arm, cervical cancer-screening service uptake increased from 19% to 29%, whereas in the control arm it was 13% at baseline and 16% at endline. The proportion of clinical breast-examination service uptake increased from 15% at baseline to 22% at endline in the component-intervention arm; similarly, in the single-intervention arm it rose from 12% to 17%. The proportion of clinical breast-examination service uptake in the control arm also increased, going from 16% at baseline to 19% at endline (Figure 1).

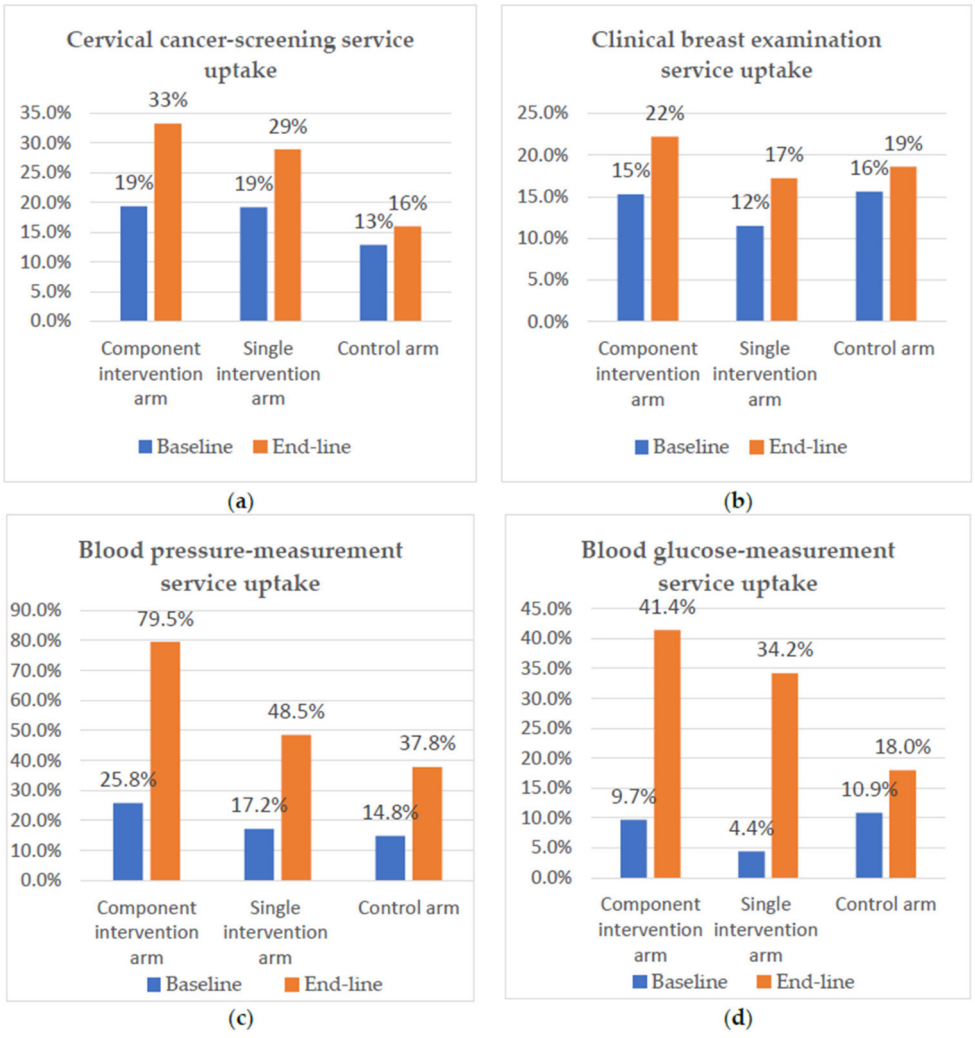

Figure 1. (**a**) Proportion of cervical cancer-screening service uptake; (**b**) proportion of clinical breast-examination service uptake; (**c**) proportion of BP-measurement service uptake; and (**d**) proportion

of blood glucose-measurement service uptake. The component-intervention arm included a multiple-NCD-screening service plus social- and behavioral-change communication intervention. The single-intervention arm included the multiple-NCD-screening service only.

The proportion of BP-measurement service uptake in the component-intervention arm increased from 26% at baseline to 79% at endline, and increased in the single-intervention arm from 17% to 48%. On the other hand, the proportion of BP-measurement service uptake increased from 15% to 38% in the control arm. Blood glucose-measurement service uptake increased from 10% at baseline to 41% at endline in the component-intervention arm, increased from 4% to 34% in the single-intervention arm, and increased from 11% to 18% in the control arm (Figure 1).

3.3. NCD-Screening Service Uptake According to Socio-Demographic Characteristics, Knowledge, and Previous Screening Service Uptake Within Study Arms at Endline Survey

Across all study arms, over three-quarters of women who had taken up cervical cancer screening at the time of the endline survey were married, reflecting a similar trend for clinical breast-examination service uptake. In the control arm, most women who underwent cervical cancer screening (CCS) had completed at least secondary education (43%) and were employed (48%). Conversely, women in the component- and single-intervention arms were more likely to be illiterate (48% and 65%, respectively) and engaged in domestic work (53% and 49%). Similar trends have been observed among those who underwent clinical breast examination at the endline survey; women in the control arm were predominantly educated and employed, while those in the intervention arms were more likely to be illiterate, and housewives or farmers. Notably, women in both intervention arms were mostly knowledgeable about cervical cancer and breast health. Furthermore, a significant proportion of women across all arms had no prior history of clinical breast examination (65%, 78%, and 99% in the component-intervention, single-intervention, and control arms, respectively). However, in the control arm, the majority of women (85%) had previously undergone CCS (Table 2).

Table 2. Participants who took up CCS and clinical breast-examination services during the endline-survey visit.

Variables	Response Categories	Have Taken Up CCS Service			Have Taken Up Clinical Breast Examination Service		
		Comp.-int. Arm (n = 120)	Single-int. Arm (n = 104)	Control Arm (n = 84)	Comp.-int. Arm (n = 80)	Single-int. Arm (n = 73)	Control Arm (n = 98)
Marital status	Married	94 (78%)	99 (95%)	76 (91%)	63 (79%)	70 (96%)	83 (85%)
	Unmarried	26 (22%)	5 (5%)	8 (10%)	17 (21%)	3 (4%)	15 (15%)
Educational status	Secondary and above	14 (12%)	9 (9%)	36 (43%)	11 (14%)	6 (8%)	55 (56%)
	Primary	11 (9%)	23 (22%)	23 (27%)	13 (16%)	12 (16%)	31 (32%)
	Only read and write	38 (32%)	4 (4%)	20 (24%)	21 (26%)	6 (8%)	0 (0%)
	Cannot read and write	57 (48%)	68 (65%)	5 (6%)	35 (44%)	49 (67%)	12 (12%)
Occupational status	Employed	25 (21%)	10 (10%)	40 (48%)	17 (21%)	9 (12%)	44 (45%)
	Housewife	64 (53%)	43 (41%)	32 (38%)	46 (58%)	34 (47%)	26 (27%)
	Farmer	30 (25%)	51 (49%)	12 (14%)	16 (20%)	29 (40%)	20 (20%)
	Unemployed	1 (1%)	0 (0%)	0 (0%)	1 (1%)	1 (1%)	8 (8%)
Knowledge	Not knowledgeable	35 (29%)	14 (14%)	5 (6%)	28 (35%)	28 (38%)	12 (12%)
	Knowledgeable	85 (71%)	88 (85%)	79 (91%)	52 (65%)	45 (62%)	86 (88%)
Previous screening-service uptake	Have ever had	59 (49%)	51 (49%)	13 (16%)	52 (65%)	57 (78%)	97 (99%)
	Never had	61 (51%)	53 (51%)	71 (85%)	28 (35%)	16 (22%)	1 (1%)

Comp.-int. arm (multiple-NCD-screening service plus social- and behavioral-change communication), single-int. arm (multiple-NCD-screening service only).

Across all study arms, the majority of participants who received BP measurement services were female. However, a different trend emerged for blood glucose measurement, with males representing the majority of participants in all arms (52%, 59%, and 53%). The majority of participants who underwent BP measurement and/or blood glucose measurement were married or living together. In the control arm, those who received BP measurements were predominantly educated at the secondary level or higher (37%). In contrast, participants in the intervention arms were more likely to be illiterate, with frequencies of 60% for both component-intervention and single-intervention arms. Overall, a significant proportion of participants in all arms demonstrated knowledge about hypertension and diabetes diseases, but very few had prior experience of BP-measurement and blood glucose-measurement services (Table 3).

Table 3. Participants who took up blood pressure-measurement and blood glucose-measurement services during the endline-survey visit.

Variables	Response Categories	Have Taken Up Blood Pressure-Measurement Service			Have Taken Up Blood Glucose-Measurement Service		
		Comp.-int. Arm (n = 449)	Single-int. Arm (n = 305)	Control Arm (n = 237)	Comp.-int. Arm (n = 149)	Single-int. Arm (n = 123)	Control Arm (n = 98)
Sex	Male	124 (28%)	97 (32%)	60 (25%)	78 (52%)	73 (59%)	52 (53%)
	Female	325 (72%)	208 (68%)	177 (75%)	71 (48%)	50 (41%)	46 (47%)
Marital status	Married	352 (78%)	282 (93%)	197 (83%)	106 (71%)	109 (89%)	75 (77%)
	Unmarried	97 (22%)	23 (8%)	40 (17%)	43 (29%)	14 (11%)	23 (24%)
Educational status	Secondary and above	47 (11%)	39 (13%)	88 (37%)	7 (5%)	18 (15%)	15 (15%)
	Primary	56 (13%)	47 (15%)	25 (11%)	20 (13%)	10 (8%)	12 (12%)
	Only read and write	76 (17%)	35 (12%)	52 (22%)	21 (14%)	12 (10%)	12 (12%)
	Cannot read and write	270 (60%)	184 (60%)	72 (30%)	101 (68%)	83 (68%)	57 (58%)
Occupational status	Employed	72 (16%)	36 (12%)	111 (47%)	13 (9%)	17 (14%)	41 (42%)
	Housewife	209 (47%)	82 (27%)	76 (32%)	35 (24%)	16 (13%)	16 (16%)
	Farmer	166 (37%)	185 (61%)	46 (19%)	101 (68%)	89 (72%)	39 (39%)
	Unemployed	2 (0.5%)	1 (0.3%)	4 (2%)	0 (0%)	1 (1%)	2 (2%)
Knowledge	Not knowledgeable	60 (13%)	69 (23%)	78 (33%)	49 (33%)	62 (50%)	54 (55%)
	knowledgeable	389 (87%)	236 (77%)	159 (67%)	100 (68%)	61 (50%)	44 (45%)
Previous screening-service uptake	Ever had	2 (0.4%)	25 (8%)	0 (0%)	37 (25%)	65 (53%)	0 (0%)
	Never had	447 (100%)	280 (92%)	237 (100%)	112 (75%)	58 (47%)	98 (100%)

Comp.-int. arm (multiple-NCD-screening service plus social- and behavioral-change communication intervention), single-int. arm (multiple-NCD-screening service only).

3.4. NCD-Screening Service Uptake Among Participants Eligible for All Available Screening Services at the Endline-Survey Visit

As per the inclusion criteria, a total of 293 endline-survey participants were eligible to take up all of the four screening services at the endline-survey visit. From those, 52 (18%) took up CCS, 37 (13%) took up clinical breast examination, close to half 138 (47%) of participants took up BP measurement, and 79 (27%) took up blood glucose-measurement service at the endline-survey visit. Very few study participants, 12 (4%), took all of the available NCD-screening services. Even though they were eligible for all of the available NCD-screening services, more than one third, 111 (38%), of the study participants did not take up any of the screening services (Figure 2).

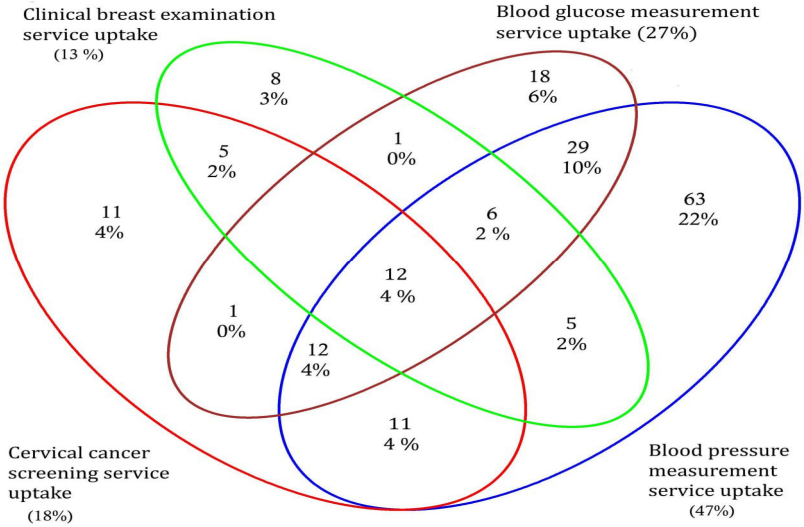

Figure 2. NCD-screening service uptake among participants eligible for all target NCDs during the endline-survey visit (n = 293).

3.5. Effect of Multiple NCD-Screening Service Availability with SBCC on NCD-Screening Service Uptake

Compared with routine care, the availability of a multiple-NCD-screening service accompanied by SBCC (component intervention) increased NCD-screening service uptake. The intervention significantly increased the uptake of CCS, clinical breast examination, BP measurement, and blood glucose measurement by 18, 9, 44, and 23 percent points, respectively (Table 4).

Table 4. Effect of multiple-NCD-screening service availability with SBCC on NCD-screening service uptake.

Type of Service Uptake	DiD Estimates			
	Crude DiD (95% CI)	***p*-Value**	**Adjusted DiD * (95% CI)**	***p*-Value**
Cervical cancer screening	0.176 (0.130–0.221)	<0.001	0.182 (0.126–0.238)	0.015
Clinical breast examination	0.056 (0.012–0.100)	0.012	0.092 (0.009–0.176)	0.045
Blood pressure measurement	0.527 (0.485–0.569)	<0.001	0.437 (0.049–0.824)	0.044
Blood glucose measurement	0.281 (0.238–0.324)	<0.001	0.227 (0.094–0.361)	0.029

* Adjusted for age, sex, marital status, educational status, occupation, knowledge, and previous screening service uptake.

3.6. Effect of Multiple NCD-Screening Service Availability Without SBCC on NCD-Screening Service Uptake

Compared with the routine care, the availability of a multiple NCD-screening service without accompanying SBCC (single intervention) had effect on increasing clinical breast-examination service uptake and blood glucose-measurement service uptake. The intervention increased clinical breast-examination service uptake by 9% point and blood glucose-measurement service uptake by 18% point. Nevertheless, CCS service uptake and BP-measurement service uptake were not affected (Table 5).

Table 5. Effect of opportunistic multiple-NCD-screening service availability without SBCC on NCD-screening service uptake.

Type of Service Uptake	DiD Estimates			
	Crude DiD (95% CI)	*p*-Value	Adjusted DiD * (95% CI)	*p*-Value
Cervical cancer screening	0.132 (0.088–0.177)	<0.001	0.132 (−0.084–0.347)	0.082
Clinical breast examination	0.016 (−0.024–0.055)	0.436	0.094 (0.089–0.099)	0.003
Blood pressure measurement	0.240 (0.199–0.282)	<0.001	0.230 (−0.189–0.649)	0.091
Blood glucose measurement	0.222 (0.180–0.263)	<0.001	0.182 (0.046–0.318)	0.037

* Adjusted for age, sex, marital status, educational status, occupation, knowledge, and previous screening service uptake.

4. Discussion

In our study, compared with routine care, providing a multiple-NCD-screening service together with SBCC interventions (the component intervention) increased the uptake of all targeted NCD-screening services (CCS, clinical breast examination, BP measurement, and blood glucose measurement). This implies that a component-intervention approach is effective in increasing NCD-screening service uptake. In line with this, a systematic review of twenty studies showed that multicomponent interventions were effective in increasing screening service uptake [28].

Compared with routine care, the availability of a multiple-NCD-screening service without SBCC intervention (the single intervention) did not show a significant effect on CCS service uptake or BP-measurement service uptake. However, a systematic review and meta-analysis to identify effective interventions to increase the uptake of CCS showed that single interventions may increase the uptake of CCS, compared with a control group [29]. This variation could be due to differences in target interventions; in our single intervention, the intervention was providing an NCD-screening corner at the healthcare facilities at which combined screening and measurement services for all NCDs—cervical cancer, clinical breast examination, BP, and blood glucose—were being offered. However, the interventions in the studies that were included in the systematic review and meta-analysis described above were counseling, health education, reminders, invitations, messaging, economic intervention (e.g., subsidized cost), and procedure provision (e.g., HPV testing, visual inspection with acetic acid (VIA) test, etc.). Moreover, according to a scoping review of the literature and resources for CCS interventions, no associations with effect size were noted for a number of intervention components [30]. Different health-behavior-change theories and models such as the health belief model [31] and the theory of planned behavior [32] indicated that behavior-change communication interventions would facilitate the occurrence of healthy behaviors. Research also indicated that effective health-communication interventions can promote positive behavior change and help to prevent diseases [33,34].

The current study showed that the uptake of all NCD-screening services increased in all arms over time from base-line to endline-survey times. The service uptake increment in the control arm could be due to the fact that people are constantly learning, both intentionally and unintentionally, throughout their lives, which naturally increases the uptake over time. In the control arm of this study, BP-measurement service uptake showed a greater increase (23%) compared with the other target NCD-screening services. This could be due to the fact that there was an active effort to improve hypertension prevention and control at the primary health-care level in Ethiopia during this study period. This effort was made by the Federal Ministry of Health of Ethiopia in collaboration with the World Health Organization (WHO) and Resolve to Save Lives [35].

Our findings in the control arm at the endline-survey visit suggested that the majority of women who underwent clinical breast examination and/or CCS were at a secondary educational level or above, and were mostly employed. Similar to this finding, other studies have also reported positive associations between educational status and CCS service

uptake [36–38]. Another study conducted in Ethiopia also showed that employed women were likely to undergo breast screening [39]. However, in both the component-intervention and single-intervention arms of this study, most women who underwent clinical breast examination at the endline survey could not read and write, and were housewives. This implies the interventions in this study were important in reaching less-educated and non-employed women for better uptake of clinical breast examination and/or CCS services.

In this study, most women who underwent clinical breast examination or/and CCS across all of the arms were those who were knowledgeable about the disease. This positive association between knowledge and screening service uptake had been reported in many other studies, as well [40–43]. This indicates that educational interventions may be helpful in increasing NCD-screening service uptake.

The majority of the participants who took up screening services (CCS, clinical breast examination, and blood glucose measurement) in the intervention arms of this study were those who had not taken it up previously. However, in most other scenarios, people would likely take up the screening service when they had experienced it before [44,45]. The same was true in the control arm of this study, in which the majority of the women who underwent CCS were those who have taken it up previously. Thus, this study intervention could be recommended to motivate people to take up the screening service, even if they had not had this experience before.

In this study, a total of 293 participants were eligible to take up all of the targeted NCD-screening services (CCS, clinical breast examination, BP measurement, and blood glucose measurement) at the endline-survey visit. Among the 293 endline-survey participants who were eligible for all screening services, 133 (47%) participants had taken up the BP-measurement service by the endline-survey visit. This could be due to the fact that BP measurement is the simplest procedure of the screening procedures used in this study. Among those participants who were eligible for all screening services, very few of them, 12 (4%), had taken up all of the available NCD-screening services by the time they completed the endline-survey visit. This could mean that, even if NCD-screening services are available in an integrated way, their uptake would vary, based on the available test strategies and procedures of each target NCD.

In general, in this study, we found that delivering different NCD-screening services (CCS, clinical breast examination, BP measurement, and blood glucose measurement) in an integrated way, together with SBCC efforts at PHFs, significantly increased the uptake of screening services. Our finding was in line with the WHO's package of essential non-communicable-disease intervention recommendations for PHFs, which recommends the use of an integrated approach to NCD screening for low-resource settings [46].

Strengths and Limitations of the Study

This study has definite strengths and limitations. As this study is a facility-based study, its findings might not be representative of the general population. In this study, more females participated than males, due to the eligibility criteria to undergo the screening services, which may limit the male representativeness of the findings.

5. Conclusions

Integration of the currently scattered NCD-screening services, by providing a multiple-NCD-screening service together with SBCC interventions, improves the uptake of NCD-screening services among PHF attendants. Thus, we recommend that PHFs allocate a specific department to offer a screening service targeting the main NCDs by performing the available test procedures together, and that they promote its uptake through various SBCC efforts.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/diseases12110278/s1, Table S1: A questionnaire to assess Non-Communicable Disease screening service uptake.

Author Contributions: Conceptualization, B.K. and A.W.; methodology, A.W. and A.A.; software, M.B. and S.N.; validation, E.J.K., M.K. and A.A. formal analysis, B.K. and M.B.; investigation, A.A. and S.N.; resources, E.J.K.; data curation, A.A.; writing—original draft preparation, B.K.; writing—review and editing, M.K., S.N., A.W. and E.J.K.; visualization, A.A.; supervision, E.J.K. and M.K.; project administration, S.N.; funding acquisition, E.J.K. and A.A. All authors have read and agreed to the published version of the manuscript.

Funding: We acknowledge the financial support of the Open Access Publication Fund of the Martin-Luther-University Halle-Wittenberg. This study was funded by the Else Kroener Foundation through the Martin Luther University, Halle-Wittenberg, Germany, and grant no. 2018_HA31SP. Funding was received through the German Ministry for Economic and Development Cooperation (BMZ) through the Academic Partnership Initiative of German International Cooperation (GIZ), project no. 81281915. The project on which this publication is based was in part funded by the German Federal Ministry of Education and Research 01KA2220B to the NORA Programme. This research was funded in part by Science for Africa Foundation to the Programme Del-22-008 with support from Wellcome Trust and the UK Foreign, Commonwealth & Development Office and is part of the EDCPT2 programme supported by the European Union. The role of the funder in this study was to provide the required budget.

Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki, and approved by the Instructional Review Board of the College of Health Sciences, Addis Ababa University. (Protocol code: 038/20/SPH; date of approval: 28 May 2020.).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: We thank Tesfamichael Awoke for providing technical support. Our gratitude goes to the study participants for devoting their time to this study. We would like to thank the management team members of the 12 PHFs at which this study was conducted.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

References

1. WHO. *Noncommunicable Diseases Country Profiles 2018*; WHO: Geneva, Switzerland, 2018.
2. WHO. *World Health Organization Non-Communicable Disease Fact Sheet 2018*; WHO: Geneva, Switzerland, 2018.
3. UNDoP. *Non-Communicable Diseases Deemed Development Challenge of 'Epidemic Proportions'*; Political Declaration Adopted during Landmark General Assembly Summit; UN: New York, NY, USA, 2011.
4. Health NDMCf. Burden of Non-Communicable Diseases (NCD) in Ethiopia. 2023. Available online: https://ndmc.ephi.gov.et/download/burden-of-non-communicable-diseases-ncd-in-ethiopia-2/ (accessed on 2 June 2024).
5. UN. *Sustainable Development Goals*; UN: New York, NY, USA, 2015.
6. WHO. Preparation for the Third High-level Meeting of the General Assembly on the Prevention and Control of Non-Communicable Diseases, to be Held in 2018. In Proceedings of the 17th World Health Assembly, Geneva, Switzerland, 18 May 2017.
7. WHO. *Guidelines on Clinical and Programmatic Management of Major Non Communicable Diseases*; WHO: Geneva, Switzerland, 2016.
8. Martinez, M.E.; Schmeler, K.M.; Lajous, M.; Newman, L.A. Cancer Screening in Low- and Middle-Income Countries. *Prev. Risk Reduct. Genet.* **2024**, *44*, e431272. [CrossRef] [PubMed]
9. Bayu, H.; Berhe, Y.; Mulat, A.; Alemu, A. Cervical Cancer Screening Service Uptake and Associated Factors among Age Eligible Women in Mekelle Zone, Northern Ethiopia, 2015: A Community Based Study Using Health Belief Model. *PLoS ONE* **2016**, *11*, e0149908. [CrossRef] [PubMed]
10. Gebru, Z.; Gerbaba, M.; Dirar, A. Utilization of Cervical Carcinoma Screening Service and Associated Factors among Currently Married Women in Arba Minch Town, Southern Ethiopia. *J. Women's Health Care* **2016**, *5*, 297. [CrossRef]
11. Ketema, B.; Addissie, A.; Negash, S.; Kantelhardt, E.J.; Kaba, M. Does Prior Experience Matter? Intention to Undergo Cervical Cancer Screening among Rural Women in South-Central Ethiopia. *Curr. Onclol.* **2024**, *31*, 4908–4916. [CrossRef]
12. Ketema, B.; Kaba, M.; Negash, S.; Addissie, A.; Kantelhardt, E.J. Intention to Undergo Clinical Breast Examination and Its Associated Factors among Women Attending Rural Primary Healthcare Facilities in South Central Ethiopia. *Breast Care* **2023**, *18*, 464–472. [CrossRef]

13. Bruni, L.; Serrano, B.; Roura, E.; Alemany, L.; Cowan, M.; Herrero, R.; Poljak, M.; Murillo, R.; Broutet, N.; Riley, L.M.; et al. Cervical cancer screening programmes and age-specific coverage estimates for 202 countries and territories worldwide: A review and synthetic analysis. *Lancet Glob. Health* **2022**, *10*, e1115–e1127. [CrossRef]
14. Ethiopia Public Health Institute. *Ethiopia Steps Report on Risk Factors for Non-Communicable Diseaes and Prevalence of Selected NCDs*; Ethiopia Public Health Institute: Addis Ababa, Ethiopia, 2016.
15. Birhanu, Z.; Abdissa, A.; Belachew, T.; Deribew, A.; Segni, H.; Tsu, V.; Mulholland, K.; Russell, F.M. Health seeking behavior for cervical cancer in Ethiopia: A qualitative study. *Int. J. Equity Health* **2012**, *11*, 83. [CrossRef]
16. Getachew, S.; Tesfaw, A.; Kaba, M.; Wienke, A.; Taylor, L.; Kantelhardt, E.J.; Addissie, A. Perceived barriers to early diagnosis of breast Cancer in south and southwestern Ethiopia: A qualitative study. *BMC Women Health* **2020**, *20*, 38. [CrossRef]
17. Sun, D.; Zhou, T.; Heianza, Y.; Li, X.; Fan, M.; Fonseca, V.A.; Qi, L. Type 2 Diabetes and Hypertension A Study on Bidirectional Causality. *AHA J.* **2019**, *124*, 930–937.
18. Han, H.; Guo, W.; Shi, W.; Yu, Y.; Zhang, Y.; Ye, X.; He, J. Hypertension and breast cancer risk: A systematic review and metaanalysis. *Sci. Rep.* **2017**, *7*, 44877. [CrossRef]
19. Chen, S.; Tao, M.; Zhang, L.Z. The association between diabetes/hyperglycemia and the prognosis of cervical cancer patients: A systematic review and meta-analysis. *Medicine* **2017**, *96*, e7981. [CrossRef] [PubMed]
20. Pastakia, S.D.; Ali, S.M.; Kamano, J.H.; Akwanalo, C.O.; Ndege, S.K.; Buckwalter, V.L.; Vedanthan, R.; Bloomfield, G.S. Screening for diabetes and hypertension in a rural low income setting in western Kenya utilizing home based and community-based strategies. *Glob. Health* **2013**, *9*, 21. [CrossRef] [PubMed]
21. Mohan, S.; Jarhyan, P.; Ghosh, S.; Venkateshmurthy, N.S.; Gupta, R.; Rana, R.; Malhotra, C.; Rao, M.B.; Kalra, S.; Tandon, N.; et al. UDAY: A comprehensive diabetes and hypertension prevention and management program in India. *BMJ Open* **2018**, *8*, e015919. [CrossRef] [PubMed]
22. Agency FDRoECS. *Population Projection of Ethiopia for All Regions At Wereda Level from 2014–2017*; Agency FDRoECS: Addis Abeba, Ethiopia, 2013.
23. Federal Democratic Republic of Ethiopia Ministry of Health. *National Strategic Action Plan (NSAP) for Prevention & Control of Non Communicable Diseases in Ethiopia 2014–2016*; Federal Democratic Republic of Ethiopia Ministry of Health: Addis Ababa, Ethiopia, 2016.
24. Federal Democratic Republic of Ethiopia Ministry of Health. *Guideline for Cervical Cancer Prevention and Control in Ethiopia*; Federal Democratic Republic of Ethiopia Ministry of Health: Addis Ababa, Ethiopia, 2015.
25. Abeje, S.; Seme, A.; Tibelt, A. Factors associated with breast cancer screening awareness and practices of women in Addis Ababa, Ethiopia. *BMC Women Health* **2019**, *19*, 4. [CrossRef] [PubMed]
26. Getahun, T.; Kaba, M.; Derseh, B.T. Intention to Screen for Cervical Cancer in Debre Berhan Town, Amhara Regional State, Ethiopia: Application of Theory of Planned Behavior. *J. Cancer Epidemiol.* **2020**, *2020*, 3024578. [CrossRef]
27. Nwabichie, C.C.; Manaf, R.A.; Ismail, S.B. Factors Affecting Uptake of Cervical Cancer Screening among African Women in Klang Valley, Malaysia. *Asian Pac. J. Cancer Prev.* **2018**, *19*, 825.
28. Rodríguez-Gómez, M.; Ruiz-Pérez, I.; Martín-Calderón, S.; Pastor-Moreno, G.; Artazcoz, L.; Escribà-Agüir, V. Effectiveness of patient-targeted interventions to increase cancer screening participation in rural areas: A systematic review. *Int. J. Nurs. Stud.* **2020**, *101*, 103401. [CrossRef]
29. Tin, K.N.; Ngamjarus, C.; Rattanakanokchai, S.; Sothornwit, J.; Aue-aungkul, A.; Paing, A.K.; Pattanittum, P.; Jampathong, N.; Lumbiganon, P. Interventions to increase the uptake of cervical cancer screening in lowand middle-income countries: A systematic review and meta-analysis. *BMC Women Health* **2013**, *23*, 120.
30. Popalis, M.L.; Ramirez, S.I.; Leach, K.M.; Granzow, M.E.; Stoltzfus, K.C.; Moss, J.L. Improving cervical cancer screening rates: A scoping review of resources and interventions. *Cancer Causes Control* **2022**, *33*, 1325–1333. [CrossRef]
31. Jones, C.L.; Jensen, J.D.; Scherr, C.L.; Brown, N.R.; Christy, K.; Weaver, J. The Health Belief Model as an Explanatory Framework in Communication Research: Exploring Parallel, Serial, and Moderated Mediation. *Health Commun.* **2015**, *30*, 566–576. [CrossRef]
32. Ajzen, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* **1991**, *50*, 179–211. [CrossRef]
33. Ngigi, S.; Busolo, D. Behaviour Change Communication in Health Promotion: Appropriate Practices and Promising Approaches. *Int. J. Innov. Res. Dev.* **2018**, *7*. [CrossRef]
34. Abu, S.H.; Woldehanna, B.T.; Nida1, E.T.; Tilahun, A.W.; Gebremariam, M.Y.; Sisay, M.M. The role of health education on cervical cancer screening uptake at selected health centers in Addis Ababa. *PLoS ONE* **2020**, *15*, e0239580. [CrossRef]
35. WHO. *Ethiopia Sets to Improve Hypertension Prevention and Control at Primary Health Care Level*; WHO: Geneva, Switzerland, 2019.
36. Dozie, U.W.; Ebirim, C.I.; Dike, C.R.; Dozie, I.N.; Ibe, S.N.; Abanobi, O.C. Determinants of cervical cancer screening uptake among female undergraduates in a tertiary institution in south eastern Nigeria: A cross sectional study. *J. Prev. Med. Hyg.* **2021**, *62*, E213.
37. Gizaw, M.; Teka, B.; Ruddies, F.; Abebe, T.; Kaufmann, A.M.; Worku, A.; Wienke, A.; Jemal, A.; Addissie, A.; Kantelhardt, E.J. Uptake of Cervical Cancer Screening in Ethiopia by Self-Sampling HPV DNA Compared to Visual Inspection with Acetic Acid: A Cluster Randomized Trial. *Cancer Prev. Res.* **2019**, *12*, 609–616. [CrossRef]
38. Mekonnen, B.D. Cervical Cancer Screening Uptake and Associated Factors among HIV-Positive Women in Ethiopia: A Systematic Review and Meta-Analysis. *Adv. Prev. Med.* **2020**, *2020*, 7071925.
39. Lera, T.; Beyene, A.; Bekele, B.; Abreha, S. Breast self-examination and associated factors among women in Wolaita Sodo, Ethiopia: A community-based crosssectional study. *BMC Women Health* **2020**, *20*, 167. [CrossRef]

40. Ayenew, A.A.; Zewdu, B.F.; Nigussie, A.A. Uptake of cervical cancer screening service and associated factors among age-eligible women in Ethiopia: Systematic review and meta-analysis. *Infect. Agent Cancer* **2020**, *15*, 67. [CrossRef]
41. Assefa, A.A.; Abera, G.; Geta, M. Breast Cancer Screening Practice and Associated Factors among Women Aged 20–70 Years in Urban Settings of SNNPR, Ethiopia. *Breast Cancer Targets Ther.* **2021**, *13*, 9–19. [CrossRef]
42. Yeshitila, Y.G.; Kassa, G.M.; Gebeyehu, S.; Memiah, P.; Desta, M. Breast self-examination practice and its determinants among women in Ethiopia: A systematic review and meta-analysis. *PLoS ONE* **2021**, *16*, e0245252. [CrossRef]
43. Tewelde, B.; Tamire, M.; Kaba, M. Breast self-examination practice and predictors among female secondary school teachers in Addis Ababa, Ethiopia: Using the health belief model. *BMC Women Health* **2022**, *22*, 317. [CrossRef] [PubMed]
44. Abamecha, F.; Tena, A.; Kiros, G. Psychographic predictors of intention to use cervical cancer screening services among women attending maternal and child health services in Southern Ethiopia: The theory of planned behavior (TPB) perspective. *BMC Public Health* **2019**, *19*, 434. [CrossRef] [PubMed]
45. Solomon, K.; Tamire, M.; Kaba, M. Predictors of cervical cancer screening practice among HIV positive women attending adult anti-retroviral treatment clinics in Bishoftu town, Ethiopia: The application of a health belief model. *BMC Cancer* **2019**, *19*, 989. [CrossRef]
46. WHO. Integrated management of NCDs. In *WHO Package of Essential Noncommunicable (PEN) Disease Interventions for Primary Health Care*; WHO: Geneva, Switzerland, 2020.

Erklärungen

(1) Ich erkläre, dass ich mich an keiner anderen Hochschule einem Promotionsverfahren unterzogen bzw. eine Promotion begonnen habe.

(2) Ich erkläre, die Angaben wahrheitsgemäß gemacht und die wissenschaftliche Arbeit an keiner anderen wissenschaftlichen Einrichtung zur Erlangung eines akademischen Grades eingereicht zu haben.

(3) Ich erkläre an Eides statt, dass ich die Arbeit selbstständig und ohne fremde Hilfe verfasst habe. Alle Regeln der guten wissenschaftlichen Praxis wurden eingehalten; es wurden keine anderen als die von mir angegebenen Quellen und Hilfsmittel benutzt und die den benutzten Werken wörtlich oder inhaltlich entnommenen Stellen als solche kenntlich gemacht.

_____

Datum, Unterschrift

Acknowledgement

I am very grateful to the health professionals, facility attendees, and key-informants who participated in this study. My sincere thanks go to the Else Kroner Fresenius Stiftung (EKFS) for funding the research project costs. I would also like to extend my gratitude both to the School of Public Health, Addis Ababa University, and Institute for Medical Epidemiology, Biostatistics and Informatics, Martin Luther University, Germany for the technical and administrative support.

Many dedicated individuals contributed to the successful completion of this study, and I am profoundly grateful for their efforts. My main supervisor Professor Eva Kantelhardt deserves very special thanks for her unreserved advice, swift communication and patience. Thank you Prof. Kantelhardt also for the great hospitality at your apartment and in the institute during my stay in Halle, Germany. I extend my sincere appreciation to my supervisor from the home institute, Professor Mirgissa Kaba, for his genuine concern, dedicated mentorship, and unwavering encouragement. His generous guidance has been a constant source of strength, not just during this study, but throughout my career development. My co-supervisor Dr. Adamu Addissie also needs to be thanked for his understanding and cooperation throughout the study. I must express my heartfelt gratitude to Professor Mitike Molla, Professor Ahmed Ali, and Professor Alemayehu Worku for the trust they placed in me, and their recommendation, which enabled my admission to this PhD program.

I am profoundly grateful to my mother, Meselu Atlaw, and my father, Ketema Dessie, for the gift of education and for their loving support in caring for my children throughout my studies. My brother, Kassahun, and my sisters, Dr. Elbet and Yanit, have been a constant source of strength, and I thank them for their love and support. The love, endurance, and support of my husband Demelash Habtie and my children Aleab Demelash and Malda Demelash were the source of my success. I love you and I'm proud of you! To all my friends, whose encouragement and assistance sustained me throughout this journey, I offer my heartfelt appreciation.

Above all, I offer my highest praise to Almighty God, whose grace enabled the successful completion of this study. I also express my gratitude to the Blessed Virgin Mary, Mother of Jesus Christ, for her comforting intercession.