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NUTRITION EDUCATION PROMOTED CONSUMPTION OF PULSE BASED FOODS AMONG RURAL WOMEN OF REPRODUCTIVE AGE IN SIDAMA ZONE, SOUTHERN ETHIOPIA

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ABSTRACT

Nutrition education about locally available, nutritionally rich crops, such as pulses, is one of the promising strategies to reduce the burden of malnutrition among women in rural communities of low-income and middle income countries such as Ethiopia. This study was conducted to determine the effectiveness of nutrition education on the knowledge, attitude and practice of women of reproductive age using the Health Belief Model. A pre-test post-test controlled intervention study was conducted on 200 randomly selected women from Hawassa Zuria district in two groups: intervention (n=100) and control (n=100). Nutrition education intervention was given using Health Belief Model (HBM) only to the intervention group, every 15 days for consecutive six months whereas the control group got the same information in a summarized form at the end of the study. Women in both groups completed knowledge, attitude and practice (KAP) and food frequency questionnaires at baseline and after six months of intervention. Data were analyzed using independent and paired sample t-tests to find out the effect of nutrition education intervention by comparing the pre and post test data between the two groups and within each group. The result showed a significant improvement in the mean knowledge ($p<0.001$), attitude ($p<0.001$), and practice scores ($p<0.001$) in the intervention group compared to control group. There was significant ($p<.001$) improvement in the scores of HBM constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and taking health action by the intervention group to the control group. The success of this intervention using nutrition education to improve practices using pulses may be due to there being repeated demonstrations of pulse processing and recipes, to group discussions involving peer learning and experience sharing, and to interest from the mothers regarding health benefits. It is concluded that nutrition education based on HBM can be effective in bringing positive change on the KAP of women of reproductive age towards household utilization of pulse based diets.

Key words: pulses, education, Health Belief Model, Ethiopia, legumes, women, diet, nutrition

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INTRODUCTION

Both food insecurity and undernutrition are prime concerns in Ethiopia, and women and young children are the most affected segments of rural households. Maternal and child malnutrition remains a growing concern in low-income and middle income countries such as in Ethiopia. The recent Ethiopian Demographic and Health (DHS) survey reported 40.4% prevalence of child stunting and 30% maternal malnutrition for the year 2014 [1]. Maternal undernutrition, however, has not changed since the first DHS in 2000 [1 - 3]. Poverty, lack of education, socio-cultural traditions and disparities in a household contribute to undernutrition in women who may consume limited amounts of animal foods and fruits and vegetables. Nutrition education that espouses women to health practices such as consuming locally available but nutritionally rich pulse crops is seen as a proven strategy for reducing the burden of malnutrition among rural households in poor rural Ethiopia [4-6]. The importance of pulses (which are the non-fatty legumes) to improve the nutritional status of young children, women and other family members is receiving increasing attention in poor agrarian communities. Pulse crops which include common beans (Phaseolus Vulgaris L.) and chickpeas (Cicer arietinum L.) commonly consumed, are a major constituent of the human diet, and are important protein, micronutrient-rich foods [7]. Studies conducted in other parts of the world documented that despite the nutritional benefits of pulses and their availability, most households in poor economies do not consume as expected, mainly due to lack of knowledge and attitudes towards consumption [8-9].

Nutrition education is an important component in improving dietary habits and food choices of the undernourished. Recent studies conducted in the study region documented the importance of nutrition education in increasing pulse consumption [10-14] for improved nutritional outcomes of children. However, few studies have addressed the needs of women. A model for nutrition education is the Health Belief Model (HBM). It is hypothesized that a pulse based diet is likely to be adopted if it is compatible with the individual's beliefs, values and behaviours and if the benefits to be gained outweigh those of the current practice [15]. The constructs of this model are *perceived susceptibility* (one's opinion of chances of getting a condition), *severity* (one's opinion of how serious a condition and its consequences are), *benefits* (one's belief in the efficacy of the advised action to reduce risk or seriousness of impact), *barriers* (one's opinion of the tangible and psychological costs of the advised action, *cues to action* (strategies to activate "readiness), and *taking health action* [16]. Previous studies have shown the HBM to improve pulse consumption of children in Ethiopia (5-6). The study was conducted to determine the effectiveness of nutrition education, using the health belief model on the knowledge, attitude and practice of women of reproductive age towards pulse consumption.

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METHOD AND MATERIALS

Study Area and Population

The study was conducted in two villages of Hawassa Zuria district, Southern Ethiopia. The district is one of the nineteen districts (Woredas) in Sidama zone administratively subdivided into 29 villages (kebeles). The district had a total population of 146,903; of these 49.6 % were female. The total population of Kejima anbulo village was 10,136 in which there were 5023 women. The number of households as registered by the Kebele administration were 1253 and women headed households were 33. The agro-climatic condition of Kejima anbulo is dominantly tropical (*kola*). The annual average rainfall varies from 750 mm to 900 mm with mean annual temperature of 27^{o}C. The major crops grown in the kebele includes potato, red and white haricot bean, maize, sweet potato and enset (false banana). Bafeno kebele had a total population of 8718, of which there were 4186 females. The agro-climatic condition is mostly midland, and hot, with temperatures averaging 29 C. The average rainfall is about 900 to 1400 mm. Major crops in this kebele are maize, haricot bean, and enset (false banana) [17].

The study population consisted of all women of reproductive age (15 – 49 y) who were living in either the intervention or control kebeles. Selection criteria included healthy reproductive age women, pregnant and lactating mothers who lived for at least 6 months prior to the survey date and were willing to participate in this study. Those women who had self-reported hearing impairment or mental illness were excluded from the study.

Study design

A pre-test–post-test control group design was used. Data were collected at baseline and again post-intervention for both the control and intervention groups. The intervention group received nutrition education, while the control group received a shortened intervention at the end of the study.

Sampling

A power calculation was used to determine sample size. A sample size of 100 was determined as adequate for each group (intervention and control). The two kebeles (one control and one intervention) were purposively selected, based on similar socio-economic status, geographical location and the potential for pulse production like red- and white haricot beans on the basis of the information from the kebele and agriculture offices of the district. The Dore Bafano kebele was selected for control and Kejima Anbulo for the intervention. A systematic random sampling technique was used to select households using the list of the households made available by the village administrations. At each selected household, a woman of reproductive age preferably a housewife or other woman who is responsible for taking care of the family's food was included in the study and given mutually exclusive codes. Where there was no one in that selected household, a woman in the next household was included until the total number of the sample size was achieved.

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Data collection

Data collection was carried out using a food frequency questionnaire with constructs from the Health Belief Model. The Health Belief Model (HBM) is recommended for nutrition education to increase the impact of educational programs [18].

The questionnaire included 30 socio-economic and demographic questions of which 21 were KAP (seven for each of the three parts), 18 were HBM (three for each of the six HBM constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy) and 8 were food frequency questions. This questionnaire was adapted from one previously used for a study of pulse education for complementary feeding [6]. The food frequency questionnaire table was adapted from "Principles of Nutrition Assessment" [19]. The HBM questionnaire, which contained three items for each of the six constructs, was scored using a five-point Likert Scale. The questions were intended to measure the mothers' perceptions of their own and their children's susceptibility to undernutrition due to poor dietary practices. In measuring the KAP domains, we used three categories: >70%, 50-70% and <50%. For the knowledge domain, for instance, the study participants were classified into categories of knowledgeable (> 70%), fairly knowledgeable (50-70%) or not knowledgeable (<50%) levels based on their test scores; a similar approach was used to assess attitude and practice scores (Table 2).

Prior to the study, functionality and reliability of the questions were checked with 10 respondents who were not part of the study. The data collection tools were then modified based on the findings of the test. All questions were translated from English to Amharic and then re-translated back to English to check for inconsistencies. Signed consents were obtained from each participant who indicated a willingness to participate in the study. Members of the research team included Development Agents (DAs) and Health Extension workers (HEWs), who received two days training and who spoke Amharic and the local language (*Sidamegna)*.

The nutrition education intervention focused on food-based strategies, which would facilitate consumption of pulse-based food products among women and their households, with reference to susceptibility of the mother to malnutrition (macro-and-micro nutrient deficiencies), consequence/severity of malnutrition on future pregnancy and its effect on their child. Recipe demonstrations and group discussions encouraged self-efficacy in preparing pulse products for household consumption. Recipe demonstrations also encouraged participants to adopt important steps in pulse food processing such as soaking, fermenting, germinating and to achieve improved bioavailability for improved nutrition. All demonstrations were performed by the main researcher in collaboration with trained Health Extension Workers.

The nutrition education sessions were conducted every other week during a six- month period, for a minimum of one-hour duration per session. Incentives (soap and iodized salt) were given to participants at the end of each session for a total of twelve sessions (six sessions for lectures, three sessions for group discussion and three sessions for recipe demonstration).

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For Data Quality Assurance, a two-day training session on data collection tools was carried out by the principle investigator with all data collectors. All data were checked for completeness under the supervision of the main investigator. Post-test data were collected following the intervention by the same HEWs.

Data processing and analysis

Descriptive statistics of frequencies and proportions were used to display study results. All continuous data were checked for normality using the Kolmogorov-Smirnov test and were expressed as mean plus or minus standard deviation (±SD) for continuous variables, or number and percentage for categorical variables. Pearson's Chi square (x^2) was used only to test the association between nutrition education intervention and selected categorical variables. A Comparison of the intervention and control groups was performed for demographic indices using independent sample t-test. Comparative analysis between data from baseline and after six months was done by paired sample t-test. Independent t-tests were used to compare intervention and control groups in the pre- and post- intervention periods. To see the effect of nutrition education intervention, the mean (SD) score for questions on HBM constructs from the intervention and control groups at baseline and at six months were compared within each group and between the two groups. A P-value of less than 0.05 was taken as significant. A Likert scale was used as a scoring system for HBM and a score of 1-5 (1 as strongly disagree and 5 as strongly agree) was considered for each question. Analyses were conducted using Statistical Packages for Social Sciences (SPSS version 16).

Ethical Considerations

Ethical approval for the study was obtained from the IRB (Institutional Review Board) office of Hawassa University. Permission to carry out the study was also obtained from the district administrative and the village offices in the study areas. The nature of the study and objectives were fully explained to officials of Health and Administration Departments. Other local authorities were informed about the study objectives for their permission and support. Participants were assured of confidentiality with regard to the information they would provide and also of their full right to choose not to participate or withdraw from the research without any consequence to their decision in this regard. Signed informed consent was obtained from each study participant.

RESULTS

Background characteristics of the study population

At baseline, the mean (SD) age of the women was 32.35 (6.01) and 33.21 (7.2) for the intervention and control groups, respectively (Table 1). The weighted mean age for the two groups was 32.78(6.6) years, and 33 (16.5%) were ≤ 30 years. Almost all women were married. When we compare the two groups, there were no statistical differences between the two groups with regard to their age, religion, ethnicity, marital status and amount of formal education.

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Effects of nutrition education intervention: comparison between and within groups

Changes in KAP score regarding household pulse utilization were assessed at baseline and at 6 months immediately after intervention.

At baseline, the majority (87%) of women in the intervention group responded correctly to only ≤ 3 of the seven knowledge questions, thus classifying them as "not knowledgeable", having received a score of less than 50 %. However, after intervention, the majority (97%) of the women in this group received a score of >70% (Table 3). Likewise, at baseline, 48% of participants neither agreed nor disagreed with ≥ 5 of the seven attitude questions, while 44% of the women disagreed to ≥ 5 attitude questions out of seven, implying a negative attitude. However, after intervention, the majority of them (81%) indicated a positive attitude towards household utilization of pulse, agreeing to ≥ 5 attitude questions (Table 3). Similar improvement observed in practice of household pulse consumption (Table 3). In contrast, there was no significant improvement observed in the baseline KAP score of women in the control kebele at 6 months or end of the intervention (Table 3).

At baseline, the mean (SD) knowledge score of women in the intervention group was 2.95 (0.76) and after 6 months, it was significantly ($p<0.001$) improved to 6.53 (0.77). However, the improvement in the mean (SD) knowledge score of women in the control group was not significant ($p=0.450$) (Table 4). Similar trends were seen for attitude and for practices (Table 4).

Effect of nutrition education intervention on HBM constructs

Responses to eighteen Health Belief Model (HBM) questions regarding household utilization of pulses were analyzed. There was a significant ($p<0.001$) improvement in the scores of all HBM constructs among the intervention group (Table 5), where as in the control group there were no detectable changes observed between scores at baseline and after six month. Similarly, the pre- and post- intervention scores of HBM constructs between the intervention and control groups showed that the scores of all HBM constructs were significantly improved ($p<0.001$) in the intervention group, but not in the control group (Table 6). Also, the perceived severity and susceptibility showed a decline for the intervention group.

Effect of nutrition education intervention on consumption pattern of pulses

A substantial improvement in the consumption pattern of pulses and other staple foods after the nutrition education intervention was observed among women in the intervention group/kebele, but no such change was observed in the control group/kebele. For instance, the reported daily consumption frequency of pulses in the intervention kebele at baseline was only 7%. It was found that 58% of women in the area consumed kidney beans once per day and 3-6 times per week, respectively. However, after the intervention, 27% and 73% of them consumed kidney bean once per day and 3-6 times per week, respectively. Similar findings were seen for chickpeas, peas, and lentils.

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DISCUSSION

There was a significant improvement in the level of knowledge of women who received a six-month nutrition education intervention on household utilization of pulses. This finding is consistent with a study conducted among lower socio-economic communities in the Free State and Northern Cape where knowledge of what to eat daily to remain healthy improved significantly from 42.2% before the nutrition education intervention to 52.6% after nutrition education intervention [20]. Others [21 - 23] also reported nutrition education to improve nutrition knowledge of women. The attitude of women towards household utilization of pulses was improved with education. Importantly, there was a positive change in the household pulse consumption. The nutrition education intervention was based on HBM, but as constructs of the HBM were improved - perceived susceptibility, severity, benefits, barriers, self-efficacy and cues to action –we are unable to determine which of these might be the most important. A previous study reported that nutrition education improved pulse consumption by young children after nutrition education using the HBM [6]. An improvement in the scores of HBM constructs was also reported by a study conducted on the effect of nutrition education based on HBM, on dietary calcium intake among Iranian female students [22]. In another study, the effectiveness of nutrition education intervention based on the Health Belief Model (HBM) on increasing knowledge and consumption pattern of folate-rich foods, as well as positive beliefs about folate and health, also indicated the post intervention improvements in scores of the HBM constructs [23].

In the present study, the successful effect of nutrition education based on HBM on improving scores of all HBM constructs, and bringing behavioral change of the participants towards consumption of pulses was probably due to the following reasons:(i) incorporating pulses in the women's daily meal was not demanding, as some pulses were already produced in the area, (ii) processing and preparation of different meals from pulses (common in the area) and other cereals and vegetables were demonstrated a number of times, (iii) during group discussions attention was given to peer learning and experience sharing, and (iv) More than 20 % of the participants were lactating mothers who were interested and attentive and who observed a pacemaker being used during demonstration and group discussion sessions. In a previous study, it was shown that changing behaviour regarding use of pulses in complementary feeding and education with the HBM was more effective than regular nutrition education by Health Extension Workers [5]. Based on that previous work, it is hypothesized that change involving food choice may be more difficult to make unless one or more of the constructs of the HBM are addressed.

There are a few studies reporting inconsistent findings with the present study. A study conducted in Free State and Northern Cape showed that, despite provision of nutrition education, a significant improvement in the median frequency of legume intake was not achieved in any of the study areas [20]. That was probably due to poverty, low purchasing power, limited availability of pulses and/or lack of awareness during the study period. Finally, this study is not without limitations, as it was a relatively short-

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term intervention and the post-test results may not have lasted after the intervention ceased.

CONCLUSION

This study found that nutrition education significantly improves knowledge, attitude and consumption of pulses at the household level. Moreover, the study showed the effectiveness of the use of HBM to guide the design of nutrition education intervention, to bring overall behavioral changes among women and households with regards to consumption of pulses.

Given the huge benefits of nutrition education, health extension workers need to be encouraged to use the model by integrating some health elements to be more effective in bringing sustainable improvement in the pattern of pulses based food consumption. Such endeavour should be regular and accompanied by promotion of production and availability of pulses.

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Conflict of interest

The authors declare no conflict of interest.

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Table 1: Demographic characteristics of respondents, Hawassa Zuria Woreda, Sidama Zone, Southern Ethiopia

Variables	*IG (n= 100)*		*CG (n= 100)*		*Chi square (X^2)*	*P-value*
Age in years	N	%	N	%		
15-24	6	6	7	7	.587	.550
25-34	59	59	52	52		
35-49	35	35	41	41		
Religion						
Protestant	83	83	91	91	.140	.093
Others	17	17	9	9		
Ethnicity						
Sidama	92	92	97	97	.213	.122
Others	8	8	2	2		
Marital status						
Ever Married	99	99	100	100	1.00	.319
Single	1	1	0	0		
Formal education						
No	78	78	73	73	.511	.414
Yes	22	22	27	27		

IG: intervention group, CG: Control group

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Table 2: Questions related to KAP regarding pulse consumptions for mothers

Knowledge	**Preferred answers**
Do you know about pulse?	Yes
If yes, from whom?	Neighbors, radio
If yes, what type of pulse do you know?	Peas, haricot bean, kidney bean
Do you know any nutritional benefit of eating pulse?	Yes
If yes, what are the benefits?	Good for health, provide protein
Do you know that you can compensate the protein from animal source food with pulses?	Yes
Do you know the importance of soaking and germinating of pulses?	Yes
Attitude (based on Likert scale as 1=Strongly disagree; 2=Disagree; 3=Undecided; 4= Agree; 5=Strongly disagree)	
Do you think that the cost of pulses is higher than animal source foods?	1& 2
Do you think pulses have nutritional value?	4 & 5
If yes, what nutritional value?	It has protein, energy, minerals and vitamins
Who do you think in the family should eat pulses?	All population group
When animal based food stuffs are unavailable, pulses are an alternative nutritious food sources?	4 & 5
During pulse food preparation, the outer most layers of the pulses should be removed?	4 & 5
The occurrence of abdominal cramp and excessive flatulence due to pulses can be reduced by soaking of pulses	4 & 5
Practice	
Do you consume any pulses or food made from pulses for yourself and your family?	Yes
How frequently?	2 or more per week; 2 or more times per day
How do you like to prepare pulses?	Boiled, sauce, roasted, porridge

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Table 3: Percentage distribution of women by KAP score of household utilization of pulses at baseline and at 6 month in both the intervention and control kebeles, Hawassa Zuria district

		KAP score	*At baseline*	*At 6 month*
Intervention group/kebele (n=100)	**Knowledge**	Knowledgeable (>70%)	5.0	97.0
		Fairly knowledgeable (50-70%)	8.0	3.0
		Not knowledgeable (<50%)	87.0	0
	Attitude	Positive attitude (>70% of agreed)	8.0	81.0
		Neutral/undecided (>70% of neutral)	48.0	18.0
		Negative attitude (>70% of disagreed)	44.0	1.0
	Practice	Practicable (>70%)	5.0	73.0
		Fairly practicable (50-70%)	20.0	21.0
		Not practicable (<50%)	75.0	6.0
Control group/kebele (n=100)	**Knowledge**	Knowledgeable (>70%)	3.0	6.0
		Fairly knowledgeable (50-70%)	6.0	8.0
		Not knowledgeable (<50%)	91.0	86.0
	Attitude	Positive attitude (>70% of agreed)	11.0	11.0
		Neutral/undecided (>70% of neutral)	40.0	49.0
		Negative attitude (>70% of disagreed)	49.0	40.0
	Practice	Practicable (>70%)	4.0	5.0
		Fairly practicable (50-70%)	22.0	19.0
		Not practicable (<50%)	74.0	76.0

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Table 4: Paired-samples t-test for women's KAP on household utilization of pulses at baseline and after six months of intervention, Hawassa Zuria district, Sidama zone, Southern Ethiopia

	Group/kebele	*Mean (SD)*		*95% CI*	*P-value*
		Baseline	**At month 6**		
Knowledge	Intervention	2.95 (0.76)	6.53 (0.77)	(-3.76, -3.39)	.001*
	Control	2.98 (0.66)	3.05 (0.73)	(-0.25, 0.11)	.450
Attitude	Intervention	1.76 (1.04)	5.62 (1.14)	(-4.17, -3.55)	.001*
	Control	1.95 (0.94)	1.91 (1.01)	(-0.25, 0.33)	.784
Practice	Intervention	3.12 (0.78)	4.89 (0.82)	(-1.96, -1.58)	.001*
	Control	3.05 (0.79)	3.10 (0.76)	(-0.26, 0.16)	.643

** Statistically significant (p<0.05)*

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Table 5: Comparison of the pre- and post- intervention Mean (SD) scores of HBM structures within each group (the intervention and the control groups)

HBM Constructs	*Intervention group Mean (SD)*		*P-value*	*95% CI*	*Control group Mean (SD)*		*P-value*	*95% CI*
	BI	*AI*			*BI*	*AI*		
Perceived Susceptibility								
Q1.	2.62 (0.65)	2.96 (0.28)	.001*	(-0.47, -0.21)	2.72 (0.55)	2.62 (0.65)	.183	(-0.05, 0.25)
Q2.	2.58 (0.64)	2.94 (0.31)	.001*	(-0.51, -0.21)	2.44 (0.73)	2.32 (0.76)	.271	(-0.09, 0.33)
Q3	1.94 (0.75)	1.29 (0.52)	.001*	(0.48, 0.82)	1.88 (0.75)	1.84 (0.71)	.705	(-0.17, 0.25)
Perceived Severity								
Q1.	1.94 (0.76)	2.77 (0.49)	.001*	(-1.00, -0.66)	1.84 (0.73)	1.83 (0.74)	.929	(-0.21, 0.23)
Q2.	1.92 (0.72)	2.92 (0.27)	.001*	(-1.15, -0.85)	1.99 (0.70)	1.95 (0.66)	.558	(-0.09, 0.17)
Q3	2.21 (0.79)	1.32 (0.57)	.001*	(0.69, 1.09)	2.25 (0.83)	2.32 (0.79)	.127	(-0.16, 0.02)
Perceived Benefits								
Q1.	1.86 (0.78)	2.89 (0.34)	.001*	(-1.19, -0.87)	1.81 (0.80)	1.68 (0.78)	.292	(-0.11, 0.37)
Q2.	2.12 (0.68)	2.91 (0.32)	.001*	(-0.93, -0.65)	1.98 (0.65)	1.81 (0.68)	.071	(-0.01, 0.35)
Q3.	2.34 (0.70)	2.83 (0.51)	.001*	(-0.65, -0.33)	2.26 (0.75)	2.16 (0.76)	.315	(-0.09, 0.29)
Perceived Barriers								
Q1.	1.43 (0.65)	1.15 (0.41)	.001*	(0.13, 0.43)	1.54 (0.76)	1.68 (0.80)	.210	(-0.36, 0.08)
Q2.	1.57 (0.81)	1.12 (0.33)	.001*	(0.27, 0.63)	1.59 (0.80)	1.74 (0.85)	.174	(-0.37, 0.07)
Q3	1.45 (0.67)	1.04 (0.28)	.001*	(0.26, 0.56)	1.55 (0.78)	1.71 (0.82)	.155	(-0.38, 0.06)
Cues to Action								
Q1.	2.32 (0.95)	2.98 (0.20)	.001*	(-0.85, -0.46)	2.48 (0.88)	2.34 (0.94)	.288	(-0.12, 0.40)
Q2.	2.61 (0.69)	3.00 (0.00)	.001*	(-0.53, -0.25)	2.70 (0.66)	2.57 (0.75)	.239	(-0.09, 0.35)
Q3	1.38 (0.56)	2.50 (0.56)	.001*	(-1.28, -0.96)	1.29 (0.52)	1.40 (0.62)	.174	(-0.27, 0.05)
Self-efficacy								
Q1.	1.57 (0.65)	2.94 (0.24)	.001*	(-1.51, -1.23)	1.56 (0.61)	1.67 (0.70)	.235	(-0.29, 0.07)
Q2	1.39 (0.53)	2.94 (0.24)	.001*	(-1.66, -1.43)	1.39 (0.49)	1.38 (0.49)	.892	(-0.13, 0.15)
Q3	1.45 (0.57)	2.95 (0.22)	.001*	(-1.63, -1.37)	57 (0.64)	1.65 (0.62)	.385	(-0.26, 0.10)

BI: Before Intervention, AI: After Intervention, Q: Questions 1, 2& 3 refer Appendix III
**Statistically significant (p<0.001)*

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Table 6: Comparison of the pre and post intervention Mean (SD) scores of HBM construct between the two groups (intervention and control)

HBM Constructs	*Before Intervention Mean (SD)*		*P- value*	*95% CI*	*After Intervention Mean (SD)*		*P- value*	*95% CI*
	IG	*CG*			*IG*	*CG*		
Perceived Susceptibility								
Q1.	2.62 (0.65)	2.72 (0.55)	.241	(-0.27,0.07)	2.96 (0.28)	2.62 (0.65)	.001*	(0.20, 0 .48)
Q2.	2.58 (0.64)	2.44 (0.73)	.150	(-0.05, 0.33)	2.94 (0.31)	2.32 (0.76)	.001*	(0.46, 0 .78)
Q3.	1.94 (0.75)	1.88 (0.75)	.574	(-0.15, 0.27)	1.29 (0.52)	1.84 (0.71)	.001*	(-0.72, -0.38)
Perceived Severity								
Q1.	1.94 (0.76)	1.84 (0.73)	.346	(-0.11, 0.31)	2.77 (0.49)	1.83 (0.74)	.001*	(0.76, 1.11)
Q2.	1.92 (0.72)	1.99 (0.70)	.488	(-0.27, 0.13)	2.92 (0.27)	1.95 (0.66)	.001*	(0.83, 1.11)
Q3.	2.21 (0.79)	2.25 (0.83)	.729	(-0.27, 0.19)	1.32 (0.57)	2.32 (0.79)	.001*	(-1.19, -0.81)
Perceived Benefits								
Q1.	1.86 (0.78)	1.81 (0.80)	.655	(-0.17,0.27)	2.89 (0.34)	1.68 (0.78)	.001*	(1.04, 1.38)
Q2.	2.12 (0.68)	1.98 (0.65)	.140	(-0.05,0.33)	2.91 (0.32)	1.81 (0.68)	.001*	(0.95, 1.24)
Q3.	2.34 (0.70)	2.26 (0.75)	.435	(-0.12,0.28)	2.83 (0.51)	2.16 (0.76)	.001*	(0.49, 0.85)
Perceived Barriers								
Q1.	1.43 (0.65)	1.54 (0.76)	.274	(-0.31,0.09)	1.15 (0.41)	1.68(0.80)	.001*	(-0.79, -0.35)
Q2.	1.57 (0.81)	1.59 (0.80)	.861	(-0.24,0.20)	1.12 (0.33)	1.74(0.85)	.001*	(-0.80, -0.44)
Q3	1.45 (0.67)	1.55 (0.78)	.334	(-0.30,0.10)	1.04 (0.28)	1.71(0.82)	.001*	(-0.84, -0.50)
Cues to Action								
Q1.	2.32 (0.95)	2.48 (0.88)	.219	(-0.41, 0.09)	2.98 (0.20)	2.34 (0.94)	.001*	(0.45, 0.83)
Q2.	2.61 (0.69)	2.70 (0.66)	.348	(-0.28, 0.10)	3.00 (0.00)	2.57 (0.75)	.001*	(0.28, 0.58)
Q3	1.38 (0.56)	1.29 (0.52)	.242	(-0.06, 0.24)	2.50 (0.56)	1.40 (0.62)	.001*	(0.93, 1.26)
Self-efficacy								
Q1.	1.57 (0.65)	1.56 (0.61)	.911	(-0.17, 0.19)	2.94 (0.24)	1.67 (0.70)	.001*	(1.12, 1.41)
Q2.	1.39 (0.53)	1.39 (0.49)	1.00	(-0.14, 0.14)	2.94 (0.24)	1.38 (0.49)	.001*	(1.45, 1.67)
Q3	1.45 (0.57)	1.57 (0.64)	.165	(-0.29, 0.05)	2.95 (0.22)	1.65 (0.62)	.001*	(1.17, 1.43)

IG: Intervention group, CG: Control group, Q: Questions 1,2 & 3 refer Appendix III
**Statistically significant (p<0.001)*

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Table 7: Descriptive statistics for food consumption pattern of households before and after the intervention, Hawassa Zuria Woreda, Sidama Zone, Southern Ethiopia

Food Consumption pattern in the intervention and Control kebeles												
Intervention kebeles							**Control kebeles**					
Household Consumption pattern	**At least Once or twice/week**		**Twice per Month / less**		**Never**		**At least once or twice/week**		**Twice per Month / less**		**Never**	
	BI	**AI**	**BI**	**AI**	**BI**	**AI**	**BI**	**AI**	**BI**	**AI**	**BI**	**AI**
Bean	13	38	21	37	66	25	8	4	26	31	66	65
Kidney/ Haricot bean	88	115	12	0	0	0	85	90	14	10	1	0
Chickpea	27	53	33	30	40	17	21	13	36	37	43	50
Peas	8	46	52	25	40	29	11	11	54	43	35	46
Lentils	18	43	53	38	29	19	25	13	54	53	21	34
Kocho	82	100	6	0	2	0	92	91	7	8	0	1
Bula	26	71	65	29	9	0	20	29	62	59	18	12
Corn porridge	61	100	17	0	12	0	67	74	22	19	11	7

BI: Before Intervention, AI: After Intervention

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