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Global Health Econ Sustain

ORIGINAL RESEARCH ARTICLE

Assessment of clinician's knowledge and attitude toward health extension program in Ethiopia: An exploratory factor analysis

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Citation: Tekle, M.G., Gebre, E.G., Medhin, G., Teklu, A.M., Tadesse, D, Gebrehiwot, G., *et al*. (2023). Assessment of clinician's knowledge and attitude toward health extension program in Ethiopia: An exploratory factor analysis. *Global Health Econ Sustain,* 1(1): 0887. https://doi.org/10.36922/ghes.0887

Received: May 1, 2023

Accepted: July 10, 2023

Published Online: July 25, 2023

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Abstract

Health extension workers (HEWs) are the primary implementers of the health extension program (HEP) – a government-led community-based health-care program, but clinicians are anticipated to play a critical part in providing extensive support, thus, this study aimed to assess clinicians' knowledge and perceptions of HEP, a cross-sectional study was conducted with 1239 clinicians. A set of 54-item questions was created based on HEP guidelines and relevant literature. Exploratory factor analysis (EFA) identified latent variables with Eigenvalues matrix >1. Cluster variables were derived through orthogonal varimax factor rotation, and internal reliability was evaluated using Cronbach's alpha coefficient. A composite score was generated for each constructed factor, and the associations between variables were determined using a one-way analysis of variance. Multiple linear regression analysis was conducted to eliminate confounders, with statistical significance set at $P < 0.05$. EFA provides three factors explaining 91% of the total variance and labeled as "clinician-perceived attitude towards the skill of HEWs" (F1), "clinician knowledge on HEP activities" (F2), and "clinician-perceived attitude towards the impact of HEP" (F3). Internal reliability for the 54 items was 0.96, and it was 0.93, 0.90, and 0.89 for F1, F2, and F3, respectively. 75.5% and 76.2% of clinicians had favorable attitudes toward F1 and F3, respectively, and 70.2% had good knowledge of F2. F1 was positively correlated with participation in HEP review meetings, home visits, HEP outreach, and willingness to work in HEP but negatively correlated with degree holders. F2 was

positively correlated with participation in HEP review meetings, home visits, being married, and non-medical doctors but negatively correlated with willingness to work in HEP, older age, female, and degree holder clinicians. Three factors, focusing on knowledge, skill, and the impact of HEP, were found and fall under the second-generation HEP framework. Therefore, strengthening HEP guidelines is essential to ensuring the delivery of sustainable and pro-poor HEP.

Keywords: Clinician; Attitude; Health Extension Program; Ethiopia

1. Introduction

In the past two decades, Ethiopia has made remarkable advancements in family and community health care (Jakovljevic *et al.*, 2021; Kok *et al.*, 2015a), most of which can be attributed to the establishment of the health extension program (HEP), which was first launched in 2003 in agrarian settings (Assefa *et al.*, 2019; Workie & Ramana, 2013). The HEP was established to meet international declarations and ensure fair distribution and accessibility of the basic health services for all citizens (Antwi *et al.*, 2017). In Ethiopia, HEP is a community-based health-care delivery strategy that focuses on disease prevention and health promotion with minimal curative care, and its main goal is to distribute healthcare services equally through family- and community-centered approaches ("*HEP Good Draft Strategy*," n.d.). To achieve this, the HEP encompasses 18 components organized into four major packages designed to fulfill the program's objectives (Workie & Ramana, 2013).

The program is primarily executed by female paid staff, known as health extension workers (HEWs) ("Ethiopia Good Practice," 2010). So far, about 39,000 HEWs have been deployed in 17,000 health posts, with the goal of placing two HEWs in each health post (HP) (Workie & Ramana, 2013). All-level health sectors, teaching institutions, political leaders, and international partners have been involved in the implementation of HEP reform and evaluation document (2010). Until 2008, the woreda health office was responsible for providing technical and administrative support for HEP. This responsibility was transferred to graduates of the environmental health science program based in woreda. Finally, follow-up and evaluation of the program were shifted to health center (HC) technical staff, or clinicians, which includes nurses, health officers (HO), midwives, and medical doctors (MD) (Medhanyie *et al.*, 2015).

Clinicians are responsible for preparing plans, providing technical and administrative support for HP, data collection and analysis, and providing on-the-job training for HEWs. Their duties also include sharing the best experience among HPs in the catchment, assisting in HP outreach efforts, assigning staff to HPs, evaluating HP performance, and sending reports to the district health office. Not only the health center but also hospital staff are responsible for supporting the program by providing training, preparing review meetings, offering field supervision, and involving other related activities (Mathewos *et al.*, 2017).

Although there is a link between HEP and a high level of clinician involvement, the knowledge and attitude of clinicians toward HEP have not been researched. Therefore, the objective of this study was to assess clinician knowledge and attitude using valid measurement tools and factors associated with the latent scales.

2. Methodology

2.1. Study setting

Ethiopia's nine regions and two city administrations, with a combined population of more than 100 million, are home to roughly 17,000 HP, 4,000 HCs, and 400 public hospitals (Resource & Directorate, 2019). The nation operates under a three-tier health system. The primary health care unit (PHCU), which includes a primary hospital (PH), HC, and HPs, provides care to the vast majority of the population. The second and third tiers consist of general and referral hospitals, which focus primarily on curative services (Republic, 2019; Resource & Directorate, 2019). Initially only present in four regions, the HEP later expanded to the rest of the nation and has been integrated into the public health system rather than operating as a standalone program (Bilal *et al.*, 2005). In accordance with this structure, the technical staff at PHs, district health administrations, and HCs, including nurses, midwives, HOs, and MDs (Resource & Directorate, 2019), are responsible for providing guidance to the HEP (Ameha *et al.*, 2014; Bilal, 2009; Fetene *et al.*, 2016; Teklehaimanot & Teklehaimanot, 2013). Each HP is staffed by two HEWs and typically serves 3000 – 5000 people (Assefa *et al.*, 2019). The data for this study were gathered in June 2019.

2.2. Study design and sample size

To collect information from clinicians working in public facilities (HCs and hospitals), a cross-sectional study design was used. Since there was no prior research on this subject, the sample size calculation was decided based on

the results of the pre-test. The pre-test results demonstrate a similar percentage of clinician knowledge and attitude; it was 37.5% for good knowledge and a positive attitude. In light of this, the sample size was established using a single population proportion formula, with a 95% confidence interval (CI), a proportion of 37.5%, a marginal error of 4%, a design effect of 2, and a 10% non-response rate, and resulting in a total sample size of 1,239 clinicians. We used a set of 54-item questions to assess the attitudes and knowledge of clinicians.

2.3. Sampling procedure

For this study, the term clinician is defined as clinical staff with the credentials of nurses (diploma and degree), midwives (diploma and degree), HO, integrated surgical and obstetricians (ISO), and medical doctors (general practitioner, pediatrician, and gynecologist–obstetricians) who work in public facilities (HC and hospitals) with at least one or more service year(s) in a public facility. This survey was done under the umbrella of "HEP assessment," in which data were collected in two rounds, with this survey being a part of the second round. In the first round, 149 HCs from 64 rural districts were selected randomly for facility assessment. Urban HEP assessment was included in the second round, and an additional 45 HCs (38 from Addis Ababa & 7 from Dire Dawa) were included in the survey. For the convenience of data collection, all HCs (149 HC from the first round and 45 from round two) were included in this survey.

Random selection was employed to choose hospitals authorized by the Federal Ministry of Health (MoH, 2010). for practical training of HEWs. As a result, 11 general hospitals (GH), 15 PHs, and 11 referral hospitals (RH) were selected. The number and type of clinicians interviewed per facility were chosen using standard staff deployment (Resource & Directorate, 2019). For each HC, the research team decided to interview five clinicians, including one HO, two nurses (degrees and diplomas), and two midwives (degrees and diplomas). In the case of PHs, the number of clinicians interviewed increased to seven, including one HO, two nurses (degrees and diplomas), two midwives (degrees and diplomas), one general practitioner, and one ISO. As for general and referral hospitals, the number of interviewees increased to nine, with the addition of one gynecologist–obstetrician and one pediatrician added to the staff types mentioned for PH.

We used simple random sampling to select healthcare facilities and systematic random sampling to select clinicians. The Kish method was applied within the facility to select the clinicians who would be interviewed. The data collector visited the maternal and child health (MCH) department of the selected facility, assuming that MCH clinicians were directly leading the HEP program. The data collector initially consulted with the department head to determine the number of providers available at the time of data collection. For instance, the data collector would speak with the HO directly if a department only had one. In cases where there were more than two HOs, the data collector listed their name in alphabetical order and selected one using the Kish-grid method. The same procedure was used for selecting clinicians with other qualifications ("Respondent Selection Methods," n.d.).

2.4. Data collection

The survey tool was developed by adapting national HEP guidelines and referring to previous studies within the field. The final questionnaire was rearranged and reviewed by experts in public health, HEP, and social education, such as psychologists, to ensure face and content validity. It was written in English and then translated into Amharic. The questionnaire was divided into four sections: sociodemographic data, clinician experience in HEP, knowledge, and attitude. To identify the outcome variables, we used 54 items (23 knowledge and 31 attitudes), all of which were positively worded. The response for knowledge item questions was marked as zero for "No," or the incorrect response, and marked as one for "Yes," or the correct response. The attitude item questions were graded using a five-point Likert scale, with 0 representing "strongly disagree," 1, 2, 3, and 4 representing "disagree," "neutral," "agree," and "strongly agree," respectively.

Health background data collectors and supervisors with bachelor's and master's degrees, possessing extensive experience in survey administration and data collection, were recruited and deployed to gather the data through face-to-face interviews. Before the main data collection phase, the survey tool underwent a pre-testing process in three districts that were not part of the selected sample. After a full day of training, field researchers used the open data kit tablet app to collect data during interviews. Once the interviews were completed, the collected data was promptly transferred to the main data storage server through the Internet. Throughout the data collection process, a central data manager closely monitored the incoming data and promptly alerted the field staff if any potential errors were detected.

2.5. Data analysis

Data were downloaded from a central server in CSV format and exported to STATA version 14 for further data analysis (STATA Corporation, College Station, Texas 77845 USA). The data were cleaned and recoded after missing values and outliers were checked. To ascertain the item distribution,

the response rates for each item were examined using mean and median summaries. Two statistical models were used: factor analysis to determine latent variables and linear regression analysis to determine associated factors. The attitude item rating scale had to be converted to run factor analysis. As a result, the attitude rating scale was recoded into two scales to align with the knowledge scales. To demonstrate incorrect perspectives, responses with neutral, disagree, and strongly disagree were changed to zero and denoted as "disagree;" conversely, responses with agree and strongly agree were changed to one and denoted as "agree." Items were normally distributed, and due to a lack of standards, each item question in the latent variable was added up to create composite scores ranging from 0 to 54. A higher score denotes that the clinician is knowledgeable or has a positive attitude toward HEP. The mean and median values of each latent variable were calculated. The central message of the item questions served as the basis for labeling the latent variables. Latent variables were converted into dichotomous variable types using the mean as a cutoff point, with values above the mean labeled as "good knowledge" or "favorable attitude" and scores below the mean labeled as "poor knowledge" or "unfavorable attitude." The factor analysis and linear regression are described as follows:

(a) Factor analysis
The similarity between items was assessed using the average inter-item correlation, and a diagonal correlation matrix was calculated to check communalities. Sampling adequacy for both individual items and factors was measured using the Kaiser–Meyer–Olkin (KMO) test, with values >0.6 considered adequate (Robson & Haddad, 2012; VanSickle *et al.*, 2016). Before performing the exploratory factor analysis (EFA), three criteria were checked: sample size, factorability of the correlation matrix, and KMO measure of sampling adequacy or Bartlett's test of sphericity. EFA was then applied, and the number of factors extracted from item questions was determined using the Eigenvalues matrix, where a value >1 was considered to construct factors. A scree plot was created to determine the relative importance of retained factors by examining significant breaks among dotted lines in the graph (Ul Hadia *et al.*, 2016). The total variance was used to explain factors removed due to significant breaks. Factor loading was carried out, and items with weak loadings (<0.4) or cross-loading on several factors were deleted (Winters *et al.*, 2016). Interpretation of factors was made after factor rotation to create cluster variables. The orthogonal varimax-type rotation method was applied to summarize the dimension of the scale (Yong & Pearce, 2013). The measure of internal reliability was assessed using Cronbach's alpha coefficient and was tested for both the subscales/factors which emerged from item reduction and for the attitude scale items as a whole.

(b) Outcome variables
A total of 54-item questions were used to derive the number of latent variables produced using EFA, which were used to determine the outcome variables. Three outcome variables—the clinicians' perceived attitude toward the skill of HEWs (F1), clinicians' knowledge towards HEP activities (F2), and clinicians' perceived attitude towards the impact of HEP (F3) were created through the use of EFA. Predicted continuous values were generated for each latent variable, and each factor underwent a linear regression analysis.

(c) Linear regression analysis
Predicted values for each constructed factor with enough items were generated. However, a factor with inadequate items (≤2) was excluded from further analysis (Yong & Pearce, 2013). An analysis of variance (ANOVA) was used to determine the level of association between dependent variables and predictors. Eleven independent variables, of which two of them (age and experience) were continuous-discrete, were included in the regression model. Categorical variables such as sex, marital status, educational level, qualification, facility type, involvement in HEP outreach, involvement in HEP review meetings, involvement in HEP home visits, and willingness to work in HEP were included. A normality test was run before multiple linear regression was carried out. Multicollinearity was checked using variance inflated factor (VIF), where VIF >10% indicates the presence of collinearity. An overall goodness-of-fit test was measured using adjusted R-squared (r^2). A variable with $P < 0.25$ in the one-way ANOVA test was considered statistically significant and re-entered into the multivariant linear regression model to exclude confounders. In the multivariant linear regression model, a $P < 0.05$ at a 95% CI was considered statistically significant.

3. Results

3.1. Characteristics of respondents

A total of 1210 clinicians were interviewed; details are shown in Table 1. Over half (53.4%) of the population was in the 25- to 29-year-old age range, with a mean age of 28.3 (SD = 5.4) years. Male respondents comprised 50.8%, and more than half (51.8%) spent the first 15 years of their lives growing up in rural areas. Married respondents account for 621 (51.3%), with the majority (42.8%) of them meeting the qualification of clinical nurses. The majority of clinicians (53.1%) had <5 years of experience, with an

average of 5.3 years spent working in the healthcare sector. Degree holders constitute 50.6% of the total. More than three fourth (77.8%) were from health centers, and 51.5% of the respondents worked in rurally situated facilities.

3.2. Level of involvement, recommendation, and willingness to support HEP

The degree of clinician participation in the HEP was assessed using three questions with dichotomous (Yes/No) answers: (i) Participation in HEP review meetings; (ii) participation in HEP outreach activities; and (iii) participation in HEP home visits. Any positive responses to these questions meant the respondent had been exposed to HEP. According to the findings, 27.8% had no involvement in HEP. 64.6%, 45.2%, and 28% of respondents, respectively, participated in HEP outreach, HEP review meetings, and home visits. Approximately 1014 (83.8%) clinicians reported treating patients whom HEWs had referred, and more than half (56.9%) reported sending patients back to HP from their facility. Clinician readiness to collaborate in HEP accounts for 88.4%. The decision to share additional tasks with HEW at HP, such as eye care, medical abortion, and hypertension screening, is being debated by healthcare professionals. Clinicians were asked about task-sharing for the aforementioned activities. As a result, 50.3% of clinicians approved of task-sharing of diabetes mellitus injection with HEWs at HPs, but 18.2% of them never approved of additional task-sharing to be cascaded into HP, as shown in Figure 1.

Table 1. Socio-demographic characteristic of respondents, clinician attitude in Ethiopia, 2019

Demography variables	Category	Frequency (*N*=1210)	Percentage
Age in complete years	20 – 24	239	19.7
	25 – 29	646	53.4
	30 – 34	184	15.2
	≥35	141	11.7
Marital status	Single	580	47.9
	Married	621	51.3
	Other	9	0.7
Profession	Medical Doctors	71	5.9
	Nurse	518	42.8
	Midwife	395	32.6
	Health officer	199	16.5
	Integrated surgical and obstetrician	27	2.23
Highest level of education	Diploma	543	44.9
	Degree	612	50.6
	Masters	23	1.9
	Specialist	32	2.6
Service year/ experience as clinician	1 – 4 years	642	53.1
	≥5 years	568	46.9
Type of facility clinicians are working in now	Hospitals	269	22.2
	Health centre	941	77.8
Location of facility clinicians are working now	Rural	623	51.5
	Urban	587	48.5

3.3. EFA

The 54 items had a sampling adequacy measure of KMO = 0.97 (ranging from 0.93 to 0.98), indicating that the variables shared enough similarities to execute EFA. The item questions demonstrated a normal distribution when graphically presented. The "factorability" was confirmed by Bartlett's test of sphericity, and the null hypothesis was rejected ($p < 0.001$ and χ^2 [405] = 17886.4). These findings supported the use of EFA based on the KMO, Bartlett's test of sphericity, and anti-image correlation. Four factors with Eigenvalues greater than 1 were found using the EFA, which utilized 54 items, as illustrated in Figure 2.

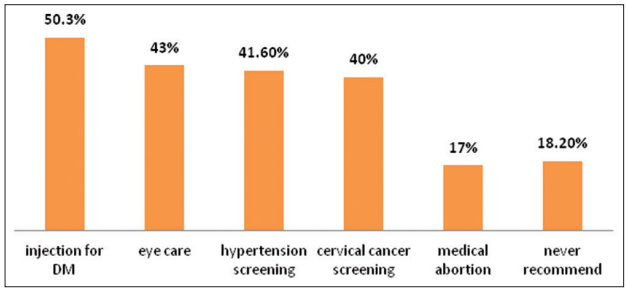

Figure 1. The task-sharing activities recommended by clinicians for implementation by health extension workers at health points in Ethiopia, 2019.

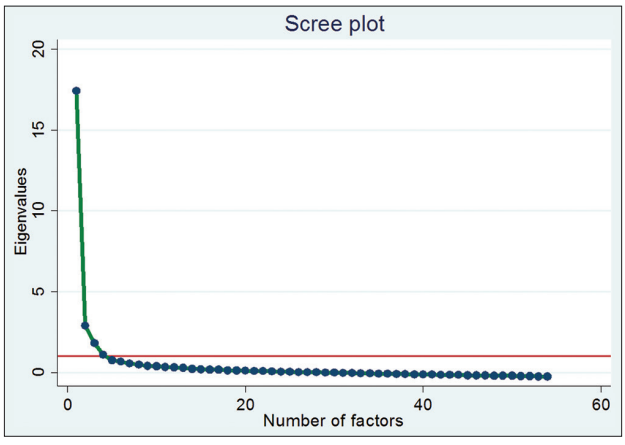

Figure 2. Scree plot of the clinician attitude factors in Ethiopia, 2019.

The four factors account for 91% of the total variance, with F1, F2, F3, and F4 accounting for 67.9%, 11.3%, 7.1%, and 4.2% of variances, respectively. Following factor extraction, the item structure for interpretation was determined using the orthogonal varimax rotation method. As illustrated in Table 2, the varimax rotated solution provides a more comprehensible four factors model, with F1 labeled as perceived clinician attitude toward HEW's skill (17 items), F2 labeled as clinician knowledge toward HEP activities (15 items), F3 labeled as perceived clinician attitude towards the impact of HEP (10 items), and F4 labeled as latrine construction (1 item).

Table 2. Explanatory factor loading, and Cronbach's alpha of clinician's attitude, Ethiopia, 2019

Code	Questions	Factors		
		F1	F2	F3
KR01	HEWs are providing appropriate health education through home visit			
KR02	HEWs are encouraging households to construct latrine			
KR03	HEWs are providing preventive health services such as vaccination for children and mothers			
KR04	HEWs are treating under five children with diarrhea		0.64	
KR05	HEWs are treating under five and adults with malaria		0.64	
KR06	HEW who are trained in ICCM are treating under five children with pneumonia		0.68	
KR07	HEWs who are trained in ICCM identify under five children with danger signs		0.62	
KR08	HEW who are trained in ICCM identify under five children with ear problems		0.59	
KR09	HEW who are trained in ICCM are treating under five children with malnutrition		0.60	
KR10	HEWs are rendering ANC services at health posts and household visits		0.45	
KR11	HEWs are providing PNC services at health post or home visits		0.49	
KR12	HEWs are providing OTP for under five children		0.55	
KR13	HEWs are conducting malnutrition screening and counseling for children, pregnant and lactating mothers		0.45	
KR14	HEWs are not providing delivery service at health post level			
KR15	HEWs who are trained FP are providing long-acting contraceptives except permanent methods		0.43	
KR16	HEWs are providing first aid for emergency cases at health post level			
KR17	HEWs are making referrals for patients from health post or home visit to higher level facilities such as HC and hospitals			
KR18	HEWs are collecting family health data using family folders		0.46	
KR19	HEWs are conducting rapid diagnostic test and treatment for malaria		0.67	
KR20	HEWs are providing TB DOTs at Health post level		0.49	
KR21	HEWs are addressing adolescent health care needs such as behavioral change and family planning		0.41	
KR22	HEWs are distributing ITN			
KR23	HEWs are carrying out epidemic surveillance and report			
ARW01	HEWs can efficiently conduct rapid diagnostic test and treatment for malaria if they receive ICCM training	0.48		
ARW02	HEWs can effectively provide community-based TB DOTs	0.41		
ARW03	HEWs can effectively treat under five children with diarrhea through training	0.67		
ARW04	HEWs can effectively treat under five and adults with malaria if they got training	0.62		
ARW05	With training HEWs can effectively treat under five children with pneumonia	0.60		
ARW06	HEWs can effectively refer under five children with danger signs if they got training	0.58		
ARW07	HEWs can treat under five children with ear problems if they got training	0.56		
ARW08	HEWs with training can effectively treat under five children with malnutrition	0.60		
ARW09	HEWs can effectively implement medical abortion if this task is shift to them with training			
ARW10	HEWs can contribute meaningful identification and referral of cases to higher level facility	0.57		
ARW11	HEWs can provide long-acting reversible contraceptives including IUCD if they got training	0.42		
ARW12	HEW can provide uncomplicated delivery service at health post level			
ARW13	HEWs can effectively deliver first aid services for emergency cases at health post	0.51		

(Cont'd...)

Table 2. *(Continued)*

Code	Questions	Factors		
		F1	F2	F3
ARW14	HEWs can successfully provide vaccination for children and mothers	0.66		
ARW15	Adolescent health needs such as behavioral change and family planning can be addressed through HEW	0.54		
ARW16	Clinicians have to give value and respect for the works done by HEWs	0.64		
ARW17	I would be happy to work with HEWs in any health-related activity	0.63		
ARW18	I do not have doubt on the competence of rural HEW to run their daily activities	0.42		
ARW19	HEWs are well trained and qualified to the level their job demands			
ARW20	HEWs are playing their role in improving community health needs			
ARW21	Generally, I support the existence and continuity of HEWs activity in the community	0.63		
ARP01	HEP has been promoting community health needs well			0.60
ARP02	HEP has been meeting Health care needs of hard-to-reach communities			0.58
ARP03	Health seeking behavior of rural community has increased after the implementation of HEP			0.63
ARP04	HEP has contributed to decreased maternal and under five mortality in rural community			0.66
ARP05	HEP is a necessary and desirable for improvement of community health needs			0.64
ARP06	HEP has an efficient planning, follow up, monitoring and evaluation			0.45
ARP07	In my view, primary healthcare delivery coverage is improved since the implementation of HEP			0.64
ARP08	Adolescent health needs such as sexual behavior, STI prevention, FP provision, and behavioral change can effectively be addressed through HEP			0.47
ARP09	Overall, HEP has a significant impact on improvement of community health in rural Ethiopia			0.68
ARP10	Generally, I support the existence and continuity of HEP activity in the community			0.65
**	Cronbach's alpha	0.93	0.91	0.89

Abbreviations: HEP: Hospital extension program; HEW: Hospital extension worker; ANC: Antenatal care; PNC: Postnatal care.

However, we decided to exclude F4 from further analysis because this factor was only constructed by one item. One item, ARW20, which was cross-loaded in F1 and F3, as well as weakly loaded items (0.4), were eliminated. 42 items were therefore kept in the final model. The sampling adequacy measure for the remaining 42 items was 0.96, with an inter-item range of 0.93 – 0.98. For F1, F2, and F3, the sampling adequacy was 0.96, 0.93, and 0.93, respectively, showing that the factors have been sufficiently sampled. The percentage of variance was the same (91%) for both item extraction and rotation sums. However, the varimax rotation resulted in changes in the percentage of variance across factors: F1 changed from 67.9 % to 31.1%, F2 changed from 11.3% to 27.2%, and F3 changed from 7.1% to 25.6%.

3.4. Internal consistency

The average inter-item variance and covariance were determined to be 0.05 and 0.31, respectively. The correlation between an item's score and the sum of all the other items was calculated to determine how well an item correlated with the overall scale, with a value of <0.3 being considered poor. Except for one item, the item-total correlation scores ranged from 0.38 to 0.70, indicating a good correlation. Even though all items showed a good item-total correlation score (>0.30), one item (ARW09) received a relatively low item-total score correlation (0.29). The 54 items' Cronbach's alpha value was reported at 0.96. The model was re-tested after dropping ARW09 from the analysis to see if Cronbach's alpha would be changed substantially. However, dropping this item did not result in an increase beyond 0.961. As a result, the final Cronbach's alpha was reported at 0.96. Cronbach's alpha was examined for items retained in each of the three factors and reported as: F1 = 0.93, F2 = 0.91, and F3 = 0.89.

3.5. Knowledge and attitude of clinicians

Clinicians' perceived attitudes toward HEWs' skill (F1), Clinicians' knowledge of HEP activities (F2), and Clinicians' perceived attitudes toward the impact of HEP (F3) are the three outcome variables created from EFA. The F1 composite score has a value between 0 and 17, with a mean score of 12.9 (SD = 4.7). As shown in Table 3, 75.5% of respondents had a favorable attitude toward F1. Activities of the HEP should continue as a community health intervention, according to 87.9% of respondents. The majority of clinicians (86.6%) thought that HEWs could successfully administer vaccination

services to their community. On the other hand, 70.1% of clinicians believe HEW could not offer safe abortion services.

Fifteen items constitute the F2, which had a reported mean score of 10.9 (SD = 4.3). An overwhelming majority of clinicians (85%) were aware that HEWs offer nutritional counseling and screening for children. The respondents' item-specific knowledge ranged from 59% to 85%, with more than two-thirds (70.2%) having good knowledge of F2. The F3 composite score value has a mean score of 8.2 (SD = 2.6) and a range from 0 to 10. The percentage of clinicians who had a favorable attitude toward specific item questions ranged from 59.5% to 90.6%, and more than three-forth (76.2%) of clinicians had a favorable attitude toward F3. The majority of respondents (90.6%) advocated for the continuation of HEP as a government initiative, and 88.7% believed that HEP had significantly reduced maternal and infant mortality in the country. However, 40.5% of respondents believed that HEP lacked a good planning, monitoring, and follow-up system.

Table 3. Outcome variables of clinician's knowledge and attitude outcome variables, in Ethiopia, 2019

Name of outcome variable	Classification	Frequency (*N*=1210)	Percent (%)
F1 (Clinician perceived attitude toward the skill of HEWs)	Favorable attitude	914	75.5
	Unfavorable attitude	296	24.5
F2 (Clinician knowledge of HEP activities)	Good knowledge	849	70.2
	Poor knowledge	361	29.8
F3 (Clinician perceived attitude toward the impact of HEP)	Favorable attitude	922	76.2
	Unfavorable attitude	288	23.8

Abbreviations: HEP: Hospital extension program; HEW: Hospital extension worker.

3.6. Level of association

A one-way ANOVA test was conducted on eleven predictors against the predicted factor. As illustrated in Table 4, all eleven variables show a significant relationship with F1. Thus, the null hypothesis was rejected. With regard to F2, only one variable (service year) was statistically insignificant. Only three variables showed a significant correlation with F3. All independent variables significantly correlated with factors were entered into a multiple linear regression model to exclude possible confounders.

3.7. Multiple regression analysis

After confirming the normal distribution of the predicted factors, multiple regression analysis was performed. Five of the eleven candidate predictors were statistically significant for F1, at the full model report of r^2 = 14%, F (16, 1184) = 12.00, and P = 0.001. Degree holders had a lower average perception of F1 than diploma holders by −0.28 (95% CI [−0.41, −0.15], P = 0.001). F1 was positively correlated with participation in HEP review meetings, outreach engagement activities, home visits, and those who reported being willing to support HEP activities. As the level of involvement in HEP review meetings increased, F1 also increased by 0.15 (95% CI [0.03, 0.27], P = 0.000). The F1 increased by 0.27 (95% CI [0.14, 0.40], P = 0.001) as HEP outreach engagement increased. A rise in home visit participation also resulted in a 0.17 (95% CI [0.05, 0.30], P = 0.005) increase in F1. Clinicians willing to support HEP had an average F1 of 0.73 higher than those who were not (95% CI [0.56, 0.89], P = 0.001).

Table 4. List of variables with ANOVA result, Ethiopia, 2019

Independent Variables	F1		F2		F3	
	F-value	*p*-value	*F*-value	*p*-value	*F*-value	*p*-value
Age	2.5	0.00	1.36	0.08	0.9	0.62
Sex	1.56	0.21	5.8	0.01	0.01	0.91
Marital status	3.4	0.06	7.45	0.006	0.63	0.42
Qualification	7.1	0.00	10.15	0.00	1.84	0.11
Level of education	6.56	0.002	8.20	0.001	2.62	0.04
Service year	1.34	0.10	1.1	0.3	1.03	0.42
Facility type working in	15,76	0.001	24.35	0.00	0.04	0.84
Involve in HEP review meeting	44.34	0.00	62.35	0.00	0.98	0.32
Involve in HEP outreach	62.36	0.00	33.44	0.00	0.03	0.85
Involve in HEP home visit	32.76	0.00	34.81	0.00	0.51	0.47
Willing to work HEP outreach	83.57	0.00	13.68	0.002	1.44	0.23

Abbreviations: HEP: Hospital extension program; ANOVA: Analysis of variance.

For the F2, eight out of ten predictors were statistically significant (r^2 = 11%, F [15, 1185] = 10.8, and P = 0.001). F2 decreased by −0.013 as age increased (95% CI [−0.02, −0.002], P = 0.02). For females, the average value of F2 was 0.20 lower (95% CI [−0.31, −0.09], P = 0.001). Clinicians who were married had an F2 that was 0.16 higher than those who were not married (95% CI [0.05, 0.27], P = 0.005). In comparison to MDs, the value of F2 increased for nurses, midwives, and HOs by 0.33 (95% CI [0.05, 0.62], P = 0.02), 0.41 (95% CI [0.11, 0.70], P = 0.007), and 0.51 (95% CI [0.20, 0.82], P = 0.00), respectively. In addition, there was a linear relationship between education level and F2, with degree holders having an average F2 value of -0.19 (95% CI [−0.32, −0.07], P = 0.002) lower than diploma holders. As participation in HEP review meetings and home visits increased, F2 also rose by 0.27 (95% CI [0.15, 0.38], P = 0.000), and 0.17 (95% CI [0.05, 0.29], P = 0.006), respectively. For the clinicians who were willing to support HEP as opposed to those who were not, the value of F2 decreased on average by -0.44 (95% CI [−0.60, −0.28], P = 0.000).

4. Discussion

To achieve universal access to primary healthcare in the most underserved communities, HEP, a well-known government initiative, continues to be a top priority for health officials (Bilal, 2009; Wang *et al.*, 2016). It is also a crucial component of the healthcare system in Ethiopia (Republic, 2019). Despite clinicians actively participating in the program and significantly contributing to its success, neither their comprehension of the program nor their attitudes toward its effects have ever been evaluated (Ameha *et al.*, 2014; Jakovljevic *et al.*, 2017). Hence, the objective of this study was to assess clinicians' knowledge of and attitudes toward the HEP as well as to analyze factors associated with latent scales. Three crucial elements that impact clinician perception and knowledge of the HEP were produced by the EFA after performing several procedures to confirm the measurement reliability. The ability of HEWs, the impact of HEP on community health, and clinicians' perspectives on HEP activities – all of which are top priorities for the healthcare system – were presented as key findings, and the authors draw the conclusion that these findings are beneficial to policymakers, program implementers, and health leaders in the Ethiopian health sector. However, due to the fact that the data only comes from public facilities, the lack of generalizability is a major limitation.

One factor, the perceived clinicians' attitude toward the HEW's skill, was identified. This supports the strategic objectives of optimizing the HEP road map, which demands that HEW capacity be strengthened to increase their skill (Ababa, 2020). The quality of care provided to the large community in Ethiopia can be improved by improving the technical proficiency of HEW, who forms the second-largest group of health professionals. There is evidence that the expanded HEP necessitates abilities far beyond what HEWs are currently capable of (Ameha *et al.*, 2014; Fetene *et al.*, 2016; Tilahun *et al.*, 2017). Strong competency standards and ongoing in-service training must therefore be a part of technical and vocational education and training to boost HEWs' confidence levels. In a previous study, it was found that 95.7% of HEWs believed they were competent in performing their job duties (Desta *et al.*, 2017). However, in the current study, there was a contrasting finding, with only 75.5% of clinicians agreeing that HEWs possessed the necessary skills to carry out the HEP program. This discrepancy in perceptions could be explained by social desirability bias, where HEWs might exaggerate their skills to present a positive self-image.

A clinician's familiarity with the system is manifested by their understanding of the tasks carried out by the HEP. In the study, the EFA yielded a dimension that measured clinicians' familiarity with HEP activities (F2). The results indicated that clinicians are well-versed in HEP activities, highlighting the extent of interconnection among the contributors, including clinicians, in the program. According to the present study, 70.2% of clinicians demonstrated a good understanding of and support for HEP activities. The interaction between HEWs and clinicians, as well as the presence of clearly defined roles, ultimately contributed to the program's success and HEW satisfaction (Kok *et al.*, 2015b). However, due to the methodological flaw, it is challenging to determine whether clinicians acquired their understanding of HEP activities through direct participation in HEP or through training.

The HEP establishment guideline primarily aimed to enhance the capacity of local communities to improve their health and bridge the healthcare access gap between urban and rural populations (Mangham-Jefferies *et al.*, 2014; Waddington & Waddington, 2015). The results of this study aligned with the goals of HEP, as the perceived attitude toward the impact of HEP (F3) emerged as the third factor. This finding is consistent with the objective of optimizing the HEP roadmap, which aims to accelerate access to essential health services (Ababa, 2020). Health professionals hold diverse opinions regarding the effect of HEP on community health. While many believe in its positive impact, some argue that the effects are not easily noticeable. Due to insufficient supporting data, such debatable issues remain unresolved. However, other researchers have identified these issues as crucial factors to consider when evaluating the effectiveness

of HEP (Ameha *et al.*, 2014; Assefa *et al.*, 2019; Bilal, 2009; Jakovljevic, *et al.*, 2020). The findings of this study indicate that 90.6% of clinicians believe that the HEP should continue as a government program, and 76.2% of clinicians perceive the HEP to have a positive impact on community health. Given that the respondents are program participants with firsthand knowledge, we, as authors, have confidence in these findings. Even though it was very specific, a study found that model HEP households experienced a 17.7% decrease in diarrheal disease among children under five, compared to households without HEP (Tadesse *et al.*, 2022). This further supports the notion that HEP is progressing toward achieving its objectives.

According to the present study, individuals with degrees had lower average values for F1 and F2 compared to those with diplomas. This observation aligns with the Ethiopian health system standards (Consent *et al.*, n.d.), which state that degree holders are more likely to be deployed in higher-level health facilities like hospitals, leading to less exposure to HEP. On the other hand, diploma holders are usually assigned to HCs, enabling them to collaborate more closely with HEWs since HPs are directly linked to HCs for administrative and support purposes. As a result, the level of clinician involvement in HEP may impact the predictive values of the different factors. As the clinicians' exposure to HEP review meetings, HEP outreach engagement, and home visits increased, the predicted value of F1 and F2 also increased. This finding is logical because greater exposure enables clinicians to witness the skills of HEWs and understand and remember the HEW's typical responsibilities. When clinicians expressed a greater willingness to work with HEWs, the predictive values of F1 increased by 0.73, while the predictive values of F2 decreased by −0.44. Given the relationship between F1 and F2, the difference in results could be attributed to chance.

The study's regression analysis revealed a negative correlation between age and the predicted value of F2, with an estimated decrease of −0.012 as age increased. One possible explanation for this finding is that older clinicians are not assigned to the HEP program due to the challenging nature of HEP activities, which limits their understanding of HEP daily activities. Similarly, female clinicians had a predictive value for F2 that was 0.20 lower than that of male clinicians. Furthermore, married clinicians exhibited a greater increase in F2 values compared to non-married clinicians. Moreover, nurses, midwives, and home visitors had higher F2 values than MDs. These findings are comparable to similar studies conducted in health systems that share a similar legacy of medical service provision and financing (Jakovljevic *et al.*, 2016; Jakovljevic *et al.*, 2021).

The EFA in the present study identified three factors that collectively accounted for 90% of the total variance. Even though the lack of literature in the field makes direct comparisons challenging, some non-similar studies have reported variance closer to the findings of the present study and are considered a good indicator of model fitness (Gould *et al.*, 2014; Winters *et al.*, 2016). However, it is worth noting that the variance in the present study was nearly three times that of a scale measured in the United States (variance = 32%) (VanSickle *et al.*, 2016). To assess the reliability of the measurement, Cronbach's alpha coefficient, which is expressed as a number between 0 and 1, is frequently used to estimate reliability (Riley, 1969); values closer to one indicate that the model is well fit (Brown, 2002; Tavakol & Dennick, 2011). In the current study, the internal consistency of the 54 items yielded a Cronbach's alpha coefficient of 0.96, demonstrating a high level of reliability for the measures. The measurement error of the instrument was calculated to be 11%, indicating that its components are interrelated. However, this does not guarantee that the alpha coefficient would not rise if the test had more items. The literature suggests that sampling adequacy is considered good when the subject-item ratio is at least 10:1 (Husum *et al.*, 2008). Therefore, a minimum of 280 samples would have been required for this study. However, the inclusion of 1,210 samples in this study exceeded this minimum requirement by four times. As a result, the high reliability observed in this study can be attributed to the large sample size used.

5. Conclusion

The tool has proven to be reliable. As a result, it is appropriate to use this tool to obtain clinician opinions for the HEP program. Three important elements relating to HEW skills and knowledge and the effect of HEP on community health were discovered through EFA. These components comply with MoH (2010) recommendations for second-generation HEPs. In this study, we found that clinician exposure to the HEP program improved their understanding of and attitude toward HEP. Health services benefit from clinician participation in HEP implementation.

Acknowledgments

The authors would like to express their heartfelt gratitude to MERQ Consultancy for funding and conducting this study, as well as for allowing us to use the data to develop this manuscript. The study was carried out by MERQ Consultancy PLC in collaboration with the Federal Ministry of Health. The comprehensive evaluation of the HEP, of which this study was a part, was funded by the Bill & Melinda Gates Foundation. We also thank the field

supervisors, data collectors, and respondents for their dedication and tireless efforts.

Funding

The comprehensive assessment of the HEP was funded by the Bill & Melinda Gates Foundation (INV007993). The current study is a component of the assessment, and the publication charge is not covered by the funding.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval (Approval ID: EPHI-IRB-151-2018) was obtained from the Ethiopian Public Health Institution (EPHI). The official approval letter has been provided by the Federal Ministry of Health.

Consent for publication

Informed consent was obtained from all the participants before the interview.

Availability of data

Data can be obtained from corresponding author following formal request.

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