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Knowledge of preconception care and associated factors among maternal health care providers working in urban public health institutions of Eastern Ethiopia

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Abstract

Background: Provision of preconception care is significantly affected by the health care provider's knowledge of preconception care. In Ethiopia, preconception care is rare, if even available, as part of maternal health care services. Thus, this study aimed to determine the level of knowledge of preconception care and associated factors among health care providers working in public health facilities in Eastern Ethiopia.

Methods: A multicenter cross-sectional study was conducted from 1 March to 1 April 2020. A simple random sampling technique was used to select a total of 415 maternal health care providers. We utilized a structured, pretested, and self-administered questionnaire to collect data. Data were entered into EpiData (version 3.1) and exported to STATA (version 16) for analysis. Descriptive statistics and bivariate and multivariate logistic regression analyses were performed. All covariates with a p value $\leqslant 0.20$ in bivariate logistic regression were entered into a multivariate logistic regression analysis to control the confounding variables; variables with a p value < 0.05 were considered statistically significant.

Results: Out of 410 respondents, 247 (60.2%; 95% confidence interval: 55.4–65.1) had good knowledge of preconception care. Having an educational level of Bachelor of Science degree and above (adjusted odds ratio: 6.97, 95% confidence interval: 3.85–12.60), 5 or more years work experience (adjusted odds ratio: 2.60, 95% confidence interval: 1.52–4.49), working in a hospital (adjusted odds ratio: 2.50, 95% confidence interval: 1.25–4.99), reading preconception care guidelines (adjusted odds ratio: 3.06, 95% confidence interval: 1.40–6.68), and training on preconception (adjusted odds ratio: 2.90, 95% confidence interval: 1.37–6.15) were significantly associated with good knowledge of preconception care.

Conclusions and Recommendations: Three out of five maternal health care providers in this study had good knowledge of preconception care. Facilitating continuous refreshment training and continuous professional development for health workers, preparing comprehensive preconception care guidelines for health institutions, and reading preconception care guidelines were highly recommended.

Keywords

Ethiopia, health care providers, knowledge, preconception care

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Introduction

Preconception care (PCC) is defined by the World Health Organization (WHO) as "the provision of biomedical, behavioral, and social health interventions to women and couples before conception occurs."[1] PCC aims to reduce the risk of adverse pregnancy outcomes by optimizing women's health, health behaviors, and knowledge before conception through risk assessment, health promotion, and medical and psychosocial interventions.[2] PCC packages include assessment of nutritional conditions, cessation of tobacco use, screening of genetic conditions, environmental health, screening and management of infertility, interpersonal violence, preventing unwanted and rapid successive pregnancies, treatment of sexually transmitted infections (STIs), prevention and management of HIV, mental health, prevention of psychoactive substance use, immunization, and prevention of female genital mutilation.[3]

There is a global commitment to end preventable maternal and childhood mortality by ensuring a continuum of care through pregnancy, childbirth, postnatal period, infancy, childhood, adolescence, and adulthood.[3] Despite prioritizing maternal and child health care services both by government and other stakeholders in developing counties, reducing maternal and child morbidity and mortality are not at the expected level, of which 77% of maternal, newborn, child deaths, and stillbirth are still preventable.[4] Many adverse reproductive outcomes, including pregnancy loss, congenital disorders, and low birthweight, are associated with preventable preconception risk factors.[1,5] One strategy toward ending preventable maternal and child mortality is implementing PCC.[6]

Available evidence from WHO shows success in implementing PCC initiatives in high-income countries, such as Italy, the Netherlands, and the United States, and low- and middle-income countries, such as Bangladesh, the Philippines, and Sri Lanka.[1] However, it is not well implemented in many countries worldwide. It especially lacks in middle- and low-income countries such as Sub-Saharan Africa, where more than 90% of maternal and neonatal mortality remains concentrated.[3,7,8]

Ensuring skilled and motivated health workers in the right place at the right time with the necessary infrastructure, removing barriers to access, and delivering high-quality services and packages of interventions in a continuum of care are among the global consensus on maternal, newborn, and child health to end preventable maternal, newborn, and child death.[9,10] Maternal health care providers (MHCPs) are primarily responsible and at the forefront to incorporate up-to-date, evidence-based clinical practices like PCC.[11] For successful preconception health promotion, health care providers need to have accurate and current information with the most recent research evidence to have ample knowledge and skill to provide PCC.[12,13] Various organizations such as Centers for Disease Control and Prevention (CDC), WHO, American College of Obstetricians and Gynecologists (ACOG), American Academy of Family Physicians (AAFP), International Federation of Gynecology and Obstetrics (FIGO), Public Health England (PHE), and Royal Australian and New Zealand College of Obstetricians and Gynecologists (RANZCOG) have developed guidelines and recommendations to improve PCC based on a review of published research and the opinions of specialists.[1,6,14–19]

Various studies identified that attending training on PCC and related topics, workplace, specialty, service year, reading guidelines, practicing PCC, and educational level were predictors of good knowledge of PCC among health care providers.[13,20–23]

Evidence from various studies identified that constrained resources, unplanned pregnancies, poor attitude and lack of awareness among the female population to seek PCC, lack of knowledge of PCC, and lack of clarity on the responsibility for providing PCC among health care providers are barriers to providing PCC.[24–26] Even if studies have been conducted on health care providers' knowledge of PCC, most of them did not include all professional categories that provide maternal health care services in their studies.[21,23,26–28] Also, there is a lack of information regarding MHCPs' knowledge of PCC in Ethiopia,[13] particularly in the study area. This study, therefore, intended to fill this information gap by assessing the level of knowledge of PCC and associated factors among MHCPs working in urban public health institutions in Eastern Ethiopia.

Methods

Study area and period

The study was conducted in Harar and Dire Dawa, Eastern Ethiopia, from 1 March to 1 April 2020. Harar is the capital city of the Harari region and East Hararghe Zone. Harar is found at a distance of 526 kilometers from the capital city, Addis Ababa. Using the 2007 Ethiopian census projection for 2019/2020, the current estimated total population of the city is 263,656. Among these, 60,667 are reproductive-aged women.[29] There are 2 public hospitals, 2 private hospitals, 1 police hospital, 4 health centers, 54 private clinics, and 24 health posts. Roughly 1219 health professionals work in this region.[30]

Dire Dawa city is one of the two self-administrative cities in Ethiopia, located 515 kilometers east of the capital city, Addis Ababa, and 47 kilometers from Harar town. According to the 2007 Ethiopian census projection for 2019/2020, the current estimated total population of the city is 492,637.[29] There are 2 public hospitals, 4 private hospitals, 8 health centers, and 32 health posts regarding the distribution of health facilities. Data from Dire Dawa City Health Bureau (DDCHB) shows 794 health

professionals are working in public health institutions in the city.[31] Approximately, 2013 health care providers are employed in both study areas. Of which, 570 employees were MHCPs. The study includes only public health institutions found in urban areas in both study areas due to feasibility issues related to COVID-19 pandemic travel restrictions during the study period.

Study design and population

An institution-based quantitative cross-sectional study was conducted from 1 March to 1 April 2020. All MHCPs working in public health institutions in Harar and Dire Dawa cities were included in the study. Those MHCPs who were on annual leave and sick leave during the data collection period were excluded from the study.

Sample size determination and sampling procedures

The minimum sample size required for the study was determined by using a single population proportion formula

$$n = \frac{\left(Z_{\alpha/2}\right)^2 \times P(1-P)}{d^2}$$

with 0.05 margin of error (d), a 95% confidence interval (CI), a 57% estimated proportion of health care providers with good knowledge of PCC (P) taken from a study done in Hawassa.[13] Thus, with adding a 10% non-response rate, a final sample size of 415 participants was used for this study.

A simple random sampling technique using computer-generated random numbers was applied to select a total of 415 MHCPs. Employer's employee registry documents taken from human resources were used as a sampling frame to draw the study unit. All public health institutions in Harar and Dire Dawa cities were included in the study regarding the sampling procedure. After getting the number of MHCPs working in each hospital and health center, the total sample size was proportionally allocated for the selected hospitals and health centers. Subsequently, the sample size given for each institution was earmarked for each profession proportional to the number of health care providers in each discipline.

Data collection tool and method

A self-administered structured questionnaire was used for data collection. A validated data collection tool named "Andarg-Ethio PCC-KAP-Questionnaire for HCPs" was adopted from a study done in Hawassa.[13] Four BSc Midwives and two BSc Public Health Officers were recruited as data collectors and supervisors for the study. A 2-day training was given on the study's overall objective, clarity of questionnaire, sampling strategy, ethical considerations, and how to facilitate and supervise the data collection process.

Respondents who scored greater than or equal to the 50th percentile of the aggregated knowledge score were categorized as having good PCC knowledge. In contrast, respondents who scored less than the 50th percentile of the aggregated knowledge score were considered poor PCC knowledge.[13] Maternal health care providers were categorized as certified obstetricians, gynecologists, general practitioners, internal emergency obstetrical surgeons, nurses, midwives, and public health officers providing (family planning, antenatal care (ANC), Prevention of mother-to-child transmission (PMTCT), abortion, childbirth, postnatal care, and other gynecologic care services for reproductive-aged women up to 1 year after childbirth).[20,32]

Data quality control

To assure the quality of data, properly designed and validated data collection tools were utilized. A pretest was performed on 5% of the total sample size at Haramaya General Hospital 2 weeks before the actual data collection period to assess the clarity, sequence, consistency, understandability, and time taken to complete the questionnaire. Later on, any ambiguity, complex words, and differences in understanding were revised based on pretest experience. Each questionnaire was coded with a unique identification number.

Adequate training was provided to data collectors and supervisors regarding data collection procedures, ethical considerations for the participants, and dangers of data validity, and briefed on each question included in the study. To obtain informed consent and reliable data, a clear explanation of the purpose, procedure, confidentiality, and benefits of the study was given to participants. The principal investigator and supervisors closely supervised and actively reviewed all questionnaires to ensure the completeness and consistency of the information collected, and immediate corrective measures were taken accordingly.

Finally, after checking for data completeness and adequately coded with a unique identification number, each questionnaire was entered into the software for analysis. EpiData was utilized for data entry as it has a controlling mechanism for error detection. Two separate data clerks did double data entry to cross check for consistency of data entry. Data were kept in the form of a file in a secure place where no one can access it except the principal investigator. Simple frequencies and cross-tabulation were done to look for missing values and outliers. This was then cross checked by reviewing hard copies of the collected data.

Methods of data processing and analysis

The data were exported to STATA (version 16) computer software for analysis. Both descriptive statistics and

regression analysis were performed. Descriptive statistical analysis such as cross-tabulation, simple frequencies, measures of central tendency, and measures of variation was computed to summarize and describe the characteristics of study participants. The information was presented using frequencies, summary measures, tables, and figures.

MHCP's comprehensive knowledge of PCC was computed from summing up 18 understanding measuring items. Among the three options given for every 18 questions measuring ability, the correct answer was recoded to "1," and the wrong options were also recoded to "0." The maximum possible scores of each MHCP participated in the study were determined by the summation of the recoded 18 knowledge questions. Respondents who scored in the 50th percentile and above were labeled as MHCPs with "good knowledge of PCC," and those who scored below the 50th percentile were labeled as MHCPs with "poor knowledge of PCC." For a further description of knowledge level, those who correctly answered >75th percentile were marked as MHCPs with "high knowledge of PCC" and those who scored 50th to 75th percentiles were labeled as MHCPs with "medium knowledge of PCC." The remaining who scored <50th percentile were marked as MHCPs with "poor knowledge of PCC."

In bivariate analysis, the crude odds ratio (COR) with 95% CI was used to see the association between each independent and dependent variable using binary logistic regression. The result was presented as a COR to show the strength of the association between independent variables and dependent variables. Independent variables with a significance level of p value ⩽0.20 at 95% CI in the bivariable analysis and which fit the model of regression were retained for inclusion into a multivariable logistic regression model to control for the confounders. Multicollinearity was checked to see the linear correlation among the associated independent variables using the variance inflation factor (VIF) and standard error. VIF of >10 or standard error of >2 was considered suggestive of multicollinearity. No multicollinearity was detected during the analysis.

Multivariate analysis was conducted using the Enter method inorder to control the confounders. Hosmer–Lemeshow's goodness-of-fit test was done to check for model fitness. Omnibus test ($p < 0.0001$) and Hosmer–Lemeshow's test were found to be significant ($p = 0.536$), which indicates the model was fitted. Adjusted odds ratio (AOR) with 95% CI was estimated to show the strength of the association between the independent variables and the dependent variable after controlling the effects of confounders. Independent variables with a p value <0.05 and which did not include the null value in the 95% CI were declared as having a statistically significant association with the outcome variable.

Results

Sociodemographic characteristics of MHCPs

In this study, out of 415 recruited participants, 410 participants agreed to participate, making an overall response rate of 98.8%; 220 (53.7%) respondents were female. The age range of the respondents was 21 to 40 years. The mean age was 29.54 (±3.733), and about 54.6% (n=224) were found within the age group of 26 to 30 years. Of the total respondents, 57.6% (n=236) were married; midwives constituted 60.0% (n=246), 35.6% (n=145) of the respondents had diploma-level education, and 59.0% (n=242) of the respondents had 5 or more years work experience (Table 1).

Related factors of health institution and health care providers

Of the total respondents, 31.0% (n=127) worked in public health centers, while the remaining were working in different public hospitals. Regarding PCC guidelines in the institution, 85.1% (n=349) responded that there is no PCC guidelines in their institution. In comparison, the remaining 14.9% (n=61) were unaware of its existence in their institution. Of the total respondents, only 23.7% (n=97) had read guidelines related to PCC, and 14.4% (n=60) use their smartphones for reading, downloading, and sharing clinical procedures (Table 2).

MHCPs' knowledge about PCC

MHCPs' knowledge was measured using their score on 18 questions assessing knowledge of PCC. Respondents who scored the mean and above the mean were regarded as having good knowledge of PCC. Those who scored less than the mean were considered to have poor knowledge of PCC. The score of MHCPs' ability of PCC ranges from 3 to 18. Out of 18 questions measuring knowledge, only three MHCPs scored 18, but no health care provider scored 0, 1, or 2. The respondents' mean score was 11.30 with standard deviation (SD) ±3.133, and the median score is 11 (Table 3).

The knowledge of respondents in different PCC issues is more than average in the majority of the items included in the tools. However, respondents' knowledge is below average on some of the essential PCC issues such as the benefits of effective controlling of chronic diseases, for example, hypertension, diabetes, asthma before conception, preconception genetic counseling, the effect of periodontal disease as a risk factor for adverse pregnancy outcomes, and fertility screening and management. Among the total respondents, 32.0% (n=131) had high knowledge of PCC, 28.8% (n=118) had moderate knowledge of PCC, and 39.3% (n=161) had poor knowledge of PCC (see Table 3 and Figure 1).

Table 1. Distribution of sociodemographic characteristics of maternal health care providers working in public health institutions in Eastern Ethiopia, 2020 (N = 410).

Characteristics	Frequency (%)	Knowledge status	
		Good (%)	Poor (%)
Sex			
Male	194 (47.3)	122 (62.9)	72 (37.1)
Female	216 (52.7)	125 (57.9)	91 (42.1)
Age category			
20–25	48 (11.7)	29 (60.4)	19 (39.6)
26–30	224 (54.6)	133 (59.4)	91 (40.6)
31–35	109 (26.6)	63 (57.8)	46 (42.2)
⩾36	29 (7.1)	22 (75.9)	7 (24.1)
Marital status			
Single	168 (41)	104 (61.9)	64 (38.1)
Married	236 (57.6)	138 (58.5)	98 (41.5)
Divorced	4 (1)	1 (25)	3 (75)
Widowed	2 (0.5)	0 (0.0)	2 (100)
Religion			
Orthodox	164 (40)	96 (58.5)	68 (41.5)
Muslim	154 (37.6)	88 (57.1)	66 (42.9)
Protestant	78 (19.0)	50 (64.1)	28 (35.9)
Catholic	11 (2.7)	10 (90.9)	1 (9.1)
Other	3 (0.7)	3 (100)	0 (0.0)
Profession			
Medical doctor	49 (12)	43 (87.8)	6 (12.2)
Nurse	104 (25.4)	45 (43.3)	59 (56.7)
Midwife	246 (60.0)	151 (61.4)	95 (38.6)
Public health officer	11 (2.7)	8 (72.7)	3 (27.3)
Maximum educational level			
Diploma	145 (35.6)	40 (27.6)	105 (72.4)
BSc degree	208 (50.7)	153 (73.6)	55 (26.4)
MSc degree	11 (2.7)	11 (100.0)	0 (0.0)
General Practitioner/Medical Doctor	26 (6.3)	24 (92.3)	2 (7.7)
Resident of obstetrics and gynecology	12 (2.9)	11 (91.7)	1 (8.3)
Specialty/gynecologist	8 (2)	8 (100.0)	0 (0.0)
Experience			
<5 years	168 (41.0)	91 (54.2)	77 (45.8)
⩾5 years	242 (59.0)	156 (64.5)	86 (35.5)
Monthly salary			
<4000	99 (24.1)	28 (28.3)	71 (71.7)
4000–5000	49 (12.0)	21 (42.9)	28 (57.1)
⩾5000	262 (63.9)	198 (75.6)	64 (24.4)

Factors associated with knowledge of PCC

Both bivariate and multivariate analyses were conducted to determine the factors associated with the MHCP's knowledge of PCC. Based on bivariate analysis, profession; educational level; years of experience; type of public health institution; unit of practice; training on PCC or related topics; reading PCC guidelines; using a smartphone to access, read, and share e-resources; presence of the library in the institution; and practicing (offering) PCC were associated with MHCPs' knowledge of PCC and retained for multivariate analysis.

Among the variables entered into multivariate logistic regression analysis, MHCP's educational level, work experience, type of public health institution, reading PCC guidelines, and training on PCC or related topics were statistically significant with knowledge of PCC among MHCPs.

This study indicated that educational level was strongly associated with knowledge of preconception. MHCPs with BSc and above educational level had six times higher odds of a good understanding of PCC than those with diploma-level education (AOR = 6.97, 95% CI: 3.85–12.60). Regarding work experience, the odds of good knowledge

Table 2. Health institution and health care providers related characteristics of maternal health care providers working in public health institutions in Eastern Ethiopia, 2020 (N = 410).

Characteristics	Frequency (%)	Knowledge status	
		Good (%)	Poor (%)
Type of public health institution			
Health center	127 (31.0)	45 (35. 4)	82 (64.6)
General hospital	123 (29.8)	82 (66.7)	41 (33.3)
Referral hospital	63 (15.4)	44 (69.8)	19 (30.2)
Specialized hospital	97 (23.9)	76 (78.4)	21 (21.6)
Current ward/unit/department of practice			
Family planning unit	60 (14.6)	22 (36.7)	38 (63.3)
Antenatal care unit	90 (22.0)	49 (54.4)	41 (45.6)
PMTCT unit	14 (3.4)	9 (64.3)	5 (35.7)
Labor, delivery, and PNC unit	153 (37.3)	103 (67.3)	50 (32.7)
Gynecology unit	93 (22.7)	64 (68.8)	29 (31.2)
Presence of PCC guidelines in the institution			
Yes	0 (0.0)	0 (0)	0 (0)
No	349 (85.1)	222 (63.6)	127 (36.4)
Don't know	61 (14.9)	25 (41.0)	36 (59.0)
Presence of library in the institution			
Yes	245 (59.8)	170 (69.4)	75 (30.6)
No	165 (40.2)	77 (46.7)	88 (53.3)
Did you, so far, get or see any PCC guidelines or protocol from any source?			
Yes	97 (23.7)	84 (86.6)	13 (13.4)
No	313 (76.3)	163 (52.1)	150 (47.9)
Do you use your smartphone for reading, downloading, and sharing clinical procedures?			
Yes	290 (70.7)	204 (70.3)	86 (29.7)
No	63 (15.4)	24 (38.1)	39 (61.9)
Don't have a smartphone	57 (13.9)	19 (33.3)	38 (66.7)
Have you taken pre-service and/or in-service training on PCC or related topics such as PMTCT, Provider-Initiated HIV Testing and Counselling (PIHTC), Antiretroviral Therapy, family planning, and youth friendly service?			
Yes	98 (23.9)	83 (84.7)	15 (15.3)
No	312 (76.1)	164 (52.6)	148 (47.4)
Have you offered some forms of PCC for your clients?			
Yes	382 (93.2)	240 (62.8)	142 (37.2)
No	28 (6.8)	7 (25.0)	21 (75.0)

PCC: Preconception Care, PMTCT: Prevention of mother to child transmission, PNC: Postnatal Care.

of PCC for MHCPs with 5 or more years of experience was two times higher than those with less than 5 years of work experience (AOR = 2.60, 95% CI: 1.52–4.49).

Similarly, the odds of good knowledge of PCC among MHCPs working in public hospitals was two times higher than those working in public health centers (AOR = 2.50, 95% CI: 1.25–4.99). MHCPs who have been reading PCC guidelines or protocols from any source were three times (AOR = 3.06, 95% CI: 1.40–6.68) more likely to have good PCC knowledge than those who had never read PCC guidelines. Training on PCC or related topics increased the likelihood of good knowledge three times (AOR = 2.90, 95% CI: 1.37–6.15; Table 4).

Discussion

The study revealed that 60.2% of MHCPs had good knowledge of PCC. Educational level, work experience, type of public health institutions, reading PCC guidelines, and training on PCC or related topics were statistically significant with MHCPs' knowledge of PCC. In this study, the overall good understanding of PCC among MHCPs was 60.2%. This was in line with the results of the research conducted in Hawassa (57%)[13] and Iran (58%).[27] However, the current study's finding was higher than the findings of a study done in Ethiopia (52%),[20] South Africa (55.0%),[22] and Nigeria (23%).[24] This discrepancy may be due to difference in sociodemographic characteristics of the study population as the current study focuses only on MHCPs, time intervals between studies on a new health issue, and the different assessment tools used. However, it was lower than the study conducted in Addis Ababa, Ethiopia (69.25),[21] and Ibadan, Nigeria (65.8%).[33] This difference might be due to differences in the sociodemographic study population, study setting, assessment tools used, and sample size.

Table 3. Aggregate of knowledge scores of maternal health care providers working in public health institutions in Harar and Dire Dawa cities, Eastern Ethiopia, 2020 (N = 410).

Questions	Correctly answered	Not correctly answered
	Frequency (%)	Frequency (%)
The eligible clients for PCC include all adolescents and reproductive-aged individuals	267 (65.1)	143 (34.9)
To be effective, PCC should start 4 weeks before conception	282 (68.8)	128 (31.2)
Periodontal disease is a risk factor for APOs	154 (37.6)	256 (62.4)
Women with BMI ⩽18.4 planning pregnancy are at risk of developing APO	297 (72.4)	113 (27.6)
All women of reproductive age should take 0.4 mg of folic acid daily	366 (89.3)	44 (10.7)
The recommended routine preconceptual laboratory tests include Hgb, HCT, HIV, HBV, and RPR or VDRL tests	376 (91.7)	34 (8.3)
Preconception genetic counseling and screening include recommending carrier screening tests for a client with sickle cell hemoglobinopathy	141 (34.4)	269 (65.6)
A clinician providing PCC for clients with diabetes mellitus and chronic hypertension should recommend genetic screening testing	195 (47.6)	215 (52.4)
Isotretinoin, valproic acid, and warfarin are medications that pose teratogenic effects requiring preconception modification	282 (68.8)	128 (31.2)
Women with asthma planning pregnancy should avoid taking salbutamol 1 month before and after conception	191 (46.6)	219 (53.4)
Early identification and treatment of diseases like depression, seizure disorder, and phenylketonuria during the preconception period reduce the occurrence of adverse birth outcomes (APO)	277 (67.6)	133 (32.4)
The recommended test that guarantees good periconceptional blood sugar control for a woman with pre-gestational diabetes is a rapid blood sugar test	195 (47.6)	215 (52.4)
Except for the Influenza vaccine, Human Papillomavirus, Rubella, and Varicella are all vaccines contraindicated during pregnancy	220 (53.7)	190 (46.3)
Recommending regular exercise is an important PCC counseling. Thus, a woman planning pregnancy should aim for 30 min of moderate exercise 5 days per week	231 (56.3)	179 (43.7)
Women planning pregnancy should be advised to delay pregnancy until reducing drug, alcohol, and tobacco use	343 (83.7)	67 (16.3)
Avoidance of exposure to environmental hazards or toxins such as ionizing radiation, pesticides, lead, mercury, and pets is a concern for women with established first-trimester pregnancy, not for couples planning a pregnancy	272 (66.3)	138 (33.7)
A clinician attending to clients with the previous cesarean section should advise the client to delay the next pregnancy for at least 18 months before the next conception	338 (82.4)	72 (17.6)
Infertility screening and management is not a concern of PCC	203 (49.5)	207 (50.5)

PCC: preconception care; APOs: adverse pregnancy outcomes; BMI: body mass index; Hgb: Hemoglobin; HCT: Hematocrit; HBV: Hepatitis B Virus; RPR: Rapid Plasma Reagin or VDRL: Venereal disease research laboratory.

This study revealed that the type of public health institution was significantly associated with MHCPs' knowledge of PCC. This is in line with the study conducted in Hawassa, Southern Ethiopia,[13] South Africa,[22] and North West Ethiopia.[20] This may be because the presence of a variety of professional skills, the availability of the number of specialists in different departments, and the types of clinical cases attended at public hospitals are very different and by far better than public health centers, which affects positively the knowledge and skills of health care providers working in the hospitals.

The present study's results showed that reading PCC guidelines is significantly associated with MHCPs' knowledge of PCC. This agrees with a task done in Hawassa, Ethiopia[13] and Awi zone, North West Ethiopia.[20] This might be because the guidelines provide updated information and stepwise activities on clinical case management, which might have contributed to the enhanced knowledge of MHCPs.

This study revealed that educational level was significantly associated with MHCPs' knowledge of PCC. This is in agreement with the research done in Iran, by

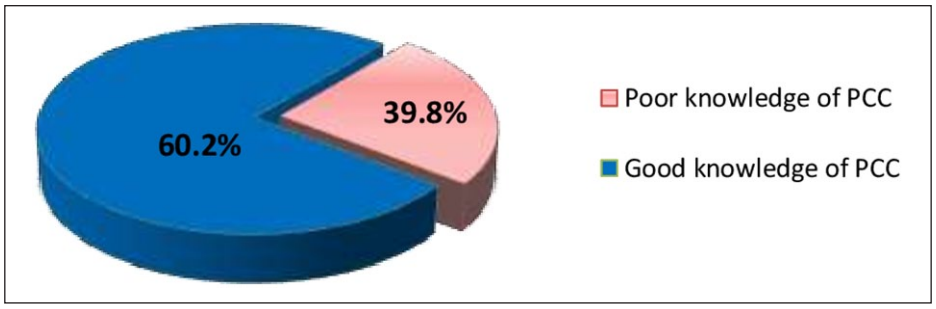

Figure 1. The level of maternal health care provider's knowledge on preconception care, Dire Dawa and Harar cities, Eastern Ethiopia, 2020 (N = 410).

Table 4. Bivariable and multivariable logistic regression analyses depicting factors associated with a level of knowledge of PCC among MHCPs working in public health institutions, Eastern Ethiopia, 2020 (N = 410).

Variables	Knowledge on PCC		COR (95% CI)	AOR (95% CI)
	Good (%)	Poor (%)		
Profession				
MD and Public Health officers	51 (85.0)	9 (15.0)	7.43 (3.32–16.67)*	2.19 (0.75–6.37)
Midwife	151 (61.4)	95 (38.6)	2.08 (1.31–3.32)*	1.36 (0.71–2.59)
Nurse	45 (43.3)	59 (56.7)	1	1
Years of experience				
<5 years	91 (54.2)	77 (45.8)	1	1
⩾5 years	156 (64.5)	86 (35.5)	1.54 (1.027–2.29)*	2.60 (1.52–4.49)***
Educational level				
Diploma	41 (28.1)	105 (71.9)	1	1
BSc and above	206 (78.0)	58 (22.0)	9.10 (5.72–14.45)*	6.97 (3.85–12.60)***
Monthly salary				
<5000 birr	49 (33.1)	99 (66.9)	1	1
⩾5000 birr	198 (75.6)	64 (24.4)	6.25 (4.01–9.74)*	1.05 (0.46–2.37)
Type of public health institutions				
Health center	52 (38.2)	84 (61.8)	1	1
Hospital	195 (71.2)	79 (28.8)	3.99 (2.59–6.15)*	2.50 (1.25–4.99)**
Unit or department of practice				
Family planning unit	22 (36.7)	38 (63.3)	1	1
ANC and PMTCT	60 (57.1)	45 (42.9)	2.30 (1.20–4.42)*	2.57 (1.05–6.29)
Labor, delivery, and PNC	103 (67.3)	50 (32.7)	3.56 (1.91–6.64)*	1.72 (0.72–4.11)
Gynecology unit	62 (67.4)	30 (32.6)	3.57 (1.80–7.06)8	1.18 (0.46–3.00)
Have you ever read PCC guidelines or protocols from any source?				
Yes	84 (86.6)	13 (13.4)	5.95 (3.18–11.11)*	3.06 (1.40–6.68)**
No	163 (52.1)	150 (47.9)	1	1
Do you use your smartphone to access, read, and share e-resources?				
Yes	204 (70.3)	86 (29.7)	4.25 (2.71–6.66)*	0.95 (0.50–1.82)
No	43 (35.8)	77 (64.2)	1	
Does your institution have a library?				
Yes	170 (69. 4)	75 (30.6)	2.59 (1.72–3.90)*	1.23 (0.63–2.403)
No	77 (46.7)	88 (53.3)	1	1
Have you taken pre-service or in-service training on PCC or related topics?				
Yes	83 (84.7)	15 (15.3)	4.99 (2.76–9.04)*	2.89 (1.36–6.14)**
No	164 (52.6)	148 (47.4)	1	1
Have you offered some forms of PCC for your clients in the past 3 months?				
Yes	240 (62.8)	142 (37.2)	5.07 (2.10–12.22)*	2.22 (0.79–6.26)
No	7 (25.0)	21 (75.0)	1	1

PCC: preconception care; MHCPs: maternal health care providers; COR: crude odds ratio; CI: confidence interval; AOR: adjusted odds ratio.
*p ⩽ 0.25, **p < 0.05, ***p < 0.0001, 1 = reference.

Bayrami et al.[27] This could be due to the difference in the curriculum contents of the training programs given at diploma, degree, and specialty level to bring improvement in the level of practice as they advance from one level to another.

Another factor identified in this study was training. MHCPs who had taken pre-service or in-service training on PCC or related topics were three times more likely to have good PCC knowledge than those who did not take training on PCC. This finding aligns with the study conducted in Nepal[34] and North West Ethiopia.[20] This might be due to the updated information obtained from training positively influencing health care providers' knowledge on PCC.

Work experience was also another factor identified in this study; the odds of good knowledge of PCC for MHCPs with 5 or more years of experience was two times higher than those with less than 5 years of work experience. This might be because more extended work experience increased exposure to diverse cases and clients asking for PCC services, forcing them to read and know about PCC and provide them a better position to learn more about PCC. Moreover, experienced health care providers had the probability of attending in-service training and different scientific conferences, which contributes knowledge of preconception. This contrasts with a study done in Nigeria[24] and Iran,[27] which revealed that respondents who had fewer years of work experience had a better knowledge of PCC. This discrepancy may be due to the time interval between studies on a new advancing health issue as PCC is a new initiative and older health personnel are not likely to have been exposed to PCC during their in-service training in those study areas.

Health care providers especially, MHCPs, are at the forefront of providing PCC. Based on the study findings, MHCPs demonstrated insufficient knowledge of PCC. This indicates clients are not obtaining quality PCC services. Given this study result, all concerned bodies were suggested to understand and take actions on the identified factors from both sides of the organization and health care provider to improve the MHCP's knowledge of PCC. Enhanced MHCP's knowledge of PCC will increase awareness of the benefits and uptake of PCC among reproductive-aged women and ensure the provision of quality PCC services. As a result, Sustainable Development Goal (SDG) will be succeeded by decreasing maternal and neonatal morbidity and mortality.

The study focused on MHCPs as they are the primary caregivers for reproductive-aged women. The study included all public health institutions (multicenter study) in the study area, increasing the study's external validity. The study used primary data. Therefore, the reliability of the data is high. The study used a validated tool, thus enabling comparison as the instrument's reliability, validity, and sensitivity are high. This study is not without limitations. Only public health institutions were included in the study due to time constraints. A limited previous research study done in Ethiopia makes comparison and discussion difficult.

Conclusion

This study assessed the level of knowledge of PCC and associated factors among MHCPs. Three out of five MHCPs in this study had good knowledge of PCC. Educational status, work experience, working in the hospital, reading PCC guidelines, training on preconception and related topics, and having a favorable attitude toward PCC were significantly and positively associated with good knowledge of PCC. The present study demonstrated that there was a need to improve the understanding of MHCPs. The results of this study revealed several practical applications and highlighted the activities to be done. Based on the study findings, the following recommendations were made actions to be taken by the following stakeholders.

We wish to recommend to health institutions and health bureaus to organize and provide continuous refreshment training on PCC-related topics, especially for newly recruited MHCPs. These refresher pieces of training can improve their knowledge and attitude toward PCC, and facilitate ongoing professional development for diploma-level health workers to improve their educational status. In addition, these refresher trainings can promote collaboration with higher stakeholders to prepare comprehensive PCC guidelines or avail to nearby workplaces like library or ward of duty if already prepared. We also wish to recommend health care providers emphasize reading PCC guidelines prepared by different organizations to update their knowledge and apply evidence-based practices. It is recommended to do further study by including private health institutions to increase the representativeness of the study.

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Author contributions

S.A.S., K.T.R., H.D.J., and H.A.W. conceived the study and wrote the original draft of the manuscript. Analysis and interpretation of data were made by S.A.S., H.D.J., L.D.R., H.A.W., and K.N.M. K.T.R., L.D.R., and T.A.Y. supervised the proposal development, data collection, analysis, and interpretation of data. K.T.R., H.D.J., H.A.W., K.N.M., and L.D.R. reviewed the draft manuscript for intellectual content and participated in the revision. All authors have read and approved the final version of the manuscript.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Ethical clearance was obtained from the Institutional Health Research Ethics Review Committee (IHRERC) of Haramaya University College Health and Medical Sciences (Ref. No: IHRERC/055/2020). After a permission letter is obtained from the school of graduate office, the letter was submitted to each public health institution head. An official letter of cooperation was obtained from the hospital's administrative office. Participants were informed clearly about the benefits of the study, and written informed consent was obtained from the participants. The respondents were told that they have the right not to participate in the study or withdraw from the study at any time or stage of the interview. Only those who are signed written consent participated in the research, and the confidentiality of respondents was maintained throughout the research process by giving code for the participant.

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Supplemental material

Supplemental material for this article is available online.

References

1. World Health Organization (WHO). Meeting to develop a global consensus on preconception care to reduce maternal and childhood mortality and morbidity. Meeting report, World Health Organization, Geneva, 6–7 February 2012, http://apps.who.int/iris/bitstream/10665/78067/1/9789241505000_eng.pdf
2. Ahmed MH and Jamil PT. Knowledge, practice, and attitude of married women about preconception care. *J Client-Cent Nurs Care* 2017; 3(1): 37–44.
3. World Health Organization (WHO). *Preconception care. Report of a regional expert group consultation, 6–8 August 2013, New Delhi, India*. Geneva: WHO, 2014.
4. Black RE, Levin C, Walker N, et al. Reproductive, maternal, newborn, and child health: key messages from disease control priorities 3rd edition. *Lancet* 2016; 388(10061): 2811–2824.
5. Johnson K, Posner SF, Biermann J, et al. Recommendations to improve preconception health and health care—United States. A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. *MMWR Recomm Rep* 2006; 55(6): 1–23.
6. WHO. *Preconception care: maximizing the gains for maternal and child health: WHO: policy brief*. Geneva: World Health Organization, 2013.
7. Mason E, Chandra-Mouli V, Baltag V, et al. Preconception care: advancing from "important to do and can be done" to "is being done and is making a difference." *Reprod Health* 2014; 11(Suppl. 3): S8.
8. Zühlke L and Acquah L. Pre-conception counseling for key cardiovascular conditions in Africa: optimizing pregnancy outcomes. *Cardiovasc J Afr* 2016; 27(2): 79–83.
9. UN. *Global strategy for women's and children's health*. New York: United Nations, 2010.
10. RCOG. *Providing quality care for women: a framework for maternity service standards*. London: Royal College of Obstetricians and Gynecologists, 2016.
11. Kassa A, Human S and Gemeda H. Level of healthcare providers' preconception care (PCC) practice and factors associated with non-implementation of PCC in Hawassa, Ethiopia. *Ethiop J Health Sci* 2019; 29(1): 903–912.
12. Elizabeth B, Jenette B and Wendy B. *Preconception and health: research and strategies*. Toronto, ON, Canada: The Best Start: Ontario's Maternal, Newborn and Early Child Development Resource Centre, 2001.
13. Kassa A, Human SP and Gemeda H. Knowledge of preconception care among healthcare providers working in public health institutions in Hawassa, Ethiopia. *PLoS ONE* 2018; 13(10): e0204415.
14. CDC. Recommendations to improve preconception health and health care. *MMWR Recomm Rep* 2006; 55(6): 1–23.
15. AAFP. *Recommendations for preconception care*. Washington, DC: American Academy of Family Physicians, 2017, https://www.aafp.org/afp/2017/1015/p492.html
16. PHE. Making the case for preconception care: planning and preparation for pregnancy to improve maternal and child health outcomes, 2018, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/729018/Making_the_case_for_preconception_care.pdf
17. ACOG. American College of Obstetricians Gynecologists Committee on gynecologic practice prepregnancy counseling: committee opinion no. 762. *Fertil Steril* 2019; 111(1): 32–42.
18. RANZCOG. *Pre-pregnancy counselling*. Melbourne, VIC, Australia: Royal Australian and New Zealand College of Obstetricians and Gynecologists, 2017.
19. Hanson M, Bardsley A, De-Regil LM, et al. FIGO recommendation on adolescent, preconception and maternal nutrition: think nutrition first. *Int J Gynaecol Obstet* 2015; 131(Suppl. 4): S213–S253.
20. Bekele MM, Gebeyehu NA, Kefale MM, et al. Knowledge of preconception care and associated factors among healthcare providers working in public health institutions in Awi Zone, North West Ethiopia, 2019: institutional-based cross-sectional study. *J Pregnancy* 2020; 2020: 6978171.
21. Waji ST and Seman WA. Knowledge, attitude and practice (KAP) of resident physicians at Tikur Anbesa Hospital on preconception care. *Ethiopian Med J* 2019; 57(2): 241–247.
22. Ukoha WC and Dube M. Primary health care nursing students' knowledge of and attitude towards the provision of

preconception care in KwaZulu-Natal. *Afr J Prim Health Care Fam Med* 2019; 11(1): 8.
23. Sattarzadeh N, Farshbaf-Khalili A and Khari E. Socio-demographic predictors of midwives' knowledge and practice regarding preconception care. *Int J Womens Health Reprod Sci* 2017; 5(3): 212–217.
24. Tokunbo O, Abimbola OK, Polite IO, et al. Awareness and perception of preconception care among health workers in Ahmadu Bello University Teaching University, Zaria. *Trop J Obstet Gynaecol* 2016; 33(2): 149–152.
25. Goossens J, De Roose M, Van Hecke A, et al. Barriers and facilitators to the provision of preconception care by healthcare providers: a systematic review. *Int J Nurs Stud* 2018; 87: 113–130.
26. Ojukwu O, Patel D, Stephenson J, et al. General practitioners' knowledge, attitudes and views of providing preconception care: a qualitative investigation. *Ups J Med Sci* 2016; 121(4): 256–263.
27. Bayrami R, Ebrahimipour H, Ebrahimi M, et al. Health care provider s' knowledge, attitude and practice regarding preconception care. *J Res Health* 2013; 3(4): 519–526.
28. Kizirian NV, Black KI, Musgrave L, et al. Understanding and provision of preconception care by general practitioners. *Aust N Z J Obstet Gynaecol* 2019; 59(6): 799–804.
29. CSA. *2007 population and housing census of Ethiopia: administrative report*. Addis Ababa, Ethiopia: Central Statistical Authority, 2012.
30. HRHB. Harari Regional Health Bureau Health Department Information Desk, 2020, unpublished data.
31. DDCHB. Dire Dawa City Health Bureau Health Department Information Desk, 2020, unpublished data.
32. Mannava P, Durrant K, Fisher J, et al. Attitudes and behaviors of maternal health care providers in interactions with clients: a systematic review. *Globalization Health* 2015; 11: 36.
33. Akanbi FO and Oluwatosin AO. Nurses' knowledge and women's awareness of pre-conception care. *Afr J Midwifery Womens Health* 2018; 5(2): 1–5.
34. Kamala U and Bhagawaty K. Knowledge on preconception care among bachelor level nursing students of selected nursing campuses of Tribhuvan University, Nepal. *IOSR J Nurs Health Sci* 2019; 8(5 Ser. III): 1–6.