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## Awareness and uptake of preconception care services in Northern Ethiopia – a qualitative exploration of experiences, challenges, opportunities, and prospects --Manuscript Draft--

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<b>Short Title:</b>	Awareness and uptake of preconception care services
<b>Corresponding Author:</b>	Gebremedhin Gebreegziabher Gebretsadik Adigrat University Mekelle, ETHIOPIA
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<b>Abstract:</b>	<p><b>Abstract</b></p> <p><b>Introduction</b></p> <p>Preconception care (PCC) has emerged as a key component of maternal continuum care worldwide, focusing on reducing poor pregnancy outcomes. Improving services requires addressing opportunities and challenges within the health system, but in Ethiopia it is often a neglected service. Hence, this study explores the experiences, challenges, and opportunities related to PCC services in Tigray, Northern Ethiopia.</p> <p><b>Methods</b></p> <p>We conducted an exploratory qualitative study involving 21 in-depth interviews with mothers who experienced adverse pregnancy outcomes and HCPs, who work in maternal, neonatal, and child health, and health extension workers. Additionally, we held six focus group discussions with women who had history of pregnancy. We also conducted key informant interviews with 10 maternal, newborn and child health experts from regional health bureau, district health offices, and professional associations. The study was conducted from January 26, 2024, to April 4, 2024 across four rural districts and two urban areas in Tigray, Northern Ethiopia. Discussions and interviews were audio-recorded, transcribed to the local language “Tigrigna”, then translated into English and thematically coded using ATLAS-ti v.7.5.4 software.</p> <p><b>Results</b></p> <p>Some women, particularly those belonging to high-risk groups, are aware of PCC services. A significant proportion of HCPs, especially gynecologists and physicians have some knowledge of PCC, recognize its importance, and provide specific components of PCC interventions. However, these services are often delivered in a fragmented manner, primarily targeting high-risk women. Identified challenges include traditional beliefs and misconceptions, insufficient counseling on contraceptive services, social influences, service costs, high workloads, perceived shortages of medicines and medical equipment, and the fragmented nature of service delivery. Conversely, opportunities include utilizing existing community platforms and an expressed desire for PCC services. Moreover, the use of diverse communication strategies, linking communities with health facilities, involving high-risk mothers as educational role models, and integrating package-based PCC services into the healthcare system were explored as perceived suggestions.</p> <p><b>Conclusion</b></p> <p>With the exception of high-risk women, most women have little to no knowledge about PCC services. Furthermore, although many HCPs possess some understanding of PCC, they deliver only a limited range of interventions, primarily catering to self-initiated high-risk mothers. Challenges identified include traditional beliefs and misconceptions, inadequate counseling on contraceptive services, social influences, high service costs, and fragmented service delivery. Existing community platforms and the perceived desire for PCC services were highlighted as opportunities to enhance PCC services. Strategies such as utilizing diverse communication methods, involving high-risk mothers as role models, strengthening community engagement activities, and improving linkages between communities and health facilities were proposed. Additionally, promoting home-based self-care was explored as a suggestion for</p>

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- Vertebrate embryos or tissues
- Field research

The Institutional Review Board of Mekelle University, College of Health Sciences (reference: MU-IRB2075/2023), granted ethical approval. The Tigray Health Bureau issued a support letter, and the relevant district health offices and villages granted permission. Before data collection, we attached a one-page consent form to the questionnaire, explaining participants' autonomy. We fully explained the study's objectives, risks, and benefits and obtained informed consent from all participants. We prioritized privacy and confidentiality and informed participants of their right to withdraw at any time. We also requested permission to record focus group discussions and interviews.

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- Indicate the form of consent obtained (written/oral) or the reason that consent was not obtained (e.g. the data were analyzed anonymously)

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1 Awareness and uptake of preconception care services in Northern Ethiopia – a  
2 qualitative exploration of experiences, challenges, opportunities, and prospects

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17

## 18 **Abstract**

### 19 **Introduction**

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21 worldwide, focusing on reducing poor pregnancy outcomes. Improving services requires  
22 addressing opportunities and challenges within the health system, but in Ethiopia it is often a  
23 neglected service . Hence, this study explores the experiences, challenges, and opportunities  
24 related to PCC services in Tigray, Northern Ethiopia.

### 25 **Methods**

26 We conducted an exploratory qualitative study involving 21 in-depth interviews with mothers  
27 who experienced adverse pregnancy outcomes and HCPs, who work in maternal, neonatal, and  
28 child health, and health extension workers. Additionally, we held six focus group discussions  
29 with women who had history of pregnancy. we also conducted key informant interviews with 10  
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## 35 **Results**

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62 utilization both at the community and facility levels.

63 Key words: Preconception Care Services, Experiences, Challenges, Opportunities, Explorative  
64 Qualitative Study, Tigray

## 65 **Introduction**

66 Preconception care (PCC) has garnered significant attention globally, primarily due to its ability  
67 to reduce the risk of adverse pregnancy outcomes (APOs). The existing continuum of care lacks  
68 pre-pregnancy care, and PCC addresses this gap by mitigating parental risk factors before  
69 conception, thereby enhancing outcomes for both mothers and infants (1). To mitigate the burden

70 of APOs, both the World Health Organization (WHO) and the Centers for Disease Control and  
71 Prevention (CDC) universally recommend PCC as an essential part of maternal healthcare. They  
72 advise that women intending to become pregnant should receive at least one preconception care  
73 checkup (2). Following CDC/WHO recommendations, several low- and middle-income  
74 countries (LMICs) including Bangladesh, the Philippines, and Sri Lanka have innovatively  
75 integrated PCC into their health systems (2, 3). Besides, some Sub-Saharan Africa(SSA)  
76 countries, like South Africa(4), Kenya (5) and Ethiopia (6, 7), have also incorporated PCC into  
77 their healthcare systems and are working to leverage this initiative to achieve the Sustainable  
78 Development Goals (SDGs) in a timely manner.

79 Worldwide, approximately 295,000 maternal deaths occur each year due to complications from  
80 pregnancy or childbirth (8). Additionally, there are around 23 million miscarriages (9), 14.8  
81 million live preterm births(10), and 295,000 neonatal deaths caused by congenital anomalies  
82 annually(11). The prevalence of congenital anomalies in LMICs is significantly high, with 94%  
83 of cases being severe(12). Similarly, the burden of APOs in LMICs remains a significant global  
84 issue. For example, the burden of APOs in SSA is 29.7% (13). Ethiopia is among the LMICs  
85 with high rates of maternal and neonatal deaths, at 412 per 100,000 live births and 33 per 1000  
86 live births, respectively (14, 15). Before the war, Tigray's health facilities ranked among the best  
87 in Ethiopia for maternal, newborn, and child health services(16). In the Tigray region, neural  
88 tube defects occur at a rate of 131 per 10,000 births (17). However, since the conflict began in  
89 Since the conflict began in November 2020, significant damage to the health system has severely  
90 disrupted maternal care and essential services. This has exacerbated preconception risks,  
91 including unwanted pregnancies, unsafe abortions, home deliveries, malnutrition, and increased

92 maternal, newborn, infant, and child mortality rates (18-20). For instance, the maternal mortality  
93 rate during the conflict reached 840 deaths per 100,000 live births.(21).

94 Despite the WHO's recognition of its feasibility in LMICs, PCC has not been successfully  
95 adopted in Africa (2). HIV testing, family planning, and contraceptive services are commonly  
96 utilized components in PCC interventions, while supplementation of folic acid is less widely  
97 used (22). A recent review in SSA found that the uptake and knowledge of PCC were only  
98 24.05% and 33.27% (23), respectively. A systematic review further revealed that in Ethiopia,  
99 only 30.95% of women had knowledge of PCC, with just 16.27% utilizing it (24), and the  
100 provision was low at 15% (25). Ethiopia has set ambitious targets under its reproductive health  
101 strategic plan to align with SDG 3.1, aiming to significantly reduce preventable pregnancy-  
102 related morbidity and mortality by 2025 (26). These targets include increasing the proportion of  
103 pregnant women receiving PCC to 25%, reducing the neonatal mortality rate from 33 to 21, and  
104 decreasing the maternal mortality rate to 271 per 100,000 live births (26). However, information  
105 is lacking on how the healthcare system has implemented PCC services.

106 Studies have indicated that identifying practical and feasible interventions based on local  
107 contexts is essential for raising awareness and improving PCC service adoption (27, 28). A  
108 qualitative study in high-income countries revealed that unfavorable attitudes, a lack of  
109 knowledge about PCC, limited resources such as time and guidelines, and unclear  
110 responsibilities for providing PCC are barriers to its provision (29). In Southwest Ethiopia, a  
111 study focused on barriers to the uptake of PCC identified some barriers, including poor  
112 knowledge, unplanned pregnancies, heavy workloads, service costs, distance, unavailability of  
113 services, and insufficient attention from media personnel (22).

114 Although Ethiopia has strategically integrated PCC into its health system with newly developed  
115 guidelines (6, 7), there is limited evidence, particularly on the challenges and opportunities  
116 within the system that influence service enhancement. This study addresses this gap by  
117 examining experiences, challenges, and opportunities from the perspectives of experts, HCPs,  
118 and women with pregnancy histories. It evaluates current practices and provides  
119 recommendations to improve PCC awareness and uptake, guiding the development and  
120 implementation of effective interventions.

## 121 **Materials and methods**

122 **Study design:** We employed an exploratory qualitative study design to investigate the  
123 experience of the current practices, challenges and opportunities for PCC services. The study  
124 was reported in accordance with the Consolidated Criteria for Reporting Qualitative Research  
125 (COREQ) checklist (30).

### 126 **Study setting**

127 We conducted the study in the eastern and central regions of Tigray, Northern Ethiopia, with  
128 populations of 994,346 and 1,522,596, respectively. According to the Tigray Regional Health  
129 Bureau, in 2020, the region had a total of 14,423,731 healthcare providers (HCPs), including  
130 3,074 health extension workers (HEWs). These zones include 591,481 women of reproductive  
131 age (23.5% of the population). The study focused on specific districts and urban areas in both  
132 zones, from January 26, 2024, to April 4, 2024. We specifically targeted two rural districts and  
133 one urban district in the eastern zone, along with two rural districts and one urban woreda in the  
134 central zone of Tigray. The region invested in primary health care units, achieving a 91.7%  
135 coverage rate. However, the war damaged over 80% of health facilities, leading to a 40% decline  
136 in maternal and child health services, including institutional deliveries (31).

## 137 **Participants**

138 In the focus group discussions (FGDs), we included women who have had a history of pregnancy  
139 or are currently pregnant and who have the intention to be pregnant. We recruited high-risk  
140 mothers (history of APOs like stillbirth, neonatal death, congenital anomalies, perinatal death,  
141 miscarriage, post-partum hemorrhage, recurrent abortion (32) or history of chronic medical  
142 disease like diabetic mellitus , hypertension or HIV ) for the in-depth interviews (IDIs). Using  
143 purposive sampling, we identified mothers who communicated with HEWs and women  
144 development groups (WDGs) from HEW registers, considering their pregnancy and risks.  
145 Furthermore, healthcare providers HCPs, including midwives, nurses, health officers, and  
146 medical doctors stationed in Maternal, Newborn, and Child Health (MNCH) units, were  
147 identified with the guidance of the medical director or MNCH coordinators of these health  
148 facilities for IDIs. Additionally, experts from the District Health Office of MNCH or Health  
149 Extension Program (HEP) case team in selected districts, the Reproductive maternal neonatal  
150 child health (RMNCH) case team from the regional health bureau, and professionals from the  
151 Ethiopian Midwives Association (EMA) and Ethiopian Obstetrics and Gynecology Association  
152 (ESOGA) participated in the Key informant interviews (KIIs). Furthermore, we selected HCPs  
153 for both IDIs and KIIs based on their substantial experience in MNCH and their ability to  
154 communicate effectively, thereby providing valuable insights into the current state of PCC.

## 155 **Data collection**

156 We obtained participant information through IDIs, KIIs, and FGDs. To triangulate and validate  
157 the data, we included mothers, medical professionals working in MNCH units, MNCH experts  
158 from district and regional health offices, and associations.

159 Mothers for FGDs and IDIs were identified with the assistance of HEWs and WDGs within the  
160 community at their households. After obtaining their consent, we interviewed in private settings,  
161 such as village health posts or households, to ensure privacy and minimize background noise.  
162 Medical directors supported selecting HCPs for IDIs, who were then interviewed in private  
163 rooms at their workplaces. Similarly, we conducted face-to-face interviews with MCH experts  
164 for KIIs in private rooms at their workplaces. The number of participants was determined based  
165 on data saturation, which occurs when participants' descriptions become repetitive. Sampling  
166 continued until no new information emerged, indicating saturation was reached (33).

167 Six FGDs were conducted, one in each district, involving 7-9 mothers to become pregnant, each  
168 session lasting 56-96 minutes. Eight mothers with a history of APOs participated in IDIs,  
169 averaging 42 minutes per interview. Additionally, 13 HCPs from six health centers and health  
170 posts were interviewed, averaging 46 minutes each. KIIs involved 10 MNCH experts, seven  
171 from district health offices and RHB, and three clinicians and academics from ESOGA & EMA,  
172 with 38-70 minutes of interviews.

173 The primary investigator (GG) and three other PhD students in public health (GB, KK, and FT)  
174 who are experienced and trained in qualitative research conducted the interviews and FGDs. The  
175 four interviewers were paired into two groups: one note-taker and one interviewer. We used  
176 interviews and discussion guides to explore experiences, challenges, and opportunities in  
177 providing PCC services. We developed semi-structured guides for four groups: mothers to be  
178 pregnant, high-risk mothers, HCPs working in the MNCH unit, MNCH experts, clinicians and  
179 academics in MNCH. These guides were initially drafted in English, translated into the local  
180 language, Tigrigna. FGDs were organized in circular seating arrangements to facilitate  
181 interactive discussions among participants (34). The interview guides comprised open-ended

182 questions [S1]. Furthermore, the interview guide incorporated probing questions. Interviewers  
183 actively guided respondents through the questions outlined in the guide, using probing  
184 techniques to prompt further explanation of participants' responses. Throughout the interviews,  
185 they audio-recorded all sessions, took field notes to document key points, and observed  
186 participants' non-verbal cues in-depth.

### 187 **Trustworthiness**

188 We ensured the reliability of our findings by implementing rigorous quality measures. The data  
189 collectors were trained on tools, interview techniques, participant selection, concept of  
190 reflexivity, and consent procedures. We pretested the topic guide in a similar setting before  
191 starting data collection with revisions made based on feedback. During data collection, the team  
192 held daily debriefing sessions to address emerging issues and spent extended time with  
193 participants to gain deeper insights. We extended the research period to gain an in-depth  
194 understanding of the phenomena. We shared participant transcripts for verification and  
195 incorporated their feedback. We conducted data collection and analysis simultaneously,  
196 triangulating findings from interview transcripts with field notes. Experienced researchers fluent  
197 in the local language and culture translated, transcribed, and coded parts of the audio recordings  
198 while the primary investigator reviewed their work to ensure accuracy. Preliminary results were  
199 presented to experts and peers, leading to further refinement of the guides. While conducting  
200 participant interviews, creating codes, and organizing these codes into categories and themes, the  
201 researcher team bracketed their prior experiences and knowledge to enhance the quality of the  
202 results. To ensure the consistency of our findings, we conducted member checking with four  
203 participants, each representing a distinct group: HCPs, MNCH experts, and the two groups of

204 mothers. Additionally, we employed IDIs, KIIs, and FGDs as data collection methods to inform  
205 and guide subsequent discussions.

## 206 **Data analysis**

207 The FGDs, IDIs and KII were audio recorded, transcribed verbatim in the local language  
208 “Tigrigna”, and translated into English. Verbatim transcripts of the data saved as an independent  
209 MS Word file were imported, stored, managed, and coded using Atlas.ti v.7.5.4 (Scientific  
210 Software Development GmbH, Berlin,Germany) qualitative data analysis software. The first  
211 author (GG) conducted the initial coding by thoroughly listening to the audio recordings from the  
212 FGDs and interviews and carefully reviewing all the transcripts to become familiar with the  
213 content and to identify initial coding. In addition, we linked field notes and investigator memos  
214 to the respective files in the software to assist in the analysis.

215 The first author (GG) conducted line-by-line coding. We used both process and values coding to  
216 analyze all the transcripts. Additionally, we applied a hybrid approach, inductive and deductive  
217 coding methods during the analysis (35). Another investigator (AM) coded the five interviews  
218 and the FGDs to check inter-coder reliability. Transcription, translation, analysis, and data  
219 collection were conducted simultaneously throughout the data collection period. The  
220 investigators grouped similar codes to create categories and subcategories. We reviewed and  
221 revised the codes for clarity and consistency then consolidated them to eliminate redundancy and  
222 overlap in the analysis. We used a thematic analysis approach to identify the major themes across  
223 the categories and subcategories (36). Furthermore, during the write-up, we performed content  
224 analysis to describe the frequency of participants in subcategories. Quotes that best described the  
225 various categories and frequently expressed sentiments across several groups were chosen and  
226 presented in italics.

227 **Ethics approval**

228 The Institutional Review Board of Mekelle University, College of Health Sciences (reference:  
229 MU-IRB2075/2023) granted ethical approval. The Tigray Health Bureau issued a support letter,  
230 and the respective district health offices and villages granted permission. We fully explained the  
231 study's objectives, risks, and benefits and obtained informed consent from all participants and the  
232 consent was approved by the college's institutional review board. We prioritized privacy and  
233 confidentiality and informed participants about their right to withdraw at any time. We also  
234 requested permission to record focus group discussions and interviews.

235 **Results**

236 **Socio-demographic characteristics of the respondents**

237 The qualitative study involved 79 participants, including 21 individuals in IDIs with HCPs and  
238 high-risk mothers. Additionally, 10 MNCH experts from district health offices, regional health  
239 bureaus, and professional associations participated in KIIs. Among the high-risk mothers, 63%  
240 were aged between 18 and 34 years, all were housewives, and 12.5 % were grand multiparous.  
241 Of the healthcare professional participants, 64% were female, with approximately 74% being  
242 midwives, public health professionals, or HEWs (Table 1). Additionally, 48 mothers to become  
243 pregnant in the future participated in the FGDs. Among these FGD participants, 63% were  
244 between 18 and 34 years old, and 46% had an educational level of high school or above (Table  
245 2).

246 **Table 1: Characteristics of the study participants in Tigray, Northern Ethiopia, 2024**

Characteristics	IDIs(N=21)	KIIs(N=10)
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		High risk mothers *(n=8)	HCPs* (n=13)	HCP experts*
Sex	Male	NA*	3	5
	Female		10	5
Age of participants, years	18-34	5	8	1
	35-49	3	5	7
	=>50	0	0	2
Work experience, years	<5 years	NA	2	1
	5-10 years		6	5
	11-20years		5	4
Occupation	House wife	8	NA*	NA*
Educational level	Not attended school	1	NA*	NA*
	Primary (1-8 <sup>th</sup> )	3		
	Secondary(9-12 <sup>th</sup> )	4		
	Diploma	0	5	0
	BSc. Degree/MD*	0	8	5
	MSc. Master /specialty	0	0	5
Profession	Midwifery	NA*	5	2
	Public Health		1	5
	Family health		0	2
	Nursing		2	0
	MD/specialty		1	1
	Health Extension Workers		4	0
Current working unit	Clinician & academic	NA*	0	3
	MNCH expert		0	7
	MNCH unit		9	0
	HEP*		4	0

Number of births	0-1	2	NA*	NA*
	2-4	5		
	=>5	1		

247

248 **NB:** PCC: Preconception Care, HEP: Health extension program , MD: Medical Doctor, MNCH:  
 249 Maternal, Neonatal, and Child Health, HCPs: Healthcare Providers working in Maternal, Neonatal, and  
 250 Child Health related units, NA: Not Applicable: HCP Experts: Healthcare professionals working at  
 251 woreda health offices, regional health bureaus, and academic institutions: High-risk mother: a mother  
 252 with a history of adverse pregnancy outcomes or chronic medical conditions

253 **Table 2: Characteristics of FGD participants in Tigray, Northern Ethiopia, 2024**

Characteristics		(FGD* 1-6)=48 mothers
Age of participants, years	18-34	30
	35-49	18
Occupation	House wife	41
	Student	2
	Merchant	4
	Daily laborer	1
Educational level	Not attended school	3
	Primary (1-8th )	23
	Secondary(9-12th)	13
	Diploma	8
	Degree	1

Number of births	0-1	14
	2-4	30
	=>5	4

254 **NB: FGDs\* , Focussed Group Discussion**

255 **Themes:** Through an analysis of the transcribed interviews, five major themes, encompassing  
 256 nineteen sub-themes, emerged. Awareness, experience, challenges, opportunities, and  
 257 suggestions themes have emerged from the qualitative data on PCC services (Table 3).

258 Table 3. A list of themes and sub-themes emerged from the data, Tigray, Northern Ethiopia,2024

Major themes	Sub-themes
Awareness of PCC services	Information
	Perceived benefits
Experiences of PCC services	Practices of PCC interventions
	Home-based preparation
Challenges of PCC services	Fragmented services
	Traditional beliefs and misconceptions
	Poor quality of counseling on contraceptive services
	Social influences
	High Workload
	Services cost
Opportunities of PCC services	Perceived lack of medicines and medical equipment
	Existing community platforms
	Perceived desire of PCC services

Perceived suggestions of for PCC services	Home-based initiative
	Use a variety of communication strategies
	Use high-risk mothers as role models
	Community engagement activities
	Community -health facility linkage
	Services integration

259

260 The conceptual framework, emerged from the qualitative data, illustrates the overall  
 261 relationships among the factors involved in PCC service. A higher level of awareness and  
 262 positive experiences positively influences PCC services. Conversely, challenges such as  
 263 traditional beliefs, misconceptions, and fragmented PCC services negatively affect PCC services,  
 264 including the level of awareness and experiences. This framework) provides a guiding structure  
 265 for implementing PCC services within the healthcare system (Fig. 1)

266 Figure 1: Framework of Experiences, Challenges, and Opportunities in PCC Services in Tigray,  
 267 Ethiopia . Note: The dashed lines represent the negative influence on PCC services, while the  
 268 solid lines indicate a positive influence.

269 **1. Awareness of PCC services**

270 **Information of PCC:** Access to information about a service is essential for utilizing it  
 271 effectively. Without awareness of its existence, people cannot benefit from it. For many women  
 272 and community members, the concept of PCC remains unfamiliar, as it is a relatively new  
 273 approach that the healthcare system has not actively promoted. Both mothers and HCPs  
 274 indicated that most women lack information about PCC, turning to healthcare services only after

275 pregnancy confirmation or fertility difficulties. This gap in understanding repeatedly results in  
276 confusion between PCC and prenatal care. High-risk mothers stated:

277 .... "I do not know what pre-pregnancy care is?" (32 years old mother, 5<sup>th</sup> grade, IDI)

278 ."Endie....the meaning of this local language is (I don't know). I am just keeping silent" (28  
279 years old mother, 8<sup>th</sup> grade, IDI)

280 Similarly, a Clinical midwifery professional said,

281 ".....there is a lack of information regarding preconception in the community; I couldn't expect  
282 mothers to visit and utilize preconception care. I believe that we healthcare providers and health  
283 professional associations didn't invest in it, and from my observation in our context, I can  
284 conclude that no mothers are coming to preconception care, even though it is not supported by  
285 research" (Midwifery professional, male, KII)

286 On the Other hand, participants noted that some high-risk mothers have information about the  
287 services. They emphasized that HCPs should advise these mothers, including those with a history  
288 of diabetes, hypertension, HIV, spontaneous abortion, infertility, or congenital abnormalities, to  
289 undergo various health screenings before conception. These screenings should include tests for  
290 non-communicable and communicable diseases, sexually transmitted infections, mental health  
291 issues, gender-based violence, and other chronic conditions. Additionally, they should receive  
292 advice on proper nutrition and avoid harmful substances like alcohol. A high-risk mother said,  
293 I have heard information on PCC from media outlets such as Tigray Television, in a program  
294 called "Maeda Hakaym." I think it is good and beneficial to have a planned life and children. It  
295 sounds nice to have plan, preparations, and examinations and give birth based on planned  
296 decisions. Screening on gender-based violence, chronic disease, sexually transmitted infections,

297 *substance use, mental health, nutritional counseling and balanced diet and consultation to a*  
298 *doctor in the presence of these factors and medication use is essential to prevent adverse*  
299 *pregnancy outcome” (35 years old mother, 10<sup>th</sup> grade, IDI).*

300 Even some mothers explain the concept of PCC and understand its benefits.

301 *“I understand that PCC means I need to check my health status, should not take alcoholic*  
302 *drinks, need to have mental stability, and limit the number of children that I have according to*  
303 *my income or relation to livelihood. These come to my mind when I am thinking about PCC” (29*  
304 *years old mother, 10<sup>th</sup> grade, IDI)*

305 Besides, most HCPs have some knowledge of PCC and emphasize the importance of women's  
306 health before conception. Gynecology professionals, medical doctors, and, to a lesser extent,  
307 midwifery professionals have a better understanding of PCC concepts and interventions. Key  
308 PCC services identified by HCPs include HIV testing, folic acid supplementation, nutritional  
309 education, family planning, chronic disease screening, substance use advice, STI/HIV screening,  
310 medication management, and assessment of APOs such as Rh incompatibility, Td vaccination,  
311 abortion, and congenital anomalies. Among these, folic acid supplementation, nutritional advice,  
312 and family planning were most frequently mentioned.

313 *HIV testing, folic acid supplementations, feeding practices, and nutrition are the things I know*  
314 *about preconception care services (Midwifery professional, female, IDI)*

315 All participants concurred that nearly all HCPs are knowledgeable about recommending three  
316 months of folic acid supplementation to mothers with a history of congenital anomalies and  
317 repeated abortions before conception.

318 *Mothers who had a history of repeated abortion before conception are eligible to take folic acid*

319 *for three months. We don't give folic acid supplementation to all eligible women (HEW, female,*  
320 *IDI)*

321 On the other hand, participants reported that some HCPs have no information about PCC and do  
322 not even recognize its name.

323 *..... No, I don't know. I don't even think there is such care here. It has been a long time since I*  
324 *started working here; I never heard anyone talking about it, and I never saw such service being*  
325 *provided here (Nursing professional, female, IDI)*

326 *We don't even know about preconception care ourselves. We health professionals don't know it*  
327 *(HEW, female, IDI)*

### 328 **Perceived benefit of PCC services**

329 Mothers and HCPs emphasized that PCC offers valuable opportunities to assess women's health,  
330 enabling early identification and management of potential issues. This approach not only  
331 enhances maternal healthcare services but also helps avoid unnecessary expenses and reduces the  
332 risk of mother-to-child HIV transmission.

333 **Give opportunities for screening of health status:** PCC provides opportunities to assess the  
334 health status of mothers, enabling early detection of various conditions and diseases and  
335 identifying potential preconception risks that may lead to adverse pregnancy outcomes, as noted  
336 by participants. This aspect contributes to the promotion of women's health.

337 *“Preconception care plays a crucial role in screening for various health risks such as substance*  
338 *use, gender-based violence, mental illness, HIV/STIs, and chronic conditions like diabetes,*  
339 *hypertension, and heart disease before conception occurs” (29 years old mother, 10<sup>th</sup> grade,*  
340 *IDI)*

341 **Enhance maternal healthcare services:** Some participants noted that PCC services would  
342 facilitate antenatal, delivery, and postnatal care services.

343 .....”Moreover, providing expectant mothers with guidance on the timing of childbirth, pre-  
344 pregnancy preparations, pregnancy care, and postnatal support can significantly ease their  
345 journey. As emphasized earlier” (**Public health professional, male, KII**)

346 “If we work on preconception care earlier now, they will be able to start ANC contact on their  
347 day” (**Public health professional, female, KII**)

348 **Prevent HIV transmission from mother to child:** The optimal time to prevent HIV  
349 transmission from mother to child is during the pre-pregnancy period, as identified by  
350 participants.

351 .....”It is essential to undergo various tests, such as HIV testing, before pregnancy to prevent  
352 the transmission of the virus to the unborn child” (**24 years old mother, 10<sup>th</sup> grade, FGD**)

353 It (PCC) can help to prevent mother-to-child transmission of diseases (**30 years old mother,**  
354 **diploma, FGD**)

355 **Save unnecessary expenses and efforts:** Participants pointed out that some women spend their  
356 money and energy on ultrasounds and other laboratory tests privately during pregnancy because  
357 they did not consult HCPs before becoming pregnant. However, if these tests were initiated  
358 earlier, mothers could avoid unnecessary expenses and efforts.

## 359 **2. Experience of PCC services**

### 360 **Current Practices in the Components of PCC Interventions**

361 HCPs highlighted a significant gap in healthcare settings, attributing it to the absence of routine  
362 PCC services with designated providers or specialized units, leading to missed opportunities for

363 comprehensive care. They observed that PCC interventions, such as folic acid supplementation  
364 and counseling, are delivered in a fragmented manner across various units, including antenatal  
365 care, gynecology/obstetrics, youth-friendly services, family planning, chronic disease clinics, and  
366 post-abortion care, particularly for high-risk mothers. Although midwives and gynecologists  
367 provide some services, participants emphasized that private clinics offer them more consistently.

368 A public health professional discussed how various units provide components of PCC  
369 interventions: *“It is done irregularly in youth-friendly services unit like the family planning  
370 itself, reproductive and diet education. But it is not deep. But something is tried. Usually, as I  
371 tell you, the peer-to-peer takes the biggest share” (Public health professional, male, KII)*

372  
373 *.....in addition to these, mothers diagnosed with DM, threatened abortion, spontaneous abortion,  
374 recurrent stillbirth etc, are informed and appointed to consult a healthcare provider before  
375 getting pregnancy in gyn/obs OPD. The consultation is specifically regarding folic acid; there is  
376 no more service provided for other possible reasons (Midwifery professional, male, KII)*

377 In general, the majority of participants noted that the components of PCC interventions provided  
378 mainly for high-risk women are:

379 **Contraceptive counseling for pregnancy delay:** All participants, including both users and  
380 providers, noted that contraceptive counseling for delaying pregnancy was offered to all women  
381 of reproductive age within the community and healthcare system.

382 **Provide folic acid supplementation:** All participants, both users, and providers, agreed that  
383 folic acid supplementation was commonly provided to mothers with a history of chronic diseases  
384 such as diabetes, congenital anomalies, and spontaneous abortion, making it one of the most  
385 frequently practiced components of PCC interventions.

386 .....”*We provide folic acid for women who have a history of abnormal pregnancy like spinal*  
387 *bifida, hydrocephalus, and anencephaly. We give priority to these women” (MD, male, KII)*

388 **Counseling about medication safety:** Participants mentioned that some women with a history  
389 of chronic diseases such as diabetes and hypertension received counseling about medication  
390 safety before conception when they visited the health facility for follow-up.

391 “ *Need advice about medication with alcohol, if mothers have diabetic mellitus, HIV, and*  
392 *Hypertension should advise her that the medicines should be changed first before pregnant for*  
393 *example ACE inhibitors drugs have teratogenic effect” (MD, male, IDI)*

394 **Counseling about substance use:** Some mothers with a history of APOs, including abortion,  
395 chronic disease, congenital anomalies, and alcohol intake, received suboptimal counseling. They  
396 were advised to avoid medications that cause teratogenic effects and to abstain from substance  
397 use. Additionally, they were recommended to take folic acid supplements and undergo HIV  
398 testing before conception.

399 *Women are counsel to take folic acid before 3 months and to avoid bad habits such as alcohol,*  
400 *smoking, and other addictive substances (Family health professional, female, KII).*

401 Contrarily, an MCH expert employed at the district health office provided insight into the  
402 availability of PCC services within healthcare facilities as follows:

403 *In both urban and rural locations, pre-pregnancy care is currently nonexistent. It hasn't existed*  
404 *before, as far as I can tell. Policy, too, begins with family planning. Additionally, access to*  
405 *preconception care is not as high as indicated. I won't be questioned about whether or not I offer*  
406 *the services. I'm speaking to you based on my level of expertise. It was lately that I attended*  
407 *training. I received thorough training on PCC in Ethiopia , XXX town and it isn't offered locally*

408 *(Public health professional, male, KII)*

409 Moreover, most of the mothers agreed that women seek pre-pregnancy care only when  
410 concerned about their health. A high-risk mother noted:

411 *As a result of my personal health issues, I sought advice from healthcare providers. I was*  
412 *diagnosed with hypertension, which unfortunately led to a stillbirth in the past. Therefore, I*  
413 *consulted with health workers to ensure the best possible outcome when I planned my next*  
414 *pregnancy. I even visited referral hospitals for further guidance and was advised to visit*  
415 *healthcare facilities ahead of any future pregnancy. I followed this advice accordingly (35 years*  
416 *old mother, 9<sup>th</sup> grade, FGD)*

417 Additionally, mothers reported not receiving any counseling as part of pre-pregnancy care, even  
418 those who visited health facilities to have their contraceptives removed in preparation for  
419 pregnancy.

420 *“When you go to health facilities for contraceptive removal, the care providers will ask you “Is*  
421 *it because you want to conceive? “ Then, they would simply remove you and do nothing else,*  
422 *even if you said yes. There is no preconception care, there is no counseling, and they didn’t*  
423 *assess your eligibility for pregnancy. Due to this, the community doesn’t have the awareness,*  
424 *doesn’t know what PCC is or what to do, and as a result, there is no demand for the service.”*  
425 *(35 years old mother, 10<sup>th</sup> grade, IDI)*

426 **Home-based preparation:** Adopting a pregnancy plan enables women to prepare effectively for  
427 conception, reducing modifiable risks and promoting healthy pregnancies and positive birth  
428 outcomes. While most mothers lack access to PCC services, some, especially high-risk mothers,

429 take proactive steps at home, such as saving for medications, modifying alcohol intake,  
430 improving their diet, and focusing on mental readiness.

431 *“Before the mother becomes pregnant, she need to get prepared psychologically and*  
432 *economically. Psychologically prepared means mentally she needs to be stable, she needs to eat*  
433 *more than usual (4-5 times per day)” (29 years old mother, 10<sup>th</sup> grade, IDI)*

434 A mother mentioned that when planning for pregnancy, she prepares the chicken with local  
435 alcohol (siwa) for her husband and drinks " siwa tsiray " herself, believing it benefits the child.

436 *.....”a chicken should be slaughtered and Siwa (local alcohol) should be prepared, it is done*  
437 *before you get pregnant or when you are thinking about pregnancy. It is mostly for my husband*  
438 *but myself also drinks the “siwa tsiray” and it is good for the child” (35 years old mother, not*  
439 *attended school, FGD)*

440 On the contrary, participants emphasized that most mothers, particularly those without known  
441 health issues, do not take any action or invest in pregnancy preparation. A high risk mother  
442 stated:

443 *.....”I didn't plan to get pregnant. In my situation, I did not take any extra precautions before*  
444 *being pregnant, so I continued to eat normally and did not seek medical advice or counsel on*  
445 *PCC until after I became pregnant. (29 years old mother, 10<sup>th</sup> grade, IDI)*

### 446 **3. Challenges of PCC services**

447 **Fragmented-based services:** Participants observed that HCPS deliver fragmented PCC  
448 components to high-risk women, resulting in low awareness and uptake. Key challenges include  
449 the lack of PCC guidelines, limited government focus, and inadequate training.

450 *“In general, the health system gave no focus to PCC. In practice, no structures have been*  
451 *established in healthcare institutions to support PCC. I think this is the main challenge. Hence, if*

452 *there is no center for PCC in the health system, if there is no focus on PCC, and if the health*  
453 *care provider does not emphasize PCC, the community will do so. I believe this is the primary*  
454 *challenge” (MD, male, KII)*

455 In general, all participants noted that while limited orientation or information about PCC was  
456 provided, the government prioritized and delivered package-based services such as antenatal care  
457 (ANC) and delivery services.

458 *“A kind of orientation or information was given about PCC by partners, but they still do not get*  
459 *that much focus from the government or partners on PCC like the other health care services.*  
460 *Through education, the community shows behavioral change about child and maternal*  
461 *nutrition” (Family health professional, female, KII)*

#### 462 **Traditional beliefs and Misconceptions**

463 **Lack of felt need to disclose desire to conception:** Mothers and HCPs have noted that, with  
464 few exceptions, most women tend to keep their desire to have a child confidential. Many women  
465 even conceal their pregnancies during the early months. They typically do not discuss their  
466 intentions to conceive with others unless it is with their husband, a very close friend. While  
467 discussing pre-pregnancy care may seem taboo or embarrassing within specific segments of the  
468 community, it might be disclosed after pregnancy is confirmed because pregnancy is perceived  
469 as a gift from St. Mary or God.

470 A high-risk mother said:

471 *.....” Discussing care before pregnancy with a neighbor or a part of the community is often*  
472 *considered impolite or embarrassing. In stead, it's more common to share this information once*  
473 *pregnancy is officially confirmed, as there's a belief that pregnancy is a blessing from St. Mary*  
474 *or God (32 years old mother, 5th grade, IDI)*

475 *“Mostly, it is in the latter stages of pregnancy that the woman discloses her pregnancy status;*  
476 *except for a for a few, most of the women keep it confidential” (29 years old mother, 10<sup>th</sup> grade,*  
477 *IDI)*

478 Additionally, an MCH expert said: *“Disclosing or consulting with healthcare providers before*  
479 *getting pregnant is the biggest challenge in the community. Mothers may feel ashamed to*  
480 *consult; normally, it shouldn’t be “(Pubich health professional, female, KII)*

481 **Misconception about fear of side effects:** Participants noted that contraception, especially the  
482 Depo injection, is believed to cause infertility. Women avoid using Depo because it delays  
483 pregnancy after discontinuation. Due to this misconception, many women are discouraged or  
484 restricted from using contraceptives.

485 *“Now, for example, faith in the contraceptive (depo) causes a delay of pregnancy and hence*  
486 *many mothers do not use contraception” (MD, male, IDI)*

487 A maternal health expert pointed out that mothers discontinue contraceptives because they  
488 believe these may be responsible for the increase in congenital anomalies.

489 *.....” You see, especially now, after encountering many congenital anomalies, numerous*  
490 *mothers have approached us to discontinue family planning”(Midwifery professional, female,*  
491 *IDI)*

492 **Misconception about intake of alcohol:** Participants noted that consuming traditional alcohol  
493 ("Siwa" and "Myes") is not harmful except when taken with medication, particularly during the  
494 first four months of pregnancy. Additionally, some mothers believe that alcohol does not  
495 increase the risk of abortion or stillbirth; instead, they attribute these risks to poor nutrition, lack  
496 of adequate rest, and stress. Participants also mentioned that some elders believe consuming  
497 honey before pregnancy may facilitate the mental development and good health of the fetus later

498 during pregnancy.

499 *“There is no problem with the intake of alcohol before pregnancy. Even though it does not cause*  
500 *any harm until four months of pregnancy, according to the lesson we took, Drinking alcohol is*  
501 *not allowed when you are taking medication. However, it has no problem with other*  
502 *issues. Drinking milk is not allowed after six months of pregnancy” (35 years old mother, not*  
503 *attended school, IDI)*

504 *“Yes, for instance, our elders say it is good to take honey before pregnancy. They say it facilitates*  
505 *mental development and the good health of the foetus later during pregnancy. Also recommended*  
506 *by the community is “Myes” intake. I don’t think these substances can cause abortion or*  
507 *stillbirth. Abortion and stillbirth are mainly caused by the factors I mentioned earlier, such as*  
508 *poor nutrition, a lack of adequate rest, and stress” (35 years old mother, 10<sup>th</sup> grade, IDI.*

#### 509 **Poor quality of counseling on contraceptive services**

510 Mothers and HCPs agreed that inadequate counseling often deters women from using  
511 contraceptives, as they worry about side effects like delayed conception and bleeding. When  
512 women discontinue contraceptives, switch to alternatives, or stop using them altogether,  
513 unintended pregnancies can occur, disrupting the effective delivery of PCC services.

514 *"I was on birth control for four years but stopped because I experienced intense bleeding or a*  
515 *hemorrhagic condition, which led to my pregnancy. It wasn't something I had planned for. I only*  
516 *used contraceptives for the first pregnancy (since it was my first, I didn't use them again), but all*  
517 *my other pregnancies were unplanned. They happened after I stopped using birth control due to*  
518 *negative side effects. I attempted to use birth control again but stopped due to these side effects*  
519 *and tried the calendar method, but that didn't work, and I ended up pregnant again. I didn't have*

520 *a specific plan for my reproductive life. A lot of it just happened by chance, not by design." (35*  
521 *years old mother, 10<sup>th</sup> grade, IDI)*

522 *"The healthcare provider is also sending mothers for each contraceptive without properly*  
523 *explaining what is wrong with it and what kind of mother it should be given to" (MD, male, IDI)*

#### 524 **Social influences**

525 Participants highlighted the influential role of husbands, older in-laws, and community leaders in  
526 encouraging women to plan pregnancies and seek healthcare advice. However, cultural beliefs  
527 often dictate that once a woman is pregnant, she must continue the pregnancy, regardless of her  
528 mental readiness. In some areas, women fear abandonment if they leave their husbands during  
529 pregnancy, while cultural norms discourage open discussions about family planning with in-laws  
530 or friends, causing embarrassment. Additionally, some elders advocate seeking blessings from  
531 holy water instead of consulting healthcare professionals.

532 *"What is the barrier to pre-pregnancy testing that you explained is the backward culture. Even*  
533 *though she knows it, she wants this, she wants to have a baby because she thinks it will hurt, or*  
534 *she is ashamed, it's a shake to be told this is what she wants, but they know it. It is very*  
535 *embarrassingn't very comfortable to say that you want to have children with your mother-in-law*  
536 *or father-in-law, even with your friends. For example, I can tell them that I want to have a baby*  
537 *here, and my baby is grown. I may even have a desire inside, but they can go out and accuse me*  
538 *of being shameful"(35 years old mother, 10<sup>th</sup> grade, FGD)*

539 Some would believe in the service, and some would not, especially the old-times people (elders).  
540 *The elders may downplay the service like: "we are here and still managed to have kids despite*  
541 *there being no such service in our time," and ask, "Consulting who else were our grandmothers*  
542 *conceiving that you are doing so now?" and the like (35 years old mother, 10<sup>th</sup> grade, IDI)*

543 Mothers and HCPs observed that while some husbands with higher literacy levels recognize the  
544 importance of PCC, the majority perceive it as a low-priority issue. As a result, they do not  
545 support women seeking HCPs services before pregnancy.

546 *The majority of them (husbands) are obstacles except a few (35 years old mother, not attended*  
547 *school, IDI)*

548 On the other hand, some participants highlighted that older mothers emphasize the importance of  
549 pre-pregnancy care, particularly for women facing infertility.

550 *“They are very supportive of it. They are especially encouraged if you give them recognition*  
551 *regarding mothers and children. It's okay because it's normal in the normal. However, women*  
552 *with the problem of being unable to get pregnant are encouraged to consult healthcare providers*  
553 *by the mothers because they want you to give birth to them. They even tell you to go in hiding”*  
554 *(Public health professional, male, KII)*

### 555 **High workload**

556 HCPs noted that providing PCC services increases their workload and places additional burdens  
557 on staff, potentially leading to demands for extra benefits and staffing. When women come for  
558 child vaccinations and family planning but also request PCC, it requires additional time and  
559 commitment from HCPs. Providers highlighted that due to time constraints, some women were  
560 not screened.

561 *“Implementing this program will increase our workload and place additional burdens on the*  
562 *staff, potentially leading to demands for extra benefits. This could pose a challenge if there is no*  
563 *allocated budget” (Midwifery professional, female, IDI)*

564 On the other hand, one HCP noted that if we work on PCC, it will make the provider’s job easier  
565 because it decreases the risk factors like malnutrition, abortion, and other complications during

566 pregnancy and childbirth.

567 ...”*For sure, but if it is done here, I think it will make our job easier for us. So we have worked*  
568 *on preconception care and are fixing this malnutrition. His silence, which we call abortion, is*  
569 *being fixed while it is there. Stunting and underweight are being fixed there. So the professionals*  
570 *finish their work there” (Public health professional, male, KII)*

### 571 **Services cost**

572 Low socioeconomic status, service costs, and transportation expenses pose major barriers to  
573 accessing PCC services. While maternal health services like antenatal care, labor, delivery, and  
574 postnatal care are free in Ethiopia, participants highlighted that the costs of PCC, such as lab  
575 tests and imaging, are challenging for low-income mothers. This financial burden can result in  
576 missed opportunities for PCC, increasing the risk of preventable maternal and child health  
577 complications. Additionally, many individuals priorities other needs over PCC if they feel  
578 healthy, and there is reluctance among mothers to seek care, even for routine checkups when ill.

579 “*Regarding the affordability of PCC costs, a mother with a low income might not be able to*  
580 *afford to pay, especially for some lab tests and imaging procedures” (32 years old mother, 5<sup>th</sup>*  
581 *grade, IDI)*

582 “*If it has a cost, those who cannot afford it would miss the service, which could contribute to the*  
583 *occurrence of maternal and child health complications that could have been prevented otherwise*

584 “*(29 years old mother, 10<sup>th</sup> grade, IDI)*

585 Mothers reported that long distances to health facilities and a lack of money for transportation  
586 often lead them to miss PCC services.

587 “*The health facility may be too far from your house, you may face a shortage of money, and you*

588 *may be unable to walk there. In that case, how are you supposed to get to the health facility? If*  
589 *you do not have transportation costs, it is necessary to stay at home. Lack of money will prevent*  
590 *you from doing many things. Then, you become stressed and decide to be ignorant” (35 years*  
591 *old mother, not attended school, IDI)*

592 Nearly all mothers and HCPs agreed that PCC services should be accessible to individuals,  
593 regardless of economic status, to enhance maternal and child health, reduce costs, and promote  
594 equity. Participants stressed the importance of providing these services free of charge, like other  
595 MCH programs, to support low-income mothers at higher risk of health complications.

596 *“The service should be free of charge. If it has a cost, those who cannot afford it will miss the*  
597 *service, which could contribute to the occurrence of maternal and child health complications*  
598 *that could have been prevented otherwise” (29 years old mother, 10<sup>th</sup> grade, IDI)*

599 *“The cost of service for PCC should be free, similar to the service provided for ANC. If there is a*  
600 *fee, the community will refuse it. The government should provide subsidies and exempt services*  
601 *related to PCC” (HEW, female, IDI)*

602 A HCP working at MCH said that providing free PCC services is also difficult for that providing  
603 free PCC services is also difficult for the health facility balanced payment may be good for  
604 sustaining the services.

605 *“If it is a free service, the health facility may also suffer, but it should be at a reasonable price.*  
606 *For example, a sugar test results in 70 or 80 birr. This should be reduced” (Public health*  
607 *professional, male, IDI)*

#### 608 **Scarcity of medicines and medical equipment**

609 The majority of both HCPs and mothers highlighted that shortages of medical equipment and

610 medicines such as iron and folic acid supplements, anti-hepatitis vaccines, immunoglobulin,  
611 laboratory reagents, essential drugs, and diagnostic tests like ultrasound pose significant  
612 challenges to PCC services, particularly at health centers. Similarly, they mentioned that due to  
613 the scarcity of medical supplies and medications, women are frequently referred to hospitals,  
614 exacerbating the situation, especially amid the crisis in the study area (Tigray). A participant  
615 working in the delivery unit highlighted a concerning trend of congenital anomalies, which they  
616 suspect may be linked to the shortage of folic acid supplements. Additionally, participants  
617 reiterated the challenges posed by the lack of guidelines and the shortage of HCPs

618 *“Most of the preconception care services, such as iron and folic acid supplements, ultrasounds,*  
619 *and lab tests for HIV/STI, are not available at the health center” (29 years old mother, 10<sup>th</sup>*  
620 *grade, IDI)*

621 *There is no guideline and a shortage of healthcare providers. ....”A mother who is Hepatitis*  
622 *positive should get Hepatitis vaccine and immunoglobulin. But we don't have this drug in the*  
623 *facility”(MD, male, IDI)*

#### 624 **4. Opportunities on PCC services**

625 **Existing community platforms:** Participants emphasized the crucial role of the HEP in ongoing  
626 PCC awareness at the community level. They suggested enhancing this program by involving  
627 HEWs with WDGs and village health leaders. Participants also highlighted that home-to-home  
628 visits strengthen PCC, as some women may feel uncomfortable discussing their desire to  
629 conceive openly.

630 *“To make the program effective, it is essential to support WDGs and HEWs. In my previous*  
631 *work, I have seen the significant impact of WDGs in addressing public health issues. They have*  
632 *detailed community knowledge and can provide valuable information about vaccinated children,*

633 *pregnant mothers, and other relevant data. By working with community leaders and WDGs, we*  
634 *can increase the acceptance and success of the program” (Midwifery professional, female, IDI)*

635 A Health extension worker said:

636 *“The home-to-home visit should be well strengthened because the woman might have felt*  
637 *ashamed to disclose her desire to get pregnant” (HEW, female, IDI)*

638 An MCH expert said *“A family health card is one. The service could be incorporated into the*  
639 *family health card checklist for the woman to read herself or to be read for her by her kids to*  
640 *improve their awareness” (Public health professional, male ,KII)*

641 Participants suggested that marriage certificate issuance venues could be effective platforms for  
642 PCC education and counseling. These venues offer couples an entry point for information and  
643 provide an opportunity to counsel them in advance, linking eligible women to health facilities.

644 *“Places where marriage certificate is provided would be even much better and of high*  
645 *importance to provide PCC service because it gives an opportunity for the couples to get the*  
646 *information before the start of sexual intercourse” (35 years old mother, 10 th grade, IDI)*

647 Social networks such as civic societies, women's development groups, and farmer's associations  
648 are effective for community mobilization and spreading information. Participants highlighted  
649 their role in increasing PCC awareness and uptake through education and counseling at local  
650 venues including churches, mosques, and traditional healing places.

651 *We can use the existing social networks such as civic societies (e.g. women’s associations),*  
652 *women’s development army, pregnant women forum...etc. Those social networks are the closet*  
653 *to the community; they can provide education to the mothers. First, the social networks need to*  
654 *be well aware of PCC and then provide roles and responsibilities to teach and mobilize mothers*

655 *to utilize the services. The social networks are very helpful in strengthening and decentralizing*  
656 *preconception care services (29 years old mother, 10<sup>th</sup> grade, IDI)*

657 SMART Start model: The SMART Start model focuses on financial preparation and achieving  
658 optimal health before pregnancy through contraception, ensuring healthy children. Participants  
659 noted that this model highlights the importance of preparation for pregnancy, akin to pre-  
660 pregnancy care. To raise awareness of PCC and uptake, the services would be integrated into the  
661 SMART Start model program as an entry point for couples, particularly adolescent couples,  
662 through activities conducted by WDGs, HEWs, and other social networks.

663 *SMART Start is very good especially because it advocates for adolescent girls to use*  
664 *contraceptives, and it creates awareness before pregnancy so that we can use it. Similarly, as*  
665 *you have mentioned very well, women's development groups can be used as an entry path way as*  
666 *we know it is vital to be aware of adolescent girls regarding preconception care (Midwifery*  
667 *professional, male, KII)*

668 **Perceived desire of PCC services:** Though there would be a fear of workload, almost all HCPs  
669 appreciated the services' benefit in preventing maternal and neonatal problems.

670 *... "There is also a higher need for PCC in the professional that can be described as an*  
671 *opportunity" (Public health professional, male, IDI)*

672 *Its necessity is unquestionable! (Public health professional, male, KII)*

673 In addition, the majority of participants emphasized that, although these services are a new  
674 concept within the health system, mothers—especially those at high risk—have provided  
675 positive feedback.

676 *"If the service is available plenty of mothers have a wish to get the service you desired" (35*

677 *years old mother, not attended school, IDI)*

678 *This is both appropriate and acceptable. Had education arrived to us in this form, we would not*  
679 *be afflicted by the illnesses and issues that we currently face. We'll say "Amen" to this, bring it*  
680 *down to our people, and persuade them to start working on it. That's a smart idea (39 years old*  
681 *mother, 3<sup>rd</sup> grade, FGD)*

## 682 **5. Perceived suggestions on PCC services**

683 **Home-based initiative:** Participants pointed out that women intending to become pregnant need  
684 to prepare at home in terms of food and money to ensure adequate nutrition, transportation,  
685 medications, and other necessities before and during pregnancy. Additionally, some participants  
686 emphasized the importance of communicating with their husbands to achieve a common  
687 understanding about the intention to get pregnant, being mentally prepared, and avoiding bad  
688 habits such as alcohol (including local beverages like (“Siwa, Areki, and Myes”), smoking, and  
689 other addictive substances as pre-pregnancy care.

690 *Before her pregnancy, she should have a plan and be prepared economically; other work-related*  
691 *activities will help her overcome the problems that may arise following pregnancy.*

692 *In her home, she should communicate and have a common understanding with her husband*  
693 *about her pregnancy. When she plans to be pregnant, she should also avoid bad habits such as*  
694 *alcohol, smoking, and other addictive substances (hashish), and not be comfortable working*  
695 *during pregnancy in her home (Family health professional, female, KII)*

696 **Use various communication strategies:** All participants agreed that creating awareness for the  
697 infant program (PCC) through education on various platforms and social networks should be the  
698 first step to improving awareness of PCC and uptake. They emphasized the need for clear,  
699 culturally sensitive education on preparation, seeking advice, and understanding preconception

700 risks to address community beliefs, myths, and misconceptions. Utilizing media such as posters,  
701 billboards, and leaflets at community and facility levels is crucial for enhancing awareness. Once  
702 the community understands the importance of PCC, they will be more likely to seek it out  
703 independently.

704 .....”Anyway, they have to work on awareness creation. Education on the causes and risk  
705 factors should be given. Education can be provided in the facilities, in groups, and in the  
706 community” (28 years old mother, 8<sup>th</sup> grade, IDI)

707 Any cultural or religious barriers are better addressed through education. We should educate  
708 the community in an understandable way for them. If we do so, I think the elders, community,  
709 and religious leaders would say yes, it is essential; there are only benefits, not harms; let’s make  
710 use of it; and so on, provided that we educate them. I don’t expect the other way around. (35  
711 years old mother, 10<sup>th</sup> grade, IDI)

712 A mother from the FGD said, “I prefer that most of the time, PCC be given on Sunday because  
713 both wife and husband could be available at home, and on this day, most people are off from  
714 work. If the HEW/WDA conduct home visits after 11:00 AM to provide education about PCC,  
715 half an hour is enough” (28 years old mother, diploma, FGD)

716 The study participants pointed out that education should be specific, pragmatic, and model-  
717 based.

718 Yes of course: it is often better to see than hear to easily understand and understand everything  
719 by looking at a picture. I think it would be better if he did the vegetables or other things diet in  
720 pictures (Midwifery professional, female, IDI)

721 If you give pretend or picture-based lessons or drama-assisted lessons, women understand easily  
722 (Public health professional, male, IDI)

723 *“Our education should be unique, which means that if we are pregnant, for example, from pre-*  
724 *pregnancy to pregnancy, our education should not be the same as the previous by saying “listen*  
725 *to her”, I mean it should be practical” (Public health professional, male, KII)*

726 Participants suggested several strategies to increase awareness and uptake of PCC, emphasizing  
727 the use of various media. Broadcast media like radio and television are particularly effective due  
728 to their widespread availability. Print media, including posters, billboards, and brochures, should  
729 be used at both community and facility levels. While HEWs play a crucial role, media influence  
730 is even more critical, as HEWs cannot reach every area. One participant noted that media can  
731 significantly raise awareness, stating that if people hear about PCC on the radio or television,  
732 they are more likely to seek health services and receive education through printed materials.

733 *“The greatest power is the media. Whether it is through television, radio, and magazines, the*  
734 *media is very crucial if you want to change the perception of the community about the PCC”*  
735 *(MD, male, IDI)*

736 *“Media has a big role. Our community follows the media. Although the role of HEWs is the*  
737 *biggest, the influence of media is more critical than anything because they can’t reach every*  
738 *corner” (Nursing professional, female, IDI)*

739 Although orientation on PCC has recently commenced, it remains a new program. Consequently,  
740 nearly all individuals involved in the healthcare system, from HEWs to district health experts,  
741 possess limited knowledge about PCC. Therefore, both short-term and long-term training are  
742 essential for effectively providing these services. All participants emphasized that training and  
743 guidelines are crucial for successfully delivering PCC services.

744 *“Training on PCC packages is required for all actors involved in the health care system, starting*  
745 *from the HEW to district/woreda health experts (health care professionals)” (Family health*

746 *professional, female, KII)*

747 **Community engagement:** Some participants emphasized that creating significant awareness  
748 about preconception care at the community level requires special efforts, mainly focusing on  
749 extensive information dissemination and community engagement.

750 *Special efforts are required, including robust community mobilization and active participation*  
751 *(HEW, female, IDI)*

752 **Community health facility Linkage:** in general, participants noted that establishing a linkage  
753 between the community and the health facility, as well as within the health facility to selected  
754 units providing PCC, using referral slips, would be vital for enhancing the uptake of PCC  
755 services and reducing delays in the health facility.

756 An MCH expert said *a referral slip is necessary. Once the eligible woman is identified, the*  
757 *referral slip can be used to link to the service. However, one thing that needs to be taken into*  
758 *consideration is whether or not it will be a free service. Maybe it could have some effect if it is*  
759 *payable service (Public health professional, male, KII)*

760 **Use high-risk mothers as role models for awareness creation:** Some participants suggested  
761 that mothers with a history of APOs could serve as role models to educate women in women's  
762 development groups, pregnancy forums, and similar platforms. This approach could motivate the  
763 community to improve awareness and uptake of PCC.

764 *"I consumed three or four beers until I gave birth while I was pregnant. Here, I found myself*  
765 *teaching others and myself about mental retardation, a health issue that my child had developed.*  
766 *Even if you have to consider it before getting pregnant, you should not drink while pregnant.*  
767 *However, since my son experienced it, I have been telling people about it once more. Since a*  
768 *baby is like a piece of paper and can be easily injured, I think that my son's alcohol abuse*

769 *contributed to his mental retardation” (27 years old mother, 10<sup>th</sup> grade, IDI)*

770 *“She also influenced other women who had difficulty conceiving. i.e., other women also seek*

771 *health facilities after taking experience from my sister” (30 years old mother, diploma, FGD)*

## 772 **Services integration**

773 HCPs unanimously recommended integrating PCC into existing services, including voluntary  
774 counseling and test, family planning units, cervical cancer screening, youth-friendly services,  
775 ANC, ART clinics, post-abortion care, EPI, and under-five clinics. This approach aims to  
776 provide services to educate women of reproductive age who visit health facilities for other  
777 reasons, using the RLP tool to identify those eligible for PCC services effectively.

778 *“All people who visit a health facility should get information on PCC. We can use health*  
779 *facilities as a means to disseminate information and create awareness” (HEW, Female, IDI)*

780 *“As a PCC, I believe that any female patient in the reproductive age group should be able to see*  
781 *you whenever they need something, like an abortion, an STI test, an family planning, a*  
782 *pregnancy test, or a PNC. Right now, all women should receive PCC counseling” (MD, male,*  
783 *IDI)*

784 Some participants suggested that PCC services should be provided as standalone services in a  
785 room, which would be more user-friendly. Integrating PCC with other services might make  
786 women uncomfortable. However, due to limited space, staff, and resources, offering PCC under  
787 the ANC unit could be beneficial, as it allows for the observation and advice on pregnancy-  
788 related abnormalities. Some participant suggests that PCC services could be offered alongside  
789 family planning services, where women typically seek to prevent pregnancy, providing an  
790 opportunity to discuss PCC.

## 791 **Discussion**

792 This study examined the experiences, challenges, and opportunities of PCC services in Tigray,  
793 Ethiopia following the government's prioritization of PCC as a strategic initiative and the  
794 introduction of new guidelines (26) (37) (38). While previous qualitative research on PCC  
795 focused solely on barriers to its uptake (39), this study took a broader approach by exploring the  
796 awareness, experiences, challenges, and opportunities related to PCC services from the  
797 perspectives of various participants.

798 The study identified key themes related to PCC services, including awareness (information and  
799 perceived benefits) and experience (practices of PCC interventions and home-based preparation).  
800 Participants also explored perceived challenges, such as traditional beliefs and misconceptions,  
801 fragmented service delivery, reluctance to disclose conception intentions, inadequate counseling  
802 on contraceptive services, societal norms, heavy workloads, high costs, and shortages of  
803 medicines and medical equipment. Additionally, they noted perceived opportunities, such as a  
804 strong interest in PCC services and the availability of community platforms. Suggestions for  
805 improvement included implementing home-based initiatives, adopting diverse communication  
806 strategies, involving high-risk mothers as role models, fostering community engagement,  
807 strengthening links between communities and healthcare facilities, and integrating PCC services  
808 within the healthcare system.

809 In the study, except a few high-risk mothers, most mothers lack awareness of PCC services,  
810 which is consistent with previous studies (24, 39-41). Many people may be unfamiliar with PCC  
811 services because the program was introduced only recently (26) (37) (38) and has not yet been  
812 fully integrated into the healthcare system. This is especially evident within the health extension  
813 program, which is vital for increasing community awareness. This study highlights the issue,  
814 showing that HEWs possess less information about the program compared to other HCPs.

815 Furthermore, HCPs often view PCC as an optional benefit rather than a standard service, leading  
816 to limited investment and delayed care-seeking until pregnancy is confirmed. Such neglect can  
817 hinder health-seeking behavior and the utilization of services. Overall, participants emphasized  
818 that enhancing PCC awareness should be a government priority, leveraging community  
819 engagement through social networks like civic organizations, women's groups, and farmers'  
820 associations, which are effective for mobilization and information sharing. Home-based  
821 preparation was identified as a promising foundation, alongside diverse communication methods  
822 and integrating PCC services into healthcare facilities to improve awareness and utilization.  
823 Evidence also showed that to enhance PCC awareness, massive public awareness campaigns and  
824 education through print media, social forums, and government-led initiatives including  
825 integrating PCC into the healthcare services (22, 42).

826 This study revealed that while most HCPs had some knowledge of PCC services, their practice  
827 was limited. The services mainly focused on specific components targeting high-risk mothers  
828 such as contraceptive counseling for pregnancy delay, medication safety, substance use  
829 counseling, and folic acid supplementation. However, most interventions recommended by the  
830 WHO and Ethiopia's national PCC guideline were not practiced (2) (38). This is consistent with  
831 previous findings from African countries, where PCC was implemented under inaccessible  
832 guidelines and primarily driven by initiatives targeting high-risk women with a limited focus on  
833 interventions such as dietary modification counseling (25) (43) (44). The limited practice of PCC  
834 is influenced by several factors such as the presence of a relatively new program, HCPs' lack of  
835 adequate training, and PCC guidelines not being easily accessible. Moreover, the government  
836 prioritizes ANC over PCC, leading HCPs to view PCC as a supplementary rather than a routine  
837 service. Evidence suggests that accessible guidelines and regular use of RLP tools can help

838 HCPs prioritize PCC and emphasize preconception care for women (22) (25). Hence, prioritizing  
839 PCC and integrating package-based services into routine care for all women of reproductive age  
840 using RLP tools could significantly enhance awareness and utilization.

841 The study revealed that traditional beliefs often compel women to keep their conception desires  
842 private avoiding discussions about PCC. Pregnancy is commonly regarded as a divine gift from  
843 St. Mary or God, and many women believe that expressing a desire to conceive before pregnancy  
844 contradicts divine will, making such discussions socially and personally taboo. This is consistent  
845 with other studies elsewhere (39, 45), indicating that women often perceive conception as a  
846 natural event requiring no preparation, resulting in limited communication with HCPs and  
847 missed opportunities to utilize PCC services. Evidence suggests that addressing traditional  
848 beliefs about conception requires collaboration between health institutions and religious  
849 organizations (39). Additionally, integrating preconception health discussions into routine  
850 healthcare, beginning with school-based services, has been proposed as a potential solution (46).  
851 In this study, participants indicated that women prefer receiving PCC at health posts and health  
852 centers, as well as through community-based services, because these settings align with cultural  
853 norms and are conveniently located, making it easier for women to discuss personal matters.

854 Evidence indicates that, without adequate counseling, clients often turn to friends and family for  
855 information. Unfortunately, this information is frequently influenced by misinformation (47). For  
856 example, in this study, misconceptions about contraceptives, such as the Depo-Provera injection,  
857 have led many women to be discouraged or even prevented from using them. These  
858 misconceptions, including unfounded fears that contraceptives may cause infertility or congenital  
859 anomalies, present significant challenges to raising awareness about PCC and improving its

860 uptake. HEWs also give due emphasis to the maternal continuum of care; however, they do  
861 nothing for PCC as a package that could be considered a missed opportunity.

862 Evidence shows that family planning unit is vital in improving preconception health by  
863 assessing pregnancy intentions and addressing misconceptions through tools like the RLP (48).  
864 Therefore, integrating PCC into family planning and antenatal services strengthens the HEP with  
865 culturally sensitive education, and utilizing health visits for PCC education can significantly  
866 enhance services and reduce misconceptions about contraceptive use.

867 Involving husbands in PCC through screenings and counseling is vital for reducing risks and  
868 promoting healthier pregnancies, as emphasized by Ethiopian (38) and Chinese national  
869 guidelines (49). Furthermore, women who made decisions independently or in partnership with  
870 their husbands were more likely to utilize PCC services (50) (51) . Our findings showed that  
871 husbands often oppose women's PCC, particularly in rural and remote areas. Poor parental  
872 behaviors before conception are linked to increased illness and mortality in offspring, while  
873 healthier habits can significantly improve pregnancy outcomes. Paternal preconception care  
874 emphasizes men's direct contributions to child health, such as genetic and epigenetic factors,  
875 lifestyle choices, and environmental exposures, as well as indirect influences through partner  
876 health and relationships (52). The paternal origins of health and disease model defines (53) the  
877 preconception population as all reproductive-age men and women, highlighting the importance  
878 of paternal health. Given men's crucial role in reproductive health decisions, couple-based  
879 counseling is strongly recommended (47).

880 The study found that poor socioeconomic status including service costs and distance hinders  
881 PCC use with some viewing pregnancy as a luxury due to basic needs and regional conflicts.  
882 These findings align with results from various other studies (39) (54). The implication is that

883 even when women acknowledge the need for PCC and wish to access it, they face additional  
884 challenges such as service charges and transportation costs. Participants suggested women prefer  
885 receiving PCC at health posts and health centers alongside community-based services. They feel  
886 more comfortable discussing personal matters in culturally familiar local settings rather than  
887 hospitals. This preference helps address transportation costs, offers more apparent education,  
888 and overcomes barriers related to disclosing pregnancy intentions; which is a major obstacle to  
889 PCC utilization. Besides, the current study emphasizes that HCPs and mothers strongly advocate  
890 for making PCC services free, as they are part of the maternal continuum of care. This could  
891 improve access, particularly for low-income mothers, enhance maternal and child health, reduce  
892 costs, and promote equity. Other study in China support this, with China's National Free  
893 Preconception Health initiative, for example, reaching over 95% of target couples with  
894 preconception health education (49). Additionally, free maternal healthcare including PCC aligns  
895 with the WHO's recommendation to eliminate financial barriers and ensure equitable access to  
896 healthcare for all. It supports achieving SDG 3.1, which aims to reduce maternal mortality to  
897 fewer than 70 per 100,000 live births by 2030 (55).

898 To enhance awareness of PCC and uptake, the study suggests using marriage certificate settings  
899 to provide couples with information and pre-counseling, thereby connecting eligible women to  
900 health facilities. This approach could be practical if the Ethiopian government in collaboration  
901 with religious leaders commits to issuing marriage certificates particularly for newly married  
902 couples. This recommendation aligns with findings from a study in Bangladesh (56). Marriage  
903 certificate settings present an ideal opportunity to introduce PCC services as couples are often in  
904 the early stages of planning their future. This universal process provides an equitable platform to  
905 educate couples on reproductive health, family planning, genetic risks, and the importance of

906 preparing for a healthy pregnancy.

907 In Ethiopia, the PCC program was integrated into the reproductive health strategy for 2020–  
908 2024/25(26), and the components of PCC interventions were incorporated into the 2022 ANC  
909 guidelines (37). Additionally, the 2024 PCC guidelines recommend providing integrated services  
910 to women planning to conceive within three months (38). However, in this study, PCC services  
911 were only partially implemented hindered by the absence of PCC guidelines, limited government  
912 focus, inadequate training, and fragmented service delivery which heavily relied on women's  
913 initiation. PCC services was neither prioritized nor adequately resourced, resulting in  
914 inconsistent practices and insufficient attention to this critical care area. High-risk women were  
915 often not offered PCC unless they explicitly requested it, and PCC was not routinely utilized to  
916 assess reproductive intentions even for women who had stopped using contraception to conceive.  
917 These findings align with studies from other parts of Africa (44, 57). In contrast, studies (49, 58)  
918 indicated that fully implemented services supported by established protocols and strong  
919 government backing, improve service utilization compared to fragmented approaches. Overall,  
920 the Ethiopian government should prioritize PCC and ensure its full implementation by  
921 integrating it into the existing healthcare system. This requires the inclusion of comprehensive  
922 PCC guidelines, protocols, and assessment tools as part of routine clinical practice.

923 According to the Motivational Theory of Role Modeling, role model-based interventions are  
924 highly effective in encouraging others to accept new services (59). In our study, participants  
925 suggested that high-risk mothers could act as role models to enhance awareness and encourage  
926 using PCC services.

927 In the study, many participants suggested integrating PCC with existing health services like  
928 ANC, voluntary counseling and testing , ART clinics, family planning units, and more targeting

929 women of reproductive age using the RLP tool. This is also in concurrent with other studies in  
930 Africa (4, 5). Most preconception counseling was provided opportunistically by HCPs working  
931 in gynecology clinics or family planning settings (60). Integrating services can improve access  
932 for women with limited awareness of available options, those not actively planning or  
933 considering pregnancy, those with low health-seeking behaviors, and those without identified  
934 health issues. By routinely offering these services to all women of reproductive age through an  
935 integrated approach that includes the RLP tool, the uptake of PCC services can be improved (22,  
936 25).

937 **Study limitations and strengths:** This first study in Ethiopia explores PCC services from  
938 multiple perspectives, including front-line HCPs in urban and rural areas. The findings  
939 significantly contribute to developing locally appropriate programs to increase awareness of PCC  
940 and uptake. However, due to resource constraints, our study did not explore the perspectives of  
941 husbands, religious leaders, and women without pregnancy histories, emphasizing the need for  
942 further research. We held open discussions and regular meetings among the researchers to  
943 maintain trustworthiness. However, because the naming of the service is unfamiliar to the  
944 community, some women may have confused PCC with ANC, potentially leading to exaggerated  
945 responses.

## 946 **Conclusions**

947 This study reveals that most women lack awareness about PCC. HCPs deliver fragmented PCC  
948 interventions without using standardized guidelines or assessment tools focusing mainly on high-  
949 risk cases. Key challenges and opportunities identified include fragmented PCC services,  
950 traditional beliefs and misconceptions, inadequate counseling on contraceptive services, social

951 influences, perceived demand for PCC, and the potential to leverage existing community  
952 platforms. Integrating services into the existing community platforms, particularly within the  
953 HEP, is recommended to enhance awareness of PCC. Diverse communication strategies,  
954 including media campaigns and educational initiatives, should address traditional beliefs,  
955 misconceptions, and low community awareness. Additionally, participants suggested to  
956 strengthening the existing home-based initiatives and leveraging high-risk mothers as role  
957 models to promote awareness of PCC. Moreover, a package-based approach need to be  
958 implemented by integrating PCC as a continuum of maternal care. Introducing the concept of  
959 RLP is essential, enabling routine use of RLP tools to identify eligible women for these services.  
960 These findings provide valuable insights for Ethiopia's Ministry of Health, guiding policymakers,  
961 and program designers to enhance PCC utilization. Additionally, innovative interventions should  
962 focus on establishing package-based services, creating demand, and strengthening service  
963 linkages for better outcomes.

#### 964 **Abbreviations**

965 ANC: Ante-natal Care

966 APOs: Adverse Pregnancy Outcomes

967 ART: Anti retro-viral therapy

968 CDC: Centers for Disease Control and Prevention

969 EPI: Expanded Program Immunization

970 FP: Family planning

971 HCPs: Healthcare providers

972 HEP: Health Extension Program

- 973 HEWs: Health Extension Workers
- 974 MNCH: Maternal, Neonatal and child health
- 975 OPD: Out Patient Department
- 976 PCC: Preconception Care
- 977 RLP: Reproductive Life Plan
- 978 SDGs: Sustainable Development Goals
- 979 VCT: Voluntary counseling and Test
- 980 WDGs: Women Development Group
- 981 WHO World Health Organization

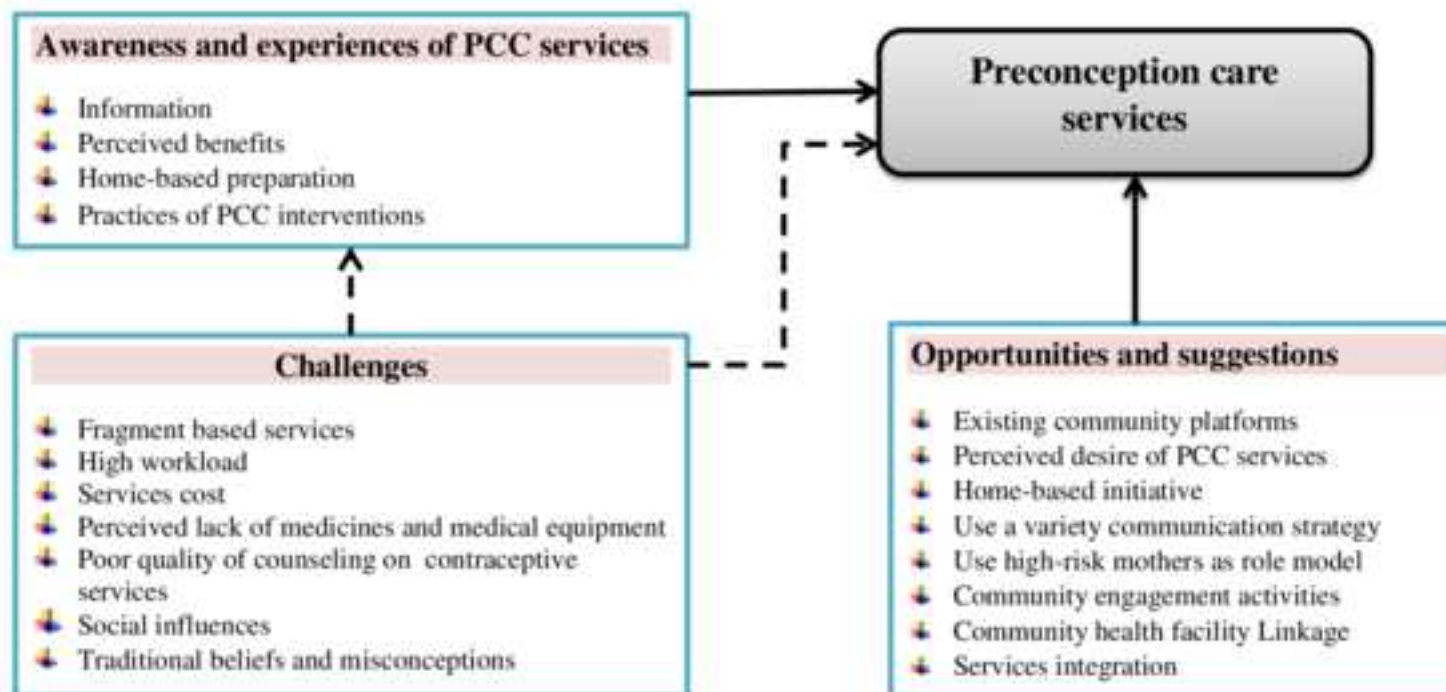
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1 Awareness and uptake of preconception care services in Northern Ethiopia – a  
2 qualitative exploration of experiences, challenges, opportunities, and prospects

3 ~~Policy Implications of Preconception Care Services: Experiences, Challenges, and Opportunities~~  
4 ~~in Tigray, Northern Ethiopia; an Exploratory Qualitative Study~~

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28 Abstract:

29 **Introduction:**

30 Preconception care (PCC) has emerged as a key component of maternal continuum care  
31 ~~healthcare~~ worldwide, focusing on reducing poor pregnancy outcomes. ~~Despite evidence~~  
32 ~~supporting its effectiveness, this critical opportunity remains largely overlooked in developing~~  
33 ~~countries, including Ethiopia. Improving services requires addressing opportunities and~~  
34 ~~challenges within the health system, but in Ethiopia it is often a neglected service~~  
35 ~~. Therefore~~ Hence, this study ~~aims to~~ explores the experiences, challenges, and opportunities  
36 related to preconception care services in Tigray, Northern Ethiopia.

37 **Methods:**

38 We conducted an exploratory qualitative study involving 21 in-depth interviews with mothers  
39 who experienced adverse pregnancy outcomes and healthcare ~~providers~~ providers, who work in  
40 maternal, neonatal, and child health, ~~including and~~ health extension workers. Additionally, we  
41 held ~~6~~ six focus group discussions with women who had ~~a~~ history of pregnancy. ~~We also~~ and  
42 conducted ~~40~~ key informant interviews with 10 maternal, newborn and child health experts  
43 from regional health bureaus, district health offices, and ~~relevant~~ professional associations. The

44 study was conducted from January 26, 2024, to April 4, 2024, across four rural districts and two  
45 urban areas in Tigray, northern Ethiopia. Discussions and interviews were audio-recorded,  
46 transcribed in to the local language “Tigrigna” then , translated into English, and thematically  
47 coded using ATLAS.ti v.7.5.4 software.

48 **Results:**

49 ~~Some women have awareness of PCC services mainly among high risk, the majority healthcare~~  
50 ~~providers, especially gynecologists and doctors, have some knowledge of PCC and understand~~  
51 ~~its importance and provide some components of PCC interventions in a fragmented way,~~  
52 ~~primarily targeting high risk women. Challenges include limited awareness, misconceptions, and~~  
53 ~~fear of contraceptive side effect, workloads, and poor quality family planning services.~~  
54 ~~Opportunities include leveraging community platforms, the SMART Start model, and interest in~~  
55 ~~PCC from both professionals and mothers. Suggested improvements include increased~~  
56 ~~government focus, offering free PCC services, assigning responsible professionals, implementing~~  
57 ~~home based initiatives, using diverse communication strategies, and involving high risk mothers~~  
58 ~~as educational role models.~~

59 Some women, particularly those belonging to high-risk groups, are aware of PCC services. A  
60 significant proportion of healthcare providers, especially gynecologists and physicians have  
61 some knowledge of PCC, recognize its importance, and provide specific components of PCC  
62 interventions. However, these services are often delivered in a fragmented manner, primarily  
63 targeting high-risk women. Identified challenges include traditional beliefs and misconceptions,  
64 insufficient counseling on contraceptive services, social influences, service costs, high  
65 workloads, perceived shortages of medicines and medical equipment, and the fragmented nature  
66 of service delivery. Conversely, opportunities include utilizing existing community platforms

67 and an expressed desire for PCC services. Moreover, the use of diverse communication  
68 strategies, linking communities with health facilities, involving high-risk mothers as educational  
69 role models, and integrating package-based PCC services into the healthcare system were  
70 explored as perceived suggestions.

71 **Conclusion ~~and recommendation:~~**

72 With the exception of high-risk women, most women have little to no knowledge about PCC  
73 services. Furthermore, although many healthcare providers possess some understanding of PCC,  
74 they deliver only a limited range of interventions, primarily catering to self-initiated high-risk  
75 mothers. Challenges identified include traditional beliefs and misconceptions, inadequate  
76 counseling on contraceptive services, social influences, high service costs, and fragmented  
77 service delivery. Existing community platforms and the perceived desire for PCC services were  
78 highlighted as opportunities to enhance PCC services. Strategies such as utilizing diverse  
79 communication methods, involving high-risk mothers as role models, strengthening community  
80 engagement activities, and improving linkages between communities and health facilities were  
81 proposed. Additionally, promoting home-based self-care was explored as a suggestion for  
82 improving PCC services. Integrating package-based PCC services into the healthcare system to  
83 routinely serve all eligible women of reproductive age was recommended to improve both  
84 awareness and uptake of PCC. Finally, tailored interventions were deemed essential for  
85 improving PCC awareness and utilization both at the community and facility levels.~~Women~~  
86 ~~have low awareness of PCC, and although most healthcare professionals possess some~~  
87 ~~knowledge, they offer fragmented interventions mainly for high risk groups. Challenges include~~  
88 ~~limited awareness, misconceptions, and a perceived lack of need for PCC among low risk~~

89 ~~women. To enhance awareness and uptake, the study recommends, package based services,~~  
90 ~~diverse communication strategies strengthening home based self care, using high risk mothers as~~  
91 ~~role models, and integrating the SMART Start model into services. Innovative interventions are~~  
92 ~~essential to boost both awareness and utilization of PCC services.~~

93 Key words: Preconception Care Services, Experiences, Challenges, Opportunities, Policy  
94 Implications, - Explorative Qualitative Study, Tigray

## 95 **Introduction**

96 Preconception care (PCC) has garnered significant attention globally, primarily due to its ability  
97 to reduce the risk of adverse pregnancy outcomes (APOs). The existing continuum of care lacks  
98 pre-pregnancy care, and PCC addresses this gap by mitigating parental risk factors before  
99 conception, thereby enhancing outcomes for both mothers and infants (1). To mitigate the burden  
100 of APOs, both the World Health Organization (WHO) and the Centers for Disease Control and  
101 Prevention (CDC) universally recommend PCC as an essential part of maternal healthcare. They  
102 advise that women intending to become pregnant should receive at least one preconception care  
103 checkup (2). Following CDC/WHO recommendations, several low- and middle-income  
104 countries (LMICs) including Bangladesh, the Philippines, and Sri Lanka ,have innovatively  
105 integrated PCC into their health systems (2), (3). Besides, some Sub-Saharan Africa(SSA)  
106 countries, like South Africa(4), Kenya (5) and Ethiopia (6) (7), have also incorporated PCC into  
107 their healthcare systems and are working to leverage this initiative to achieve the Sustainable  
108 Development Goals (SDGs) in a timely manner.

109 Worldwide, approximately 295,000 maternal deaths occur each year due to complications from  
110 pregnancy or childbirth (8). Additionally, there are around 23 million miscarriages (9), 14.8

111 million live preterm births(10), and 295,000 neonatal deaths caused by congenital anomalies  
112 annually(11). The prevalence of congenital anomalies in LMICs is significantly high, with 94%  
113 of cases being severe(12). Similarly, the burden of APOs in LMICs remains a significant global  
114 issue. For example, the burden of APOs in SSA is 29.7% (13). Ethiopia is among the LMICs  
115 with high rates of maternal and neonatal deaths, at 412 per 100,000 live births and 33 per 1000  
116 live births, respectively (14, 15). Before the war, Tigray's health facilities ranked among the best  
117 in Ethiopia for maternal, newborn, and child health services(16). In the Tigray region, neural  
118 tube defects occur at a rate of 131 per 10,000 births (16). However, since the conflict began in  
119 Since the conflict began in November 2020, significant damage to the health system has severely  
120 disrupted maternal care and essential services. This has exacerbated preconception risks,  
121 including unwanted pregnancies, unsafe abortions, home deliveries, malnutrition, and increased  
122 maternal, newborn, infant, and child mortality rates (18-20). For instance, the maternal mortality  
123 rate during the conflict reached 840 deaths per 100,000 live births.(21). ~~In the Tigray region,~~  
124 ~~neural tube defects occur at a rate of 131 per 10,000 births (16).~~ The war has worsened  
125 preconception risks(17), with a maternal mortality rate of 840 per 100,000 live births during the  
126 conflict (18).

127 Despite the WHO's recognition of its feasibility in LMICs, PCC has not been successfully  
128 adopted in Africa (2). HIV testing, family planning, and contraceptive services are commonly  
129 utilized components in PCC interventions, while supplementation of folic acid is less ~~commonly~~  
130 ~~utilized~~ widely used (19). A recent review in SSA found that the uptake and knowledge of PCC  
131 were only 24.05% and 33.27% (20), respectively. A systematic review further revealed that in  
132 Ethiopia, only 30.95% of women had knowledge of PCC, with just 16.27% utilizing it (21), and  
133 the provision was low at 15% (22). Ethiopia has set ambitious targets under its reproductive

134 health strategic plan to align with SDG 3.1, aiming to significantly reduce preventable  
135 pregnancy-related morbidity and mortality by 2025 (23). These targets include increasing the  
136 proportion of pregnant women receiving PCC to 25%, reducing the neonatal mortality rate from  
137 33 to 21, and decreasing the maternal mortality rate to 271 per 100,000 live births (23).  
138 However, information is lacking on how the healthcare system has implemented PCC services.

139 Studies have indicated that identifying practical and feasible interventions based on local  
140 contexts is essential for raising awareness and improving PCC service adoption (24, 25). A  
141 qualitative study in high-income countries revealed that unfavorable attitudes, a lack of  
142 knowledge about PCC, limited resources such as time and guidelines, and unclear  
143 responsibilities for providing PCC are barriers to its provision [49]. In Southwest Ethiopia, a  
144 study focused on barriers to the uptake of PCC identified some barriers, including poor  
145 knowledge, unplanned pregnancies, heavy workloads, service costs, distance, unavailability of  
146 services, and insufficient attention from media personnel (19).

147 ~~However, this study addresses the lack of qualitative research on PCC by exploring the~~  
148 ~~experiences, challenges, and opportunities from the perspectives of experts, healthcare providers,~~  
149 ~~and women with a history of pregnancy. We examined current practices and gathered~~  
150 ~~suggestions to enhance PCC awareness and uptake, aiming to inform the implementation of~~  
151 ~~effective interventions.~~Although Ethiopia has strategically integrated PCC into its health system  
152 with newly developed guidelines (6, 7), there is limited evidence, particularly on the challenges  
153 and opportunities within the system that influence service enhancement. This study addresses  
154 this gap by examining experiences, challenges, and opportunities from the perspectives of  
155 experts, healthcare providers, and women with pregnancy histories. It evaluates current practices

156 and provides recommendations to improve PCC awareness and uptake, guiding the development  
157 and implementation of effective interventions.

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## 158 **Materials and methods**

159 Study design: We employed an exploratory qualitative study design to investigate the  
160 experience of the current practices, challenges and opportunities for PCC services. The study  
161 was reported in accordance with the Consolidated Criteria for Reporting Qualitative Research  
162 (COREQ) checklist (30).

### 163 **Study setting**

164 ~~Since 2020, Ethiopia has strategically integrated PCC into its health system, guided by newly~~  
165 ~~developed guidelines (6, 7).~~ We conducted the study in the eastern and central regions of Tigray,  
166 Northern Ethiopia, ~~which have with~~ populations of 994,346 and 1,522,596, respectively.  
167 According to the Tigray Regional Health Bureau, in 2020, the region had a total of 14,423,731  
168 healthcare providers (HCPs), including 3,074 health extension workers (HEWs). These zones  
169 include 591,481 women of reproductive age (23.5% of the population) ~~and employ 1,731~~  
170 ~~healthcare providers, including 350 with Health extension workers (HEWs).~~ The study focused  
171 on specific districts and urban areas in both zones, ~~taking place~~ from January 26, 2024, to April  
172 4, 2024. We specifically targeted two rural districts and one urban district in the eastern zone,  
173 along with two rural districts and one urban woreda in the central zone of Tigray. The region  
174 invested in primary health care units, achieving a 91.7% coverage rate. However, the war  
175 damaged over 80% of health facilities, leading to a 40% decline in maternal and child health  
176 services, including institutional deliveries (26).

177 ~~Study design: We employed an exploratory qualitative study design to investigate the~~  
178 ~~experience of the current practices, challenges and opportunities of PCC services provision.~~

179 **Recruitment of study participants**

180 ~~We included pregnant women and women with potential for future pregnancies in~~In the focus  
181 group discussions (FGDs), we included women who have had a history of pregnancy or are  
182 currently pregnant and who have the intention to be pregnant. We recruited high-risk mothers  
183 (history of APOs like stillbirth, neonatal death, congenital anomalies, perinatal death,  
184 miscarriage, post-partum hemorrhage, recurrent abortion (119) or history of chronic medical  
185 disease like diabetic mellitus , hypertension or HIV )) for the in-depth interviews (IDIs)and high  
186 risk mother (history of APOs or chronic medical disease) in the in-depth interviews (IDIs). Using  
187 purposive sampling. ~~w~~We identified participants communicated with HEWs and women  
188 development group (WDGs) from HEW registers. ~~using purposive sampling,~~ considering their  
189 pregnancy and risks. Furthermore, healthcare providers including, HEWs, midwives, nurses,  
190 health officers, and medical doctors stationed in Maternal, Newborn, and Child Health (MNCH)  
191 units were identified with the guidance of the medical director or MNCH coordinators of these  
192 health facilities for IDIs. Additionally, experts from the District Health Office MNCH/HEP  
193 (Health extension program) case team in selected districts, the Reproductive maternal neonatal  
194 child health (RMNCH) case team from the regional health bureau, and professionals from the  
195 Ethiopian Midwives Association and Ethiopian Obstetrics and Gynecology Association  
196 participated in the Key informant interviews (KIIs).

197 Furthermore, we selected healthcare providers for both IDIs and KIIs based on their substantial  
198 experience in MNCH and their ability to communicate effectively, thereby providing valuable  
199 insights into the current state of PCC.

200 **Data collection/Interviews**

201 We obtained participant information through IDIs, KIIs, and FGDs. ~~In order to Triangulate~~ and  
202 validate the data, we included mothers, medical professionals working in MNCH units, MCNH  
203 experts from district and regional health offices, and associations.

204 Mothers for FGDs and IDIs were identified with the assistance of HEWs and WDGs within the  
205 community at their households. After obtaining their consent, we ~~conducted the~~ interviewed in  
206 private settings, such as village health posts or households, to ensure privacy and minimize  
207 background noise. Medical directors supported ~~the~~ selectiong of healthcare providers for IDIs,  
208 who were then interviewed in private rooms at their workplaces. Similarly, we conducted face-  
209 to-face interviews ~~for KHs~~ with MCH experts for KIIs in private rooms at their workplaces. The  
210 number of participants was determined based on data saturation, which occurs when participants'  
211 descriptions become repetitive. Sampling continued until no new information emerged,  
212 indicating ~~that~~ saturation ~~had been~~ was reached (27).

213 Six FGDs were conducted, one in each district, involving 7-9 mothers ~~with the intention to~~  
214 become pregnant, each session lasting 56-96 minutes. Eight mothers with a history of APOs  
215 participated in IDIs, averaging 42 minutes per interview. Additionally, 13 ~~healthcare~~  
216 ~~providers~~ HCPs from six health centers and health posts were interviewed, averaging 46 minutes  
217 each. KIIs involved 10 MNCH experts, ~~including~~ seven from district health offices and RHB,  
218 and three clinicians and academics from ESOGA & EMA, with ~~interviews~~ lasting 38-70 minutes  
219 of interviews.

220 The primary investigator (GG) and three other PhD students in public health (GB, KK, and FT)  
221 who are experienced and trained in qualitative research conducted the interviews and FGDs. The  
222 four interviewers were paired into two groups, ~~each consisting of~~ one note-taker and one  
223 interviewer.

224 We used interviews and discussion guides to explore experiences, challenges, and opportunities  
225 in providing PCC services. We developed semi-structured guides for four groups: mothers with  
226 an intention to be pregnant, ~~mothers~~ High-risk mothers with a history of APOs, ~~healthcare~~  
227 ~~providers~~ HCPs—working in the MNCH unit, MNCH experts, clinicians and academics in  
228 MNCH. These guides were initially drafted in English, translated into the local language,  
229 Tigrigna, ~~and pre-tested in a similar setting, with revisions made based on feedback. During data~~  
230 ~~collection, the team held daily debriefing sessions to address emerging issues and spent extended~~  
231 ~~time with participants to gain deeper insights. Preliminary results were presented to experts and~~  
232 ~~peers, leading to further refinement of the guides. While conducting participant interviews,~~  
233 ~~creating codes, and organizing these codes into categories and themes, the researcher team~~  
234 ~~bracketed their prior experiences and knowledge to enhance the quality of the results. To~~  
235 ~~enhance the consistency of the results, we conducted member checking with four participants,~~  
236 ~~each representing a different group: healthcare providers, MNCH experts, and both groups of~~  
237 ~~mothers~~. FGDs were organized in circular seating arrangements to facilitate interactive  
238 discussions among participants (28). The interview guides comprised open-ended questions [S1].  
239 Furthermore, the interview guide incorporated probing questions. Interviewers actively guided  
240 respondents through the questions outlined in the guide, using probing techniques to prompt  
241 further explanation of participants' responses. Throughout the interviews, they audio-recorded all  
242 sessions and took field notes to document key points and observe participants' non-verbal cues  
243 in-depth.

#### 244 Trustworthiness

245 We ensured the reliability of our findings by implementing rigorous quality measures. The data  
246 collectors were trained on tools, interview techniques, participant selection, and consent  
247 procedures. We pre-tested the topic guide in a similar setting before starting data collection with  
248 revisions made based on feedback. During data collection, the team held daily debriefing  
249 sessions to address emerging issues and spent extended time with participants to gain deeper  
250 insights. We extended the research period to gain an in-depth understanding of the phenomena.  
251 We shared participant transcripts for verification and incorporated their feedback. We conducted  
252 data collection and analysis simultaneously, triangulating findings from interview transcripts  
253 with field notes. Experienced researchers fluent in the local language and culture translated,  
254 transcribed, and coded parts of the audio recordings while the primary investigator reviewed  
255 their work to ensure accuracy. Preliminary results were presented to experts and peers, leading  
256 to further refinement of the guides. While conducting participant interviews, creating codes, and  
257 organizing these codes into categories and themes, the researcher team bracketed their prior  
258 experiences and knowledge to enhance the quality of the results. To ensure the consistency of  
259 our findings, we conducted member checking with four participants, each representing a distinct  
260 group: healthcare providers, MNCH experts, and the two groups of mothers. Additionally, we  
261 employed IDIs, KIIs, and FGDs as data collection methods to inform and guide subsequent  
262 discussions.

## 263 **Data analysis**

264 The FGDs, IDIs and KII were audio recorded, transcribed verbatim in the local language  
265 “(Tigrigna)”, and ~~then~~ translated into English. Verbatim transcripts of the data saved as an  
266 independent ~~file in~~ MS Word file were imported, stored, managed, and coded using Atlas.ti  
267 v.7.5.4 (Scientific Software Development GmbH, Berlin,Germany) qualitative data analysis

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268 software. The first author (GG) conducted the initial coding by thoroughly listening to the audio  
269 recordings from the FGDs and interviews and carefully reviewing ~~the entire~~all the transcripts to  
270 become familiar with the content and to identify initial coding. In addition, we linked field notes  
271 and investigator memos to the respective files in the software to assist in the analysis.

272 The first author (GG) conducted line-by-line coding. We used both process and values coding to  
273 analyze ~~the entire~~all the transcripts. Additionally, we applied a hybrid approach, inductive and  
274 deductive coding methods during the analysis (29). Another investigator (AM) coded ~~each of~~ the  
275 five interviews and the FGDs to check inter-coder reliability. Transcription, translation, analysis,  
276 and data collection were conducted simultaneously throughout the data collection period. The  
277 investigators grouped similar codes to create categories and subcategories. We reviewed and  
278 revised the codes for clarity and consistency then consolidated them to eliminate redundancy and  
279 overlap in the analysis. We used a thematic analysis approach to identify the major themes across  
280 the categories and subcategories (30). Furthermore, during the write-up, we performed content  
281 analysis to describe the frequency of participants in subcategories. Quotes that best described the  
282 various categories and frequently expressed sentiments across several groups were chosen and  
283 presented in italics.

#### 284 **Ethics approval ~~and consent to participate~~**

285  
286 The Institutional Review Board of Mekelle University, College of Health Sciences (reference:  
287 MU-IRB2075/2023), granted ethical approval. The Tigray Health Bureau issued a support letter,  
288 and the relevant district health offices and villages granted permission. ~~Before data collection,~~  
289 ~~we attached a one page consent form to the questionnaire, explaining participants' autonomy.~~ We

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290 fully explained the study's objectives, risks, and benefits and obtained informed consent from all  
 291 participants and the consent was approved by the college's institutional review board. We  
 292 prioritized privacy and confidentiality and informed participants of their right to withdraw at any  
 293 time. We also requested permission to record focus group discussions and interviews.

294 **Results**

295 **Socio-demographic characteristics of the respondents**

296 ~~In this~~The qualitative study, ~~we included a total of~~involved 79 participants, ~~including.~~ This  
 297 ~~comprised~~ 21 individuals in IDIs with, ~~including both healthcare providers (HCPs) and~~ highrisk  
 298 ~~mothers.~~ Additionally, 10 MNCH experts from district health offices, regional health bureaus, and  
 299 professional associations participated in KIIs. Among the high-risk mothers, 63% were aged between 18  
 300 and 34 years, all were housewives, and 12.5 % were grand multiparous. Of the healthcare professional  
 301 participants, 64% were female, with approximately 74% being midwives, public health professionals, or  
 302 HEWs (Table 1). Additionally, 48 mothers to become pregnant in the future participated in the FGDs.  
 303 Among these FGD participants, 63% were between 18 and 34 years old, and 46% had an educational  
 304 level of high school or above (Table 2). ~~with histories of APOs; 48 mothers with pregnancy histories~~  
 305 ~~or the intention to become pregnant in FGDs; and 10 MNCH experts from district health offices,~~  
 306 ~~regional health bureaus, and associations. Among the mothers, 59% were aged 20-34, and 46%~~  
 307 ~~had attended primary school. Of the healthcare professional participants, 64% were female.~~  
 308 ~~Approximately, 74% of the HCPs were midwives, public health professionals, and HEW (Table~~  
 309 ~~1).~~

310 **Table 1: Characteristics of the study participants in Tigray, Northern Ethiopia, 2024**

Characteristics	———— IDIs(N=21)	———— FGDs(N=6)	———— KIIs(N=10)
-----------------	-----------------	----------------	-----------------

		High risk mothers *(n=8)	HCPs* working in MNCH unit & HEWs* (n=13)	mothers with intention to become pregnant (n=48)	MNCH* experts from RHB* and district health offices (n=7)	Clinicians & Academics in MCNH from associations(n=3)	Formatted: Line spacing: Double
Sex	Male		3		3	2	Formatted: Line spacing: Double
	Female		10		4	1	
Age of participants, years	15-19	0	0	2	0	0	Formatted: Line spacing: Double
	20-34	5	8	28	0	1	
	35-49	3	5	18	5	2	
	=>50	0	0	0	2	0	
Work experience, years	<5 years		2		1	0	Formatted: Line spacing: Double
	5-10 years		6		2	3	
	11-20 years		5		4	0	
Occupation	House wife	8		42			Formatted: Line spacing: Double
	Student	0		1			
	Merchant	0		5			
Educational level	Not attended school	1		3			Formatted: Line spacing: Double
	Primary (1-8 <sup>th</sup> )	3		23			
	Secondary(9-12 <sup>th</sup> )	4		13			
	Diploma	0	5	8	0	0	
	BSc. Degree/MD*	0	8	1	4	1	
	MSc. Master /specialty	0	0	0	3	2	
Profession	Midwifery		5		0	2	Formatted: Line spacing: Double

	Public Health		1		5	0	
	Family health		0		2	0	
	Nursing		2		0	0	
	MD/specialty		1		0	1	
	HEW		4		0	0	
Current working unit	Clinician & academic		0		0	3	Formatted: Line spacing: Double
	MNCH expert		0		7	0	
	MNCH unit		9		0	0	
	HEP*		4		0	0	
Number of pregnancy	1	0		8			Formatted: Line spacing: Double
	2-4	5		28			
	≥5	3		12			
Number of birth	0-1	2		14			Formatted: Line spacing: Double
	2-4	5		30			
	≥5	1		4			
High risk mother	No			36			Formatted: Line spacing: Double
	Yes			12			
History of PCC* service	No	4		32			Formatted: Line spacing: Double
	Yes	4		16			

311 **Table 1: Characteristics of the study participants in Tigray, Northern Ethiopia, 2024**

Characteristics		IDIs(N=21)		KIIs(N=10)
		High risk mothers *(n=8)	HCPs (n=13)	HCP Experts*

<u>Sex</u>	<u>Male</u>	<u>NA</u>	<u>3</u>	<u>5</u>
	<u>Female</u>		<u>10</u>	<u>5</u>
<u>Age of participants, years</u>	<u>18-34</u>	<u>5</u>	<u>8</u>	<u>1</u>
	<u>35-49</u>	<u>3</u>	<u>5</u>	<u>7</u>
	<u>=&gt;50</u>	<u>0</u>	<u>0</u>	<u>2</u>
<u>Work experience, years</u>	<u>&lt;5 years</u>	<u>NA</u>	<u>2</u>	<u>1</u>
	<u>5-10 years</u>		<u>6</u>	<u>5</u>
	<u>11-20years</u>		<u>5</u>	<u>4</u>
<u>Occupation</u>	<u>House wife</u>	<u>8</u>	<u>NA</u>	<u>NA*</u>
<u>Educational level</u>	<u>Not attended school</u>	<u>1</u>	<u>NA</u>	<u>NA*</u>
	<u>Primary (1-8<sup>th</sup>)</u>	<u>3</u>		
	<u>Secondary(9-12<sup>th</sup>)</u>	<u>4</u>		
	<u>Diploma</u>	<u>0</u>	<u>5</u>	<u>0</u>
	<u>BSc. Degree/MD*</u>	<u>0</u>	<u>8</u>	<u>5</u>
	<u>MSc. Master /specialty</u>	<u>0</u>	<u>0</u>	<u>5</u>
<u>Profession</u>	<u>Midwifery</u>	<u>NA*</u>	<u>5</u>	<u>2</u>
	<u>Public Health</u>		<u>1</u>	<u>5</u>
	<u>Family health</u>		<u>0</u>	<u>2</u>
	<u>Nursing</u>		<u>2</u>	<u>0</u>
	<u>MD/specialty</u>		<u>1</u>	<u>1</u>
	<u>HEW</u>		<u>4</u>	<u>0</u>
<u>Current working unit</u>	<u>Clinician &amp; academic</u>	<u>NA*</u>	<u>0</u>	<u>3</u>
	<u>MNCH expert</u>		<u>0</u>	<u>7</u>
	<u>MNCH unit</u>		<u>2</u>	<u>0</u>
	<u>HEP*</u>		<u>4</u>	<u>0</u>

<u>Number of births</u>	<u>0-1</u>	<u>2</u>	<u>NA*</u>	<u>NA*</u>
	<u>2-4</u>	<u>5</u>		
	<u>=&gt;5</u>	<u>1</u>		

312 **NB:** PCC, preconception care: High-risk mother: a mother with a history of adverse pregnancy outcomes  
313 or chronic medical conditions: HEP, Health extension program: MD, Medical doctor: ~~RHB, Regional~~  
314 ~~health bureau~~: MNCH, Maternal, Neonatal and child health: HCPs, Healthcare providers working in  
315 Maternal, Neonatal, and Child Health related units: ~~HEWs, Health extension workers~~ : HCP Experts:  
316 Healthcare professionals working at woreda health offices, regional health bureaus, and academic  
317 institutions

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318 **Table 2: Characteristics of FGD participants in Tigray, Northern Ethiopia, 2024**

<u>Characteristics</u>		<u>(FGD* 1-6)=48 mothers</u>
<u>Age of participants, years</u>	<u>18-34</u>	<u>30</u>
	<u>35-49</u>	<u>18</u>
<u>Occupation</u>	<u>House wife</u>	<u>41</u>
	<u>Student</u>	<u>2</u>
	<u>Merchant</u>	<u>4</u>
	<u>Daily laborer</u>	<u>1</u>
<u>Educational level</u>	<u>Not attended school</u>	<u>3</u>
	<u>Primary (1-8th )</u>	<u>23</u>
	<u>Secondary(9-12th)</u>	<u>13</u>
	<u>Diploma</u>	<u>8</u>
	<u>Degree</u>	<u>1</u>

<u>Number of births</u>	<u>0-1</u>	<u>14</u>
	<u>2-4</u>	<u>30</u>
	<u>=&gt;5</u>	<u>4</u>

319 **NB: FGDs\* , Focussed Group Discussion**

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320 **Themes:** Through an analysis of the transcribed interviews, five major themes, encompassing  
 321 ~~nineteen~~ ~~twenty nine~~ sub-themes, emerged. Awareness and experience, current practice of PCC,  
 322 challenges, opportunities, and suggestions themes have emerged from the qualitative data on  
 323 PCC services provision (Table 2).

324 Table 2. A list of ~~t~~Themes and ~~s~~Sub-themes ~~e~~merged from the ~~d~~Data, Tigray, Northern  
 325 Ethiopia, 2024

<u>Major themes</u>	<u>Sub-themes</u>
<u>Awareness of PCC services</u>	<u>Information</u>
	<u>Perceived benefits</u>
<u>Experiences of PCC services</u>	<u>Practices of PCC interventions</u>
	<u>Home-based preparation</u>
<u>Challenges of PCC services</u>	<u>Fragmented services</u>
	<u>Traditional beliefs and misconceptions</u>
	<u>Poor quality of counseling on contraceptive services</u>
	<u>Social influences</u>
	<u>High Workload</u>
	<u>Services cost</u>
	<u>Perceived lack of medicines and medical equipment</u>

<u>Opportunities of PCC services</u>	<u>Existing community platforms</u>
	<u>Perceived desire of PCC services</u>
<u>Perceived suggestions for PCC services</u>	<u>Home-based initiative</u>
	<u>Use a variety of communication strategies</u>
	<u>Use high-risk mothers as role models</u>
	<u>Community engagement activities</u>
	<u>Community -health facility linkage</u>
	<u>Services integration</u>
<u>Major themes</u>	<u>Sub-themes</u>
<u>Awareness and experience of PCC services</u>	<u>Home-based preparation</u>
	<u>Awareness</u>
	<u>Perceived benefit of PCC</u>
	<u>Knowledge</u>
	<u>Components of PCC services</u>
<u>Challenges of PCC services</u>	<u>Poor awareness</u>
	<u>Deliver in a fragmented</u>
	<u>Belief, and misconceptions</u>
	<u>Unintended pregnancy</u>
	<u>Lack of perceived desire to disclose conception</u>
	<u>Influence of elder person and religious leaders</u>
	<u>Poorly perceived of services for low risk women</u>
	<u>Husband opposition PCC</u>
	<u>Workload</u>

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	Services cost
	Scarcity of resources
	Poor quality of family planning services
Opportunities for improving of awareness and uptake of PCC	Smart start model
	Utilize the existing community platforms
	Integrating the services into existing health facilities
	Perceived interest of HCP in PCC services
	Maternal interest in PCC services
Suggestions for increasing PCC awareness and uptake	Home-based initiative
	Use variety communication strategies
	Use high risk mothers as role model for education
	Community based PCC services
	Linkage
	PCC services would be free of charge
	Need focus from government
	Participants' view on PCC services

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327 The conceptual framework, emerged from the qualitative data, illustrates the overall  
328 relationships among the factors involved in PCC service. ~~This framework helps in the~~  
329 ~~implementation of these services within primary healthcare units.~~ The findings derived from the  
330 qualitative data highlight the overall relationships between the sub-themes, themes, and their  
331 connection to PCC services. A higher level of awareness and positive experiences positively impact PCC  
332 services. Conversely, challenges such as traditional beliefs, misconceptions, and fragmented PCC

333 ~~services negatively affect PCC services, including the level of awareness and experiences. This~~  
334 ~~framework helps in the implementation of these services within primary healthcare units. (Fig 1).~~

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335 Figure 1: Framework of Experiences, Challenges, and Opportunities in PCC Services in Tigray,  
336 Ethiopia (Developed by Researchers) **Note:** ~~The dashed lines represent the negative influence on PCC~~  
337 ~~services, while the solid lines indicate a positive influence.~~

### 338 **Awareness and experience of PCC services**

339 ~~**Home based preparation:** Adopting a pregnancy plan allows women to adequately prepare for~~  
340 ~~conception. Preparedness for pregnancy is crucial to minimize modifiable risk behaviors that can~~  
341 ~~lead to poor pregnancy outcomes. This proactive approach not only encourages planned, healthy~~  
342 ~~pregnancies but also fosters positive birth outcomes and overall well-being for both women and~~  
343 ~~infants. Some mothers, particularly high risk mothers, take proactive steps to prepare for~~  
344 ~~pregnancy. They save money for medications, food, and childcare, and focus on mental~~  
345 ~~preparation to ensure stability when facing the challenges of pregnancy, especially during the~~  
346 ~~initial trimester.~~

347 ~~A mother with a history of APOs said: "before the mother becomes a pregnant, need to get~~  
348 ~~prepared psychologically and economically. Psychologically prepared means mentally she needs~~  
349 ~~to be stable, she need to eat more than usual (1-5 times per day)" (29 years old mother, 10<sup>th</sup>~~  
350 ~~grade, IDI)~~

351  
352 ~~A mother mentioned that when planning for pregnancy, she prepares the chicken with local~~  
353 ~~alcohol (siwa) for her husband and drinks "siwa siray" herself, believing it benefits the child.~~  
354 ~~....."a chicken should be slaughtered and Siwa (local alcohol) should be prepared, it is done~~

355 ~~before you get pregnant or when you are thinking about pregnancy. It is mostly for my husband~~  
356 ~~but myself also drinks the siwa siray and it is good for the child". (35 years old mother, not~~  
357 ~~attended school, FGD)~~  
358 ~~Pre pregnancy information was not adequately emphasized in healthcare services, including~~  
359 ~~those within the community, leading to a lack of essential information for women to properly~~  
360 ~~prepare for pregnancy. Participants emphasized that most mothers, particularly those without~~  
361 ~~known health issues, do not take any action or invest in pregnancy preparation. Mothers with a~~  
362 ~~history of APOs stated:~~  
363 ~~....."I didn't plan ahead to get pregnant." Some mothers are unaware of the kind of care or~~  
364 ~~preparation that should be done prior to becoming pregnant. In my situation, I did not take any~~  
365 ~~extra precautions prior to being pregnant, so I continued to eat normally and did not seek~~  
366 ~~medical advice or counsel on PCC until after I became pregnant. (29 years old mother, 10<sup>th</sup>~~  
367 ~~grade, IDI)~~

### 369 1. Awareness of PCC services

370 Information of PCC: Access to information about a service is essential for utilizing it effectively.  
371 Awareness of a service is crucial for its utilization. Without awareness of its existence, knowing it  
372 exists, people cannot benefit from it. For many women and community members, the concept of PCC  
373 remains unfamiliar, as it is a relatively new approach that the healthcare system has not actively  
374 promoted. Both mothers and HCPs indicated that most women lack information about PCC, turning to  
375 healthcare services only after pregnancy confirmation or fertility difficulties. This gap in understanding  
376 repeatedly frequently results in confusion between PCC and prenatal care. High-High-risk mothers  
377 stated people can't use it. According to the participants, the majority of women was unaware of  
378 PCC and only sought health services after confirming pregnancy or facing conception issues.

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379 ~~This lack of awareness led to confusion between PCC and prenatal care. Mothers with a history~~  
380 ~~of APOs said:~~

381 ..... "I do not know what pre-pregnancy care is?" (32 years old mother, 5<sup>th</sup> grade, IDI)

382 ."Endie.....the meaning of this local language is (I don't know). I am just keeping silent" (28  
383 years old mother, 8<sup>th</sup> grade, IDI)

384 .

385 Similarly, a Clinical midwifery professional said,

386 ".....there is a lack of information regarding preconception in the community; I couldn't expect  
387 mothers to visit and utilize preconception care. I believe that we healthcare providers and health  
388 professional associations didn't invest in it, and from my observation in our context, I can  
389 conclude that no mothers are coming to preconception care, even though it is not supported by  
390 research" (Midwifery professional, male, KII)

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391 On the Other hand, participants noted that some high-risk mothers have information about the  
392 services. They emphasized that healthcare providers should advise these mothers, including  
393 those with a history of diabetes, hypertension, HIV, spontaneous abortion, infertility, or  
394 congenital abnormalities, to undergo various health screenings before conception. These  
395 screenings should include tests for non-communicable and communicable diseases, sexually  
396 transmitted infections, mental health issues, gender-based violence, and other chronic conditions.  
397 Additionally, they should receive advice on proper nutrition and avoid harmful substances like  
398 alcohol. A high-risk mother said,

399 I have heard information on PCC from media outlets such as Tigray Television, in a program  
400 called "Maeda Hakaym." I think it is good and beneficial to have a planned life and children. It  
401 sounds nice to have plan, preparations, and examinations and give birth based on planned

402 decisions. Screening on gender-based violence, chronic disease, sexually transmitted infections,  
403 substance use, mental health, nutritional counseling and balanced diet and consultation to a  
404 doctor in the presence of these factors and medication use is essential to prevent adverse  
405 pregnancy outcome” (35 years old mother, 10<sup>th</sup> grade, IDI).

406 Even some mothers explain the concept of PCC and understand its benefits.

407 “I understand that PCC means I need to check my health status, should not take alcoholic  
408 drinks, need to have mental stability, and limit the number of children that I have according to  
409 my income or relation to livelihood. These come to my mind when I am thinking about PCC” (29  
410 years old mother, 10<sup>th</sup> grade, IDI)

411 Besides, most HCPs have some knowledge of PCC and emphasize the importance of women's  
412 health before conception. Gynecology professionals, medical doctors, and, to a lesser extent,  
413 midwifery professionals have a better understanding of PCC concepts and interventions. Key  
414 PCC services identified by HCPs include HIV testing, folic acid supplementation, nutritional  
415 education, family planning, chronic disease screening, substance use advice, STI/HIV screening,  
416 medication management, and assessment of APOs such as Rh incompatibility, Td vaccination,  
417 abortion, and congenital anomalies. Among these, folic acid supplementation, nutritional advice,  
418 and family planning were most frequently mentioned.

419 HIV testing, folic acid supplementations, feeding practices, and nutrition are the things I know  
420 about preconception care services (Midwifery professional, female, IDI).

421 All participants concurred that nearly all healthcare providers are knowledgeable about  
422 recommending three months of folic acid supplementation to mothers with a history of  
423 congenital anomalies and repeated abortions before conception.

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424 Mothers who had a history of repeated abortion before conception are eligible to take folic acid  
425 for three months. We don't give folic acid supplementation to all eligible women (HEW, female,  
426 IDI)

427 On the other hand, participants reported that some HCPs have no information about PCC and do  
428 not even recognize its name.

429 ..... No, I don't know. I don't even think there is such care here. It has been a long time since I  
430 started working here; I never heard anyone talking about it, and I never saw such service being  
431 provided here (Nursing professional, female, IDI)

432 We don't even know about preconception care ourselves. We health professionals don't know it  
433 (HEW, female, IDI)

434 ~~Participants noted that awareness varies, but it is relatively higher among mothers with a history~~  
435 ~~of APOs. They emphasized that healthcare providers should advise these mothers, including~~  
436 ~~those with a history of diabetes, hypertension, HIV, spontaneous abortion, infertility, or~~  
437 ~~congenital abnormalities, to undergo various health screenings before conception. These~~  
438 ~~screenings should include tests for non-communicable and communicable diseases, sexually~~  
439 ~~transmitted infections, mental health issues, gender-based violence, and other chronic conditions.~~  
440 ~~Additionally, they should receive advice on proper nutrition and avoid harmful substances like~~  
441 ~~alcohol. Some mothers even explained the concept of PCC and understood its benefits.~~

442 ~~“Screening for communicable disease (STIs, HIV, Hepatitis b, and malaria), none communicable~~  
443 ~~disease (diabetes, hypertension) and other health problems should be done for a mother at~~  
444 ~~preconception period to know her status” (32 years old mother, 5<sup>th</sup> grade, IDI)~~

445 ~~.....” So, the woman should take adequate nutrition before and during pregnancy to give birth~~  
446 ~~to a healthy baby” (35 years old mother, not attended school, IDI)~~

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447 ~~Even some mothers explain the concept of PCC and understand its benefits.~~  
448 ~~I understand that PCC means, I need to check my health status, should not take alcohol drinks,~~  
449 ~~need to have mental stability and limit the number of children that I have according to my~~  
450 ~~income or relation to livelihood. These come to my mind when I am thinking about PPC (29~~  
451 ~~years old mother, 10<sup>th</sup> grade, IDI)~~  
452 ~~I have ever heard information on PCC from media outlets such as Tigray Television, in a~~  
453 ~~program known as “Maeda Hakaym.” I think it is good and beneficial to have a planned life and~~  
454 ~~children. It sounds nice to be able to have plan, preparations, and examinations and give birth~~  
455 ~~based on make planned decisions. Screening on gender based violence, chronic disease, sexually~~  
456 ~~transmitted infections, substance use, mental health, nutritional counseling and balanced diet~~  
457 ~~and consultation to a doctor in the presence of these factors and medication use is important to~~  
458 ~~prevent adverse pregnancy outcome” (35 years old mother, 10<sup>th</sup> grade, IDI),~~

459

#### 460 Perceived benefit of PCC services

461 Mothers and HCPs emphasized that PCC offers valuable opportunities to assess women's health,  
462 enabling early identification and management of potential issues. This approach not only  
463 enhances maternal healthcare services but also helps avoid unnecessary expenses and reduces the  
464 risk of mother-to-child HIV transmission.

465 Give opportunities for screening of health status: PCC provides opportunities to assess the  
466 health status of mothers, enabling early detection of various conditions and diseases and  
467 identifying potential preconception risks that may lead to adverse pregnancy outcomes, as noted  
468 by participants. This aspect contributes to the promotion of women's health.

469 “Preconception care plays a crucial role in screening for various health risks such as substance

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470 use, gender-based violence, mental illness, HIV/STIs, and chronic conditions like diabetes,  
471 hypertension, and heart disease before conception occurs” (29 years old mother, 10<sup>th</sup> grade,  
472 IDI),

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473 **Enhance maternal healthcare services:** Some participants noted that PCC services would  
474 facilitate antenatal, delivery, and postnatal care services.

475 .....”Moreover, providing expectant mothers with guidance on the timing of childbirth, pre-  
476 pregnancy preparations, pregnancy care, and postnatal support can significantly ease their  
477 journey. As emphasized earlier” (Public health professional, male, KII)

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478 “If we work on preconception care earlier now, they will be able to start ANC contact on their  
479 day” (Public health professional, female, KII)

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480 **Prevent HIV transmission from mother to child:** The optimal time to prevent HIV  
481 transmission from mother to child is during the pre-pregnancy period, as identified by  
482 participants.

483 .....”It is essential to undergo various tests, such as HIV testing, before pregnancy to prevent  
484 the transmission of the virus to the unborn child” (24 years old mother, 10<sup>th</sup> grade, FGD)  
485 It (PCC) can help to prevent mother-to-child transmission of diseases (30 years old mother,  
486 diploma, FGD),

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487 **Save unnecessary expenses and efforts:** Participants pointed out that some women spend their  
488 money and energy on ultrasounds and other laboratory tests privately during pregnancy because  
489 they did not consult healthcare providers before becoming pregnant. However, if these tests were  
490 initiated earlier, mothers could avoid unnecessary expenses and efforts.

491 **Perceived benefit of PCC**

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492 ~~Participants emphasized that PCC offers valuable opportunities to assess women's health,~~  
493 ~~enabling early identification and management of potential issues. This approach not only~~  
494 ~~enhances maternal healthcare services but also helps avoid unnecessary expenses and reduces the~~  
495 ~~risk of mother to child HIV transmission.~~

496 ~~**Give opportunities for screening of health status:** PCC provides opportunities to assess the~~  
497 ~~health status of mothers, enabling early detection of various conditions and diseases, and~~  
498 ~~identifying potential preconceptional risks that may lead to adverse pregnancy outcomes, as~~  
499 ~~noted by participants. This aspect contributes to the promotion of women's health.~~

500 ~~*"Preconception care plays a crucial role in screening for various health risks such as substance*~~  
501 ~~*use, gender-based violence, mental illness, HIV/STIs, and chronic conditions like diabetes,*~~  
502 ~~*hypertension, and heart disease before conception occurs"* (29 years old mother, 10<sup>th</sup> grade,~~  
503 ~~**IDI**)~~

504  
505 ~~**Enhance maternal healthcare services:** Some participants noted that PCC services would~~  
506 ~~facilitate antenatal, delivery, and postnatal care services.~~

507 ~~....."Moreover, providing expectant mothers with guidance on the timing of childbirth, pre-~~  
508 ~~pregnancy preparations, pregnancy care, and postnatal support can significantly ease their~~  
509 ~~journey. As emphasized earlier"~~ (Public health professional, male, KII)

510  
511 ~~*"If we work on preconception care earlier now, they will be able to start ANC contact on their*~~  
512 ~~*day"* (Public health professional, female, KII)~~

513 ~~**Prevent HIV transmission from mother to child:** The optimal time to prevent HIV~~  
514 ~~transmission from mother to child is during the pre-pregnancy period, as identified by~~

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516 ..... "It is important to undergo various tests, such as HIV testing, before pregnancy to prevent  
517 the transmission of the virus to the unborn child" (24 years old mother, 10<sup>th</sup> grade, FGD)  
518 It (PCC) can help to prevent mother to child transmission of diseases (30 years old mother,  
519 diploma, FGD)

520  
521 ~~Save unnecessary expenses and efforts:~~ Participants pointed out that some women spend their  
522 money and energy on ultrasounds and other laboratory tests privately during pregnancy because  
523 they did not consult healthcare providers before becoming pregnant. However, if these tests were  
524 initiated earlier, mothers could avoid many unnecessary expenses and efforts.

## 525 2. Experience with PCC services

### 526 Current Practices in the Components of PCC Interventions

#### 527 ~~Current Practices of Healthcare Providers Regarding Components of PCC~~ 528 ~~interventions~~

529 ~~Knowledge of PCC:~~ Most HCPs have some knowledge of PCC and emphasize the importance  
530 of women's health before conception. Gynecology professionals, medical doctors, and, to a lesser  
531 extent, midwifery professionals, have a better understanding of PCC concepts and interventions.  
532 ~~Key PCC services identified by HCPs include HIV testing, folic acid supplementation,~~  
533 ~~nutritional education, family planning, chronic disease screening, substance use advice, STI/HIV~~  
534 ~~screening, medication management, and assessment of APOs such as Rh incompatibility, Td~~  
535 ~~vaccination, abortion, and congenital anomalies. Among these, folic acid supplementation,~~  
536 ~~nutritional advice, and family planning were most frequently mentioned. Although there is no~~  
537 ~~formal PCC program, healthcare workers highlight adolescent health programs, premarital HIV~~

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538 ~~testing, and family planning services as essential components related to PCC interventions.~~

539

540 ~~“I have information about how to lose weight (weight loss) through health education, nutritional~~  
541 ~~supplementation, smoking should be reduced, opioid misuse of drugs should be reduced, alcohol~~  
542 ~~should be reduced, and immunizations (vaccination) should be administered before~~  
543 ~~pregnancy.”(General practitioner professional, male, IDI)~~

544

545 ~~HIV testing, folic acid supplementations, feeding practices, or nutrition are the things I know~~  
546 ~~about preconception care services (Midwifery professional, female, IDI)~~

547 ~~All participants concurred that nearly all healthcare providers are knowledgeable about~~  
548 ~~recommending three months of folic acid supplementation to mothers with a history of~~  
549 ~~congenital anomalies and repeated abortions prior to conception.~~

550 ~~Mothers who had history of repeated abortion before conception are eligible to take folic acid~~  
551 ~~for three months. We don't give folic acid supplementation to all eligible women (HEW, female,~~  
552 ~~IDI)~~

553 ~~On the other hand, participants reported that majority HCPs have no information about PCC and~~  
554 ~~do not even recognize its name.~~

555 ~~..... No, I don't know. I don't even think there is such care here. It has been a long time since I~~  
556 ~~started working here; I never heard anyone talking about it, and I never saw such service being~~  
557 ~~provided here (Nursing professional, female, IDI)~~

558

559 ~~..... “It is a new concept for the community and most health professionals including HEWs do~~  
560 ~~not know exactly what preconception care is.” (Family health professional, female, KH)~~

561

562 *We don't even know about preconception care ourselves. We health professionals don't know it*  
563 *(HEW, female, IDI)*

564 ~~Current practices on Components of PCC interventions:~~ Participants observed that while  
565 "PCC" is not widely recognized, providers still practice components like family planning, iron  
566 and folic acid supplementation, and premarital HIV testing, often unintentionally. They agreed  
567 that primary healthcare settings lack routine PCC services with assigned providers or designated  
568 units, missing a significant opportunity. HCPs highlighted a significant gap in healthcare  
569 settings, attributing it to the absence of routine PCC services with designated providers or  
570 specialized units, leading to missed opportunities for comprehensive care. They observed that  
571 ~~They also noted that providers deliver some~~ PCC interventions, such as folic acid  
572 supplementation and various forms of counseling, in a fragmented manner across various units  
573 ~~like including~~ antenatal care, gynecology/obstetrics, youth-friendly service units, family  
574 planning, chronic disease clinics, and post-abortion care, ~~especially~~ particularly for high-risk  
575 mothers, ~~aiming to reduce APOs.~~ Although Mmidwives and gynecologists ~~deliver provide~~  
576 some ~~of these~~ services, ~~but~~ participants highlighted that private clinics offer them more  
577 ~~commonly provide them~~ consistently.

578 A public health professional discussed how various units provide components of PCC  
579 interventions as: "It is done irregularly in youth friendly services unit like the family planning  
580 itself, reproductive and diet education. But it is not deep. But something is tried. Usually, as I  
581 tell you, the peer to peer takes the biggest share" (Public health professional, male, KII)

582  
583 .....in addition to these mothers diagnosed with DM, threatened abortion, spontaneous abortion,  
584 recurrent still birth etc are informed and appointed to consult healthcare provider before getting

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585 pregnancy in gyn/obs OPD. The consultation is specifically regarding folic acid, there is no  
586 more service provided for other possible reasons (Clinical Midwifery professional, male, KII

587 ~~A 35 years old women said: As a result of my personal health issues, I sought advice from~~  
588 ~~healthcare providers. I diagnosed for hypertension, which unfortunately led to a stillbirth in the~~  
589 ~~past. Therefore, when I planned my next pregnancy, I consulted with health workers to ensure~~  
590 ~~the best possible outcome. I even visited referral hospitals for further guidance and was advised~~  
591 ~~to visit healthcare facilities ahead of any future pregnancy. I followed this advice accordingly~~  
592 ~~(35 years old mother, 9<sup>th</sup> grade, FGD)~~

593 ~~Contrarily, an MCH expert employed at the district health office provided insight into the~~  
594 ~~availability of PCC services within healthcare facilities as follows:~~

595 ~~In both urban and rural locations, pre pregnancy care is currently nonexistent. It hasn't existed~~  
596 ~~before, as far as I can tell. Policy, too, begins with family planning. Additionally, access to~~  
597 ~~preconception care is not as high as indicated. I won't be questioned about whether or not I offer~~  
598 ~~the services. I'm speaking to you based on my level of expertise. It was lately that I attended~~  
599 ~~training. I received thorough training on PCC in Adama, and it isn't offered locally (Public~~  
600 ~~health professional, male, KII)~~

601  
602 ~~Similarly, women have not received any counseling as pre pregnancy care, even for those~~  
603 ~~women who have visited the health facility for the removal of their contraceptives for the~~  
604 ~~purpose of pregnancy. Mothers with history of APOs said:~~

605 ~~....."For instance, before my fifth pregnancy, I used a method of birth control to avoid getting~~  
606 ~~pregnant for eight years. When we decided to have a child for a variety of reasons, I went to a health~~  
607 ~~facility and asked the HCP about our plans and wanted to have the implant contraceptive medication~~

608 ~~removed in accordance with our plan. After removing the contraceptive, I got pregnant. HCPs did not~~  
609 ~~educate us about PCC or other preconception care at that time” (32 years old mother, 5th grade,~~  
610 ~~IDI)~~

611 ~~A public health professional discussed how various units provide components of PCC~~  
612 ~~interventions as: “It is done irregularly in youth friendly services unit like the family planning~~  
613 ~~itself, reproductive and diet education. But it is not deep. But something is tried. Usually, as I~~  
614 ~~tell you, the peer to peer takes the biggest share” (Public health professional, male, KH)~~

615  
616 ~~.....in addition to these mothers diagnosed with DM, threatened abortion, spontaneous abortion,~~  
617 ~~recurrent still birth etc are informed and appointed to consult healthcare provider before getting~~  
618 ~~pregnancy in gyn/obs OPD. The consultation is specifically regarding folic acid, there is no~~  
619 ~~more service provided for other possible reasons (Clinical midwifery professional, male, KH)~~

620  
621 ~~On the other hand~~ in general, the majority of participants noted that the components of PCC  
622 interventions provided mainly for the high risk women are:

623 **Contraceptive counseling for pregnancy delay:** All participants, including both users and  
624 providers, noted that contraceptive counseling for delaying pregnancy was offered to all women  
625 of reproductive age within the community and healthcare system.

626 **Provide folic acid supplementation:** All participants, both users and providers, agreed that folic  
627 acid supplementation was commonly provided to mothers with a history of chronic diseases such  
628 as diabetes, congenital anomalies, and spontaneous abortion, making it one of the most  
629 frequently practiced components of PCC interventions.

630 .....” *We provide folic acid for women who have history of abnormal pregnancy like spinal*

631 *bifida, hydrocephalus, and anencephaly. We give a priority for these women” (MD, Obstetrics*  
632 *and gynecology professional, male, KII)*

633

634 **Counseling about medication safety:** Participants mentioned that some women with a history  
635 of chronic diseases such as diabetes and hypertension received counseling about medication  
636 safety before conception when they visited the health facility for follow-up.

637 “ *Need advice about medication with alcohol, if mothers have diabetic mellitus, HIV, and*  
638 *Hypertension should advise her that the medicines should be changed first before pregnant for*  
639 *example ACE inhibitors drugs have teratogenic effect” (General practitioner professional MD,*  
640 *male, IDI)*

641 **Counseling about substance use:** Some mothers with a history of APOs, including abortion,  
642 chronic disease, congenital anomalies, and alcohol intake, received suboptimal counseling. They  
643 were advised to avoid medications that cause teratogenic effects and to abstain from substance  
644 use. Additionally, they were recommended to take folic acid supplements and undergo HIV  
645 testing before conception.

646 *Women counsel to take folic acid before 3 months and to avoid bad habits such as alcohol,*  
647 *smoking, and other addictive substances (Family health professional, female, KII)*

648 *Contrarily, an MCH expert employed at the district health office provided insight into the*  
649 *availability of PCC services within healthcare facilities as follows:*

650 *In both urban and rural locations, pre-pregnancy care is currently nonexistent. It hasn't existed*  
651 *before, as far as I can tell. Policy, too, begins with family planning. Additionally, access to*  
652 *preconception care is not as high as indicated. I won't be questioned about whether or not I offer*

653 the services. I'm speaking to you based on my level of expertise. It was lately that I attended  
654 training. I received thorough training on PCC in Ethiopia xxx town, and it isn't offered locally  
655 (Public health professional, male, KII)

656 Moreover, most of the mothers agreed that women seek pre-pregnancy care only when  
657 concerned about their health. A high-risk mother noted:

658 As a result of my personal health issues, I sought advice from healthcare providers. I was  
659 diagnosed with hypertension, which unfortunately led to a stillbirth in the past. Therefore, I  
660 consulted with health workers to ensure the best possible outcome when I planned my next  
661 pregnancy. I even visited referral hospitals for further guidance and was advised to visit  
662 healthcare facilities ahead of any future pregnancy. I followed this advice accordingly (35 years  
663 old mother, 9<sup>th</sup> grade, FGD)

664 Additionally, mothers reported not receiving any counseling as part of pre-pregnancy care, even  
665 those who visited health facilities to have their contraceptives removed in preparation for  
666 pregnancy.

667 “When you go to health facilities for contraceptive removal, the care providers will ask you “Is  
668 it because you want to conceive? “ Then, they would simply remove you and do nothing else,  
669 even if you said yes. There is no preconception care, there is no counseling, and they didn't  
670 assess your eligibility for pregnancy. Due to this, the community doesn't have the awareness,  
671 doesn't know what PCC is or what to do, and as a result, there is no demand for the service.”

672 (35 years old mother, 10<sup>th</sup> grade, IDI)

673 Home-based preparation: Adopting a pregnancy plan allows women to adequately prepare for

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674 conception. Preparedness for pregnancy is crucial to minimize modifiable risk behaviors that can  
675 lead to poor pregnancy outcomes. This proactive approach not only encourages planned, healthy  
676 pregnancies but also fosters positive birth outcomes and overall well-being for both women and  
677 infants. Some mothers, particularly high risk mothers, take proactive ~~at home such as saving for~~  
678 medications, modifying alcohol intake, improving their diet, and focusing on mental readiness.~~steps to~~  
679 prepare for pregnancy. They save money for medications, food, and childcare, and focus on  
680 mental preparation to ensure stability when facing the challenges of pregnancy, especially during  
681 the initial trimester.

682 A mother with a history of APOs said:- “before the mother becomes a pregnant, need to get  
683 prepared psychologically and economically. Psychologically prepared means mentally she needs  
684 to be stable, she need to eat more than usual (4-5 times per day)” (29 years old mother, 10<sup>th</sup>  
685 grade, JDI)

686  
687 A mother mentioned that when planning for pregnancy, she prepares the chicken with local  
688 alcohol (siwa) for her husband and drinks " siwa siray " herself, believing it benefits the child.  
689 .....”a chicken should be slaughtered and Siwa (local alcohol) should be prepared, it is done  
690 before you get pregnant or when you are thinking about pregnancy. It is mostly for my husband  
691 but myself also drinks the siwa siray and it is good for the child” (35 years old mother, not  
692 attended school, FGD)

693 Pre pregnancy information was not adequately emphasized in healthcare services, including  
694 those within the community, leading to a lack of essential information for women to properly  
695 prepare for pregnancy. ~~On the contrary, p~~ Participants emphasized that most mothers, particularly

696 those without known health issues, do not take any action or invest in pregnancy preparation. A  
697 high risk M mothers with a history of APOs stated:  
698 ....."I didn't plan ahead to get pregnant." Some mothers are unaware of the kind of care or  
699 preparation that should be done prior to becoming pregnant. In my situation, I did not take any  
700 extra precautions prior to being pregnant, so I continued to eat normally and did not seek  
701 medical advice or counsel on PCC until after I became pregnant. (29 years old mother, 10<sup>th</sup>  
702 grade, IDI)

### 704 ~~2.~~ **3. Challenges of preconception care PCC services**

#### 705 **Poor awareness of PCC**

706 ~~The community lacks information about pre-pregnancy care: Most women and community~~  
707 ~~members are unfamiliar with PCC, as it is a new concept that the healthcare system does not~~  
708 ~~promote. Health professionals view it as an additional benefit rather than an essential one.~~  
709 ~~Consequently, women typically visit healthcare facilities only after confirming pregnancy or~~  
710 ~~encountering conception issues, resulting in poor awareness and uptake of PCC.~~

711 ~~“.....there is a lack of information regarding preconception in the community, I couldn't expect~~  
712 ~~mothers to visit and utilize preconception care. I believe that we healthcare providers and health~~  
713 ~~professional associations didn't invest in it, and from my observation in our context, I can~~  
714 ~~conclude that there are no mothers coming to preconception care, even though it is not~~  
715 ~~supported by research” (Clinical midwifery professional, male, KH)~~

716 ~~Deliver fragmented~~ **Fragmented services based services:** Participants observed that ~~healthcare~~  
717 ~~providers HCPs~~ deliver fragmented PCC components to high-risk women, resulting in low  
718 awareness and uptake. Key challenges include the lack of ~~package based services and access to~~

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719 PCC guidelines, limited government focus, and inadequate training, and insufficient provider  
720 awareness.

721 *“In general, the health system gave no focus to PCC. In practice, no structures have been*  
722 *established in ~~any~~ healthcare institutions to support PCC. I think this is the main challenge.*  
723 *Hence, if there is no center for PCC in the health system, if there is no focus on PCC, and if the*  
724 *health care provider ~~will not~~does not ~~give emphasis~~emphasize to PCC, the community will do*  
725 *so. ~~Moreover, healthcare providers are not receiving adequate training in PCC, leading to poor~~*  
726 *~~attitudes and a lack of skill in this area.~~*

727 *I believe this is the primary challenge” (Obstetrics and gynecology professional, MD, male, KII)*

728 In general, all participants noted that while limited orientation or information about PCC was  
729 provided, the government prioritized and delivered package-based services such as antenatal care  
730 (ANC) and delivery services.

731 “A kind of orientation or information was given about PCC by partners, but they still do not get  
732 that much focus from the government or partners on PCC like the other health care services.  
733 Through education, the community shows behavioral change about child and maternal  
734 nutrition” (Family health professional, female, KII)

### 735 **Traditional Bbelief and misconceptions**

736 Lack of felt need to disclose desire to conception: Mothers and healthcare providers have  
737 noted that, with few exceptions, most women tend to keep their desire to have a child  
738 confidential. Many women even conceal their pregnancies during the early months. They  
739 typically do not discuss their intentions to conceive with others unless it is with their husband, a  
740 very close friend. While discussing pre-pregnancy care may seem taboo or embarrassing within  
741 certain segments of the community, it might be disclosed after pregnancy is confirmed because

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742 pregnancy is perceived as a gift from St. Mary or God.  
743 Mothers~~High-risk Mother~~ with a history of APOs said:  
744 .....” Discussing care before pregnancy with a neighbor or a part of the community is often  
745 considered impolite or embarrassing. Instead, it's more common to share this information once  
746 pregnancy is officially confirmed, as there's a belief that pregnancy is a blessing from St. Merry  
747 or God (32 years old mother, 5th grade, IDI)  
748  
749 “Mostly, it is in the latter stages of pregnancy that the woman discloses her pregnancy status;  
750 except for a for a few, most of the women keep it confidential” (29 years old mother, 10<sup>th</sup> grade,  
751 IDI)  
752  
753 Additionally, a MCH expert said: “Disclosing or consulting with healthcare providers before  
754 getting pregnant is the biggest challenge in the community. Mothers may feel ashamed to  
755 consult; normally, it shouldn't be “(Reproductive~~Public~~ health professional, female, KII).  
756  
757 Misconception about fear of side effects: Mothers noted that contraception, especially the  
758 Depo injection, is believed to cause infertility. Women avoid using Depo because it delays  
759 pregnancy after discontinuation. Due to this misconception, many women are discouraged or  
760 restricted from using contraceptives.  
761 “Now, for example, faith in the contraceptive (depo) causes a delay of pregnancy and hence  
762 many mothers do not use contraception” (General~~practitioner professional~~ MD, male, IDI)  
763 A maternal health expert pointed out that mothers discontinue contraceptives because they  
764 believe these may be responsible for the increase in congenital anomalies.  
765 .....”You see, especially now, after encountering many congenital anomalies, numerous mothers

766 have approached us to discontinue family planning” (Midwifery professional, female, IDI)  
767 ~~Beliefs about conception: participants highlighted an entrenched cultural belief within the~~  
768 ~~community that could impede women from accessing PCC services. This belief revolves around~~  
769 ~~the perception that pregnancy is not solely determined by individual choices but is instead~~  
770 ~~viewed as a divine gift from God or influenced by St. Mary.~~  
771 ~~..... According to the moms' and society's beliefs, conception is a gift from God or determined~~  
772 ~~by St. Merry, and being pregnant or the moment a mother becomes pregnant is not something a~~  
773 ~~mother chooses to have. (Family health professional, female, KH)~~  
774 ~~.....”When you think of pre-pregnancy testing, you might wonder if God doesn't do it. The~~  
775 ~~question may arise as to how you come by the work of God. It is God's work whether a child is~~  
776 ~~created or not” (HEW, female, IDI)~~  
777 ~~**Misconception about the risks of pregnancy losses and mistrust of providers:** Participants~~  
778 ~~noted that mothers often mistakenly believe the TT vaccine during pregnancy may cause~~  
779 ~~pregnancy loss. They also think healthcare providers don't fully understand the natural or genetic~~  
780 ~~causes of recurrent loss, which continues despite treatment, potentially affecting the acceptance~~  
781 ~~of PCC. A mother with history of APOs said;~~  
782 ~~“Maybe it is a natural problem. I may naturally have a problem. I have abdominal bloating; I~~  
783 ~~used to feel as if something was moving inside my abdomen. I don't know about the causes of the~~  
784 ~~others, but mine might be associated with Mengegna. Mengegna meant something natural, an~~  
785 ~~inborn problem that causes pregnancy loss. Even the doctors didn't know it; they give you~~  
786 ~~medicines, but they don't tell you what the problem is. For instance, in the most recent loss, the~~  
787 ~~doctor told me to take the medicine because I had recurrent pregnancy loss; however, he didn't~~  
788 ~~tell me what exactly the problem behind this recurrent loss was” (28 years old mother, 8th~~

789 ~~*grade, IDI)*~~

790 ~~Myth about contraception: Some mothers also mentioned that rumors spread by religious leaders,~~  
791 ~~who claim that contraception is a sin, further complicate the situation. This belief may be an~~  
792 ~~obstacle for pre-pregnancy care because, for PCC, women need to have a plan for pregnancy;~~  
793 ~~otherwise, it will be difficult to provide the services.~~

794 ~~*The rumors spread by religious leaders who claim contraception are a sin further complicates*~~  
795 ~~*the situation (Nursing professional, female, IDI)*~~

796  
797 ~~**Misconception about fear of side effects:** Mothers noted that contraception, especially the~~  
798 ~~Depo injection, is believed to cause infertility. Women avoid using Depo because it delays~~  
799 ~~pregnancy after discontinuation. Due to this misconception, many women are discouraged or~~  
800 ~~restricted from using contraceptives.~~

801 ~~*“Now, for example, faith in the contraceptive (depo) causes a delay of pregnancy and hence*~~  
802 ~~*many mothers do not use contraception” (General practitioner professional, male, IDI)*~~

803 ~~A maternal health expert pointed out that mothers discontinue contraceptives because they~~  
804 ~~believe these may be responsible for the increase in congenital anomalies.~~

805 ~~*..... “You see, especially now, after encountering many congenital anomalies, numerous mothers*~~  
806 ~~*have approached us to discontinue family planning” (Midwifery professional, female, IDI)*~~

807 **Misconception about intake of alcohol:** Participants noted that consuming traditional alcohol  
808 ("Siwa" and "Myes") is not harmful except when taken with medication, particularly during the  
809 first four months of pregnancy. Additionally, some mothers believe that alcohol does not  
810 increase the risk of abortion or stillbirth; instead, they attribute these risks to poor nutrition, lack  
811 of adequate rest, and stress. Participants also mentioned that some elders believe consuming

812 honey before pregnancy may facilitate the mental development and good health of the fetus later  
813 during pregnancy.

814 *“There is no problem with the intake of alcohol before pregnancy. Even though it does not cause  
815 any harm until four months of pregnancy, according to the lesson we took, Drinking alcohol is  
816 not allowed when you are taking medication. However, it has no problem with other issues,  
817 including. Drinking milk is not allowed after six months of pregnancy” (35 years old mother, not  
818 attended school, IDI)*

819  
820 *“Yes, for instance, our elders say it is good to take honey before pregnancy. They say it facilitates  
821 mental development and the good health of the foetus later during pregnancy. Also recommended  
822 by the community is Myes intake. I don't think these substances can cause abortion or stillbirth.  
823 Abortion and stillbirth are mainly caused by the factors I mentioned earlier, such as poor  
824 nutrition, a lack of adequate rest, and stress” (35 years old mother, 10<sup>th</sup> grade, IDI.*

825 **Poor quality of counseling on contraceptive services**

826 **Unwanted pregnancies due to concerns about side effects**

827 ~~Both M~~mothers and ~~healthcare providers~~HCPs acknowledged that many women are deterred  
828 from using contraceptives due to fears of side effects such as delayed pregnancy and bleeding.  
829 Discontinuing contraceptives, switching to alternatives, or stopping altogether can lead to  
830 unexpected pregnancies, which hinder the provision of PCC services.

831 *“I was on birth control ~~shots~~ for four years but stopped because I experienced intense bleeding  
832 or a hemorrhagic condition, which led to my pregnancy. It wasn't something I had planned for. I  
833 only used contraceptives for the first pregnancy (since it was my first, I didn't use them again),  
834 but all my other pregnancies were unplanned. They happened after I stopped using birth control*

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835 *due to negative side effects. I attempted to use birth control again but stopped due to these side*  
836 *effects and tried the calendar method, but that didn't work, and I ended up pregnant again. I*  
837 *didn't have a specific plan for my reproductive life. A lot of it just happened by chance, not by*  
838 *design." (35<sup>th</sup> years old mother, 10<sup>th</sup> grade, IDI)*

839  
840 ~~**Lack of felt need to disclose desire to conception:** Mothers and healthcare providers have~~  
841 ~~noted that, with few exceptions, most women tend to keep their desire to have a child~~  
842 ~~confidential. Many women even conceal their pregnancies during the early months. They~~  
843 ~~typically do not discuss their intentions to conceive with others unless it is with their husband, a~~  
844 ~~very close friend. While discussing pre-pregnancy care may seem taboo or embarrassing within~~  
845 ~~certain segments of the community, it might be disclosed after pregnancy is confirmed because~~  
846 ~~pregnancy is perceived as a gift from St. Mary or God.~~

847 ~~Mothers with a history of APOs said:~~  
848 ~~....." Discussing care before pregnancy with a neighbor or a part of the community is often~~  
849 ~~considered impolite or embarrassing. Instead, it's more common to share this information once~~  
850 ~~pregnancy is officially confirmed, as there's a belief that pregnancy is a blessing from St. Mary~~  
851 ~~or God (32 years old mother, 5<sup>th</sup> grade, IDI)~~

852  
853 ~~"Mostly, it is in the latter stages of pregnancy that the woman discloses her pregnancy status,~~  
854 ~~except for a for a few, most of the women keep it confidential" (29 years old mother, 10<sup>th</sup> grade,~~  
855 ~~IDI)~~

856  
857 ~~Additionally, a MCH expert said: "Disclosing or consulting with healthcare providers before~~  
858 ~~getting pregnant is the biggest challenge in the community. Mothers may feel ashamed to~~

859 ~~consult, normally, it shouldn't be~~ "(Reproductive health professional, female, KH)

860 **Social influences**

861 **Influence of elder person and religious leaders**

862 ~~Resistance to planning pregnancy:~~ Participants highlighted the influential role of husbands, older  
863 in-laws, and community leaders in encouraging women to plan pregnancies and seek healthcare advice  
864 noted that older in laws and community leaders play a key role in encouraging women to plan  
865 their pregnancies and seek healthcare advice beforehand. However, cultural beliefs often dictate  
866 that once a woman is pregnant, she must continue the pregnancy, regardless of her mental readiness.  
867 many women, along with their husbands and mothers in-law, believe that once a woman is  
868 pregnant, she must proceed with the pregnancy, regardless of her mental readiness. In some  
869 areas/regions, women fear abandonment if they may hesitate to leave their husbands, fearing  
870 abandonment during pregnancy whiel. Additionally, cultural norms discourage women from  
871 openly discussiong about family planning with in-laws or friends, causing embarrassment. their  
872 desire to have children with in laws or friends, leading to embarrassment. Some Additionally,  
873 elders also promote seeking blessings from holy water rather than consulting healthcare  
874 professionals.

875 *"What is the barrier to pre-pregnancy testing that Yau explained is the backward culture. Even*  
876 *though she knows it, she wants this, she wants to have a baby because she thinks it will hurt, or*  
877 *she is ashamed, it's a shake to be told this is what she wants, but they know it. It is very*  
878 *embarrassing to say that you want to have children with your mother-in-law or father-in-law,*  
879 *even with your friends. For example, I can tell them that I want to have a baby here and my baby*  
880 *is grown, I may even have a desire inside, but they can go out and accuse me of being*  
881 *shameful"*(35<sup>th</sup> years old mother, 10<sup>th</sup> grade, FGD)

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882  
883 Some would believe in the service and some would not, especially the old-times people (elders).  
884 *The elders may downplay the service like: “we are here and still managed to have kids despite*  
885 *there ~~being-was~~ no such service in our time,” and ask “Consulting who else were our*  
886 *grandmothers conceiving that you are doing so now?” and the like (35 years old mother, 10<sup>th</sup>*  
887 *grade, IDI)*

888 On the other hand, some participants highlighted that older mothers emphasize the importance of  
889 pre-pregnancy care, particularly for women facing infertility ~~pointed out that community leaders~~  
890 ~~and elder mothers advocate for pre-pregnancy care, particularly for women facing infertility to~~  
891 ~~deliver a healthy baby. Furthermore, some elderly mothers advise women to discreetly seek~~  
892 ~~guidance from healthcare providers~~

893 *“They are very supportive of it. They are especially encouraging if you give them recognition*  
894 *when it comes to mothers and children. It's okay because it's normal in the normal. ~~But~~ however,*  
895 *women with the problem of being unable to get pregnant are encouraged to consult healthcare*  
896 *providers by the mothers because they want you to give birth to them. They even tell you to go in*  
897 *hiding” (Public health professional, male, KII)*

898 **Poorly perceived PCC for low-risk women:**

899 ~~Participants noted that the community may criticize and socially pressure mothers without~~  
900 ~~known health problems to seek PCC services, potentially leading to them being ridiculed.~~

901 *“The community criticizes or said to her as what does it mean to seek care before being*  
902 *pregnant without sick and replay to her this is joking” (32 years old mother, 5<sup>th</sup> grade, IDI)*

903 **Husband opposes PCC:** ~~Mothers iterated that a significant husband may influence women to~~  
904 ~~uptake PCC services. The reason might be they do not perceive seeking care before pregnancy~~

905 for women with no known health issues. Participants also noted that except for some husbands  
906 with good literacy levels, most of them understand that PCC is not a priority issue, so not support  
907 to consult women's healthcare provider services before pregnancy.

908 *The majority of them (husbands) are obstacles except a few (35 years old mother, not attended*  
909 *school, IDI)*

910 *"Some husband makes fun of them. For example, I met a mother who gave birth to 10 children*  
911 *and told me to take contraception but my husband refused. He is still a son-of-a-bitch. Imagine*  
912 *being unable to protect a mother with 9 children whose one is dead. Surprisingly, she told him to*  
913 *use protection in front of me and he joked that she would still be engaged/married" (HEW,*  
914 *female, IDI)*

915

### 916 **High Workload**

917 **~~Extra burden on the healthcare provider:~~** Healthcare providers HCPs noted that providing  
918 PCC services increases their workload and places additional burdens on staff, potentially leading  
919 to demands for extra benefits and staffing. When women come for child vaccinations and family  
920 planning but also request PCC, it requires additional time and commitment from healthcare  
921 providers. Providers highlighted that due to time constraints, some women were not screened.

922

923 *"Implementing this program will increase our workload and place additional burdens on the*  
924 *staff, potentially leading to demands for extra benefits. This could pose a challenge if there is no*  
925 *allocated budget" (Midwifery professional, female, IDI)*

926

927 On the other hand one healthcare provider noted that, if we work on PCC it will make the  
928 provider's job easier because it decreases the risk factors like malnutrition, abortion and other

929 complications during pregnancy and childbirth.

930 ....”For sure, but if it is done here, I think it will make our job easier for us. So we have worked  
931 on preconception care, and we are fixing this malnutrition-~~thing~~. His silence, which we call  
932 abortion, is being fixed while it is there. Stunting and underweight are being fixed there. So the  
933 professionals finish their work there” (**Public health professional, male, KII**)

934

### 935 **Services cost**

936 Low socioeconomic status, service costs, and transportation expenses pose major barriers to  
937 accessing preconception care (PCC) services. While maternal health services like antenatal care,  
938 labor, delivery, and postnatal care are free in Ethiopia, participants highlighted that the costs of  
939 PCC, such as lab tests and imaging, are challenging for low-income mothers. This financial  
940 burden can result in missed opportunities for PCC, increasing the risk of preventable maternal  
941 and child health complications. Additionally, many individuals’ priorities other needs over PCC  
942 if they feel healthy, and there is reluctance among mothers to seek care, even for routine  
943 checkups when ill.

944

945 “Regarding the affordability of PCC costs, a mother with a low income might not be able to  
946 afford to pay, especially for some lab tests and imaging procedures” (**32 years old mother, 5<sup>th</sup>**  
947 **grade, IDI**)

948

949 “If it has a cost, those who cannot afford it would miss the service, which could contribute to the  
950 occurrence of maternal and child health complications that could have been prevented otherwise  
951 “(**29 years old mother, 10<sup>th</sup> grade, IDI**)

952

953 ~~Distance to health facility: A mother~~ Mothers reported that, long distance because of distance  
954 to health facility and, lack of money for transport lack of money for transport often leads them  
955 to miss the PCC services, mothers may induce to for decision to miss the PCC services.  
956 *“The health facility may be too far from your house, you may face a shortage of money, and you*  
957 *may be unable to walk there. In that case, how are you supposed to get to the health facility? If*  
958 *you do not have transportation costs, it is necessary to stay at home. Lack of money will prevent*  
959 *you from doing many things. Then, you become stressed and decide to be ignorant” (35 years*  
960 *old mother, not attended school, IDI)*

961 Nearly all mothers and HCPs agreed that PCC services should be accessible to individuals,  
962 regardless of economic status, to enhance maternal and child health, reduce costs, and promote  
963 equity. Participants stressed the importance of providing these services free of charge, like other  
964 MCH programs, to support low-income mothers at higher risk of health complications.

965 *“The service should be free of charge. If it has a cost, those who cannot afford it ~~would~~ will miss*  
966 *the service, which could contribute to the occurrence of maternal and child health complications*  
967 *that could have been prevented otherwise” (29 years old mother, 10<sup>th</sup> grade, IDI),*

968 *“The cost of service for PCC should be free, similar to the service provided for ANC. If there is a*  
969 *fee, the community will refuse it. The government should provide subsidies and exempt services*  
970 *related to PCC” (HEW, female, IDI)*

971 A healthcare provider working at MCH said that providing free PCC services is also difficult for  
972 the health facility ~~balanced payment may be good for sustain~~ that providing free PCC services is  
973 also difficult for the health facility ~~balanced payment may be good for sustaining the services.~~

974 *“If it is a free service, the health facility may also suffer, but it should be at a reasonable price.*

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975 *For example, a sugar test results in 70 or 80 birr. This should be reduced” (Public health*  
976 *professional, male, IDI),*

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977  
978 **Scarcity of medicines and medical equipmentresources**

979 The majority of both HCPs and mothers highlighted that shortages of medical equipment and  
980 medicines such as iron and folic acid supplements, anti-hepatitis vaccines, immunoglobulin,  
981 laboratory reagents, essential drugs, and diagnostic tests like ultrasound pose significant  
982 challenges to PCC services, particularly at health centers. Similarly they mentioned that due to  
983 the scarcity of medical supplies and medications, women are frequently referred to hospitals,  
984 exacerbating the situation, especially amid the crisis in the study area (Tigray). A participant  
985 working in the delivery unit highlighted a concerning trend of congenital anomalies, which they  
986 suspect may be linked to the shortage of folic acid supplements. Additionally, participants  
987 reiterated the challenges posed by the lack of guidelines and the shortage of healthcare providers.

988 *“Most of the preconception care services, such as iron and folic acid supplements, ultrasounds,*  
989 *and lab tests for HIV/STI, are not available at the health center” (29 years old mother, 10 th*  
990 *grade, IDI)*

991  
992 *There is no guideline~~s~~ and a shortage of healthcare providers. ....”A mother who is Hepatitis*  
993 *positive should get ~~anti~~-Hepatitis vaccine and immunogloblin. But we don't have this drug in the*  
994 *facility”(General practitioner professional, male, IDI)*

995 ~~On the other hand, some midwives working at MCH described that no need of extra resources~~  
996 ~~for PCC, it can provide together with the routine activities and not demand extra human~~  
997 ~~resources.~~

998 ~~“I don't believe it requires additional resources. While we are completing our daily tasks, we can~~

1099 ~~offer the women advice. We will serve the person who has already arrived for another primary~~  
1000 ~~complaint if it is in OPD. We can even tell women when they come here for family planning, or~~  
1001 ~~EPI. We complete this easy task in addition to our daily responsibilities. Not all of them call for~~  
1002 ~~additional human resources. We can combine it with other activities” (Midwifery professional,~~  
1003 ~~female, IDI)~~

1004 **Poor quality of family planning services:** The study participants identified a lack of access to  
1005 contraceptives and inadequate contraceptive counseling services as reasons for unintended  
1006 pregnancies.

1007 ~~“The healthcare provider is also sending mothers for each contraceptive without properly~~  
1008 ~~explaining what is wrong with it and what kind of mother it should be given to” (General~~  
1009 ~~practitioner professional, male, IDI)~~

1010 **Poor adherence to iron-folic acid supplementation:** Due to the frequently cited side effects of  
1011 gastritis, many mothers, including those with a history of APOs such as congenital anomalies, do  
1012 not consistently take iron and folic acid, as some participants pointed out.

1013 ~~“In our experience, mothers frequently disregarded our advice to take folic acid. They regularly~~  
1014 ~~gave reasons for not complying, such as gastritis, as side effects. A mother in a recent congenital~~  
1015 ~~anomaly case acknowledged not taking folic acid or stopping the medication because she had~~  
1016 ~~gastritis” (Midwifery professional, female, IDI)~~

1017 ~~A healthcare participant mentioned a prevalent rumor among primigravida women that iron~~  
1018 ~~should not be taken because it can cause the baby to grow too large, making delivery difficult~~  
1019 ~~and increasing the risk of surgery.~~

1020 ~~“If they are primigravida, there is a rumor that iron should not be taken because it makes the~~  
1021 ~~baby grow too big, is difficult to deliver by uterus, and exposes them to surgery, even if we tell~~

1022 *them its benefits properly.” (Midwifery professional, female, IDI)*

#### 1023 **4. Opportunities of for improving of awareness of PCC services and uptake**

1024  
1025 ~~SMART Start model: The SMART Start model focuses on financial preparation and achieving~~  
1026 ~~optimal health before pregnancy through contraception, ensuring healthy children. Participants~~  
1027 ~~noted that this model highlights the importance of preparation for pregnancy, akin to pre-~~  
1028 ~~pregnancy care. To raise awareness and increase the uptake of PCC, the SMART Start model~~  
1029 ~~should be integrated into community health services as an entry point for couples, particularly~~  
1030 ~~adolescent couples, through activities conducted by WDGs, HEWs, and other social networks.~~

1031 ~~SMART Start is very good especially because it advocates for adolescent girls to use~~  
1032 ~~contraceptives and it creates awareness before pregnancy, so that we can use it. Similarly as you~~  
1033 ~~have mentioned very well women’s development groups can be used as an entry path way as we~~  
1034 ~~know it is vital to be aware of adolescent girls regarding preconception care~~ **Clinical midwifery**  
1035 **professional, male, KH)**

1036 ~~Utilize the Existing community platforms:~~ Participants emphasized the crucial role of the  
1037 HEP in ongoing PCC awareness at the community level. They suggested enhancing this program  
1038 by involving HEWs with WDGs and village health leaders. Participants also highlighted that  
1039 home-to-home visits strengthen PCC, as some women may feel uncomfortable discussing their  
1040 desire to conceive openly.

1041 *“To make the program ~~me~~ effective, it is essential to support WDGs and HEWs. In my previous*  
1042 *work, I have seen the significant impact of WDGs in addressing public health issues. They have*  
1043 *detailed community knowledge ~~of the community~~ and can provide valuable information about*  
1044 *vaccinated children, pregnant mothers, and other relevant data. By working with community*

1045 *leaders and WDGs, we can increase the acceptance and success of the program” (Midwifery*  
1046 *professional, female, IDI)*

1047 A Health extension worker said:

1048 *“The home-to-home visit should be well strengthened because the woman might have felt*

1049 *ashamed to disclose her desire to get pregnant” (Nursing professional HEW, female, IDI)*

1050 *An MCH expert said “A family health card is one. The service could be incorporated into the*

1051 *family health card checklist for the woman to read herself or to be read for her by her kids to*

1052 *improve their awareness” (Public health professional, male, KII)*

1053 Participants suggested that marriage certificate issuance venues could ~~serve as~~ effective

1054 platforms for PCC education and counseling. These venues offer couples an entry point for

1055 information and provide an opportunity to counsel them in advance, linking eligible women to

1056 health facilities.

1057 *“Places where marriage certificate is provided would be even much better and of high*

1058 *importance to provide PCC service because it gives an opportunity for the couples to get the*

1059 *information before the start of sexual intercourse” (35 years old mother, 10 th grade, IDI)*

1060 Social networks such as civic societies, women's development groups, and farmer's associations

1061 are effective for community mobilization and spreading information. Participants highlighted

1062 their role in increasing PCC awareness and uptake through education and counseling at local

1063 venues including churches, mosques, and traditional healing places.

1064 *We can use the existing social networks such as civic societies (e.g. women’s associations),*

1065 *women’s development army, pregnant women forum...etc . Those social networks are the closet*

1066 *to the community they can provide education to the mothers. First, the social networks need to be*

1067 *well aware of PCC and then provide roles and responsibilities to teach and mobilize mothers to*

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1068 utilize the services. The social networks are very helpful in strengthening and decentralizing  
1069 preconception care services (29 years old mother, 10<sup>th</sup> grade, IDI)

1070 SMART Start model: The SMART Start model focuses on financial preparation and achieving  
1071 optimal health before pregnancy through contraception, ensuring healthy children. Participants  
1072 noted that this model highlights the importance of preparation for pregnancy, akin to pre-  
1073 pregnancy care. To raise awareness of PCC and uptake, the services would be integrated in to the  
1074 SMART Start model program as an entry point for couples, particularly adolescent couples,  
1075 through activities conducted by WDGs, HEWs, and other social networks.

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1076 *SMART Start is very good especially because it advocates for adolescent girls to use*  
1077 *contraceptives and it creates awareness before pregnancy, so that we can use it. Similarly as you*  
1078 *have mentioned very well women's development groups can be used as an entry path way as we*  
1079 *know it is vital to be aware of adolescent girls regarding preconception care (Midwifery*  
1080 *professional, male, KII)*

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1081 ~~**Integrating PCC services into existing health facilities:** Many study participants suggested to~~  
1082 ~~integrate PCC with existing health services, such as voluntary counseling and testing, family~~  
1083 ~~planning units, cervical cancer screening units, youth friendly services, and antiretroviral therapy~~  
1084 ~~(ART) clinics, to create awareness about PCC through education for women of reproductive age~~  
1085 ~~who visit the health facility for other reasons using RLP tool.~~

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1086 ~~*“All people who visit a health facility should get information on PCC. We can use health*~~  
1087 ~~*facilities as a means to disseminate information and create awareness” (HEW, Female, IDI)*~~

1088 ~~*“As a PCC, I believe that any female patient in the reproductive age group should be able to see*~~  
1089 ~~*you whenever they need something, like an abortion, a STI test, FP, a pregnancy test, or a PNC.*~~

1090 ~~*Right now, all women should receive PCC counseling” (General practitioner professional,*~~

1091 ~~male, IDI)~~  
1092 **Perceived desire interest of healthcare providers of in PCC services:** Though there would be  
1093 a fear of workload, almost all healthcare providers appreciated the services' the benefit of the  
1094 ~~services~~ in preventing all of the maternal and neonatal problems.  
1095 ... "There is also a higher need for PCC in the professional that can be described as an  
1096 opportunity" (**Public health professional, male, IDI**)

1097 *Its necessity is unquestionable!* (**Public health professional, male, KII**)

1098 In addition, the majority of participants emphasized that, although these services are a new  
1099 concept within the health system, mothers—especially those at high risk—have provided  
1100 positive feedback.

1101 "If the service is available plenty of mothers have a wish to get the service you desired" (**35**  
1102 **years old mother, not attended school, IDI**)

1103 This is both appropriate and acceptable. Had education arrived to us in this form, we would not  
1104 be afflicted by the illnesses and issues that we currently face. We'll say "Amen" to this, bring it  
1105 down to our people, and persuade them to start working on it. That's a smart idea (**39 years old**  
1106 **mother, 3<sup>rd</sup> grade, FGD**)

1107 ~~**Maternal interest in PCC services:** The majority of the participants pointed out that, though~~  
1108 ~~the services are a new concept for the health system, mothers give positive feedback, especially~~  
1109 ~~those living with a history of APOs.~~

1110 ~~*A mother with a history of APOs said: "If the service is available plenty of mothers have a wish*~~  
1111 ~~*to get the service you desired"*~~ (**35 years old mother, not attended school, IDI**)

1112  
1113 ~~*Thus, this is both appropriate and acceptable. Had education arrived to us in this form, we*~~

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1114 ~~would not be afflicted by the illnesses and issues that we currently face. We'll say "Amen" to this,~~  
1115 ~~bring it down to our people, and persuade them to start working on it. That's a smart idea (39~~  
1116 ~~years-old mother, 3<sup>rd</sup> grade, FGD)~~

## 1117 **5. Perceived Suggestions for increasing awareness of PCC and uptake**

1118 **Home-based preparation initiative:** Participants pointed out ~~those that~~ women intending to  
1119 become pregnant need to prepare at home in terms of food and money to ensure adequate  
1120 nutrition, transportation, medications, and other necessities before and during pregnancy.  
1121 Additionally, some participants emphasized the importance of communicating with their  
1122 husbands to achieve a common understanding about the intention to get pregnant, being mentally  
1123 prepared, and avoiding bad habits such as alcohol (including local beverages like (“Siwa, Areki,  
1124 and Myes”), smoking, and other addictive substances as pre-pregnancy care.

1125  
1126 ~~The woman should assess if the living condition of her life is suitable for getting pregnant.~~  
1127 ~~Ensure economical and psychological readiness first (35 years-old mother, 10<sup>th</sup> grade, IDI)~~

1128  
1129 ~~Prior to before her pregnancy, she should have a plan and be prepared economically; other~~  
1130 ~~work-related activities will help her overcome the problems that may arise following pregnancy.~~

1131 ~~In her home, she should communicate and have a common understanding with her husband~~  
1132 ~~about her pregnancy. When she plans to be pregnant, she should also avoid bad habits such as~~  
1133 ~~alcohol, smoking and, other addictive substances (hashish), and not be comfortable working~~  
1134 ~~during pregnancy in her home (Family health professional, female, KII)~~

1135 **Use various variety communication strategies:** All participants agreed that creating awareness  
1136 for the infant program (PCC) through education on various platforms and social networks should

1137 be the first step to improving awareness of PCC and uptake. They emphasized the need for clear,  
1138 culturally sensitive education on preparation, seeking advice, and understanding preconception  
1139 risks to address community beliefs, myths, and misconceptions. Utilizing media such as posters,  
1140 billboards, and leaflets at ~~both~~ community and facility levels is crucial for enhancing awareness.  
1141 Once the community understands the importance of PCC, they will be more likely to seek it out  
1142 independently.

1143 ..... "Anyway, they have to work on awareness creation. Education on the causes and risk  
1144 factors should be given. Education can be ~~provided~~~~given~~ in the facilities, in groups, and in the  
1145 community" (28 years old mother, 8<sup>th</sup> grade, IDI)

1146 Any cultural or religious barriers are better addressed through education. We should educate  
1147 the community in an understandable way for them. If we do so, I think the elders, community,  
1148 and religious leaders would say yes, it is ~~essential~~~~important~~; there are only benefits, not harms;  
1149 let's make use of it; and so on, provided that we educate them. I don't expect the other way  
1150 around. (35 years old mother, 10<sup>th</sup> grade, IDI)

1151  
1152 A Mother from the FGD said: "I prefer most of the time, PCC ~~should~~ be given on Sunday  
1153 because both wife and husband could be available at home and on this day most people are off  
1154 from work. If the HEW/WDA conduct home visits after 11:00 AM to provide education about  
1155 PCC half an hour is enough" (28 years old mother, diploma, FGD)

1156 The study participants pointed out that ~~E~~education should be specific, pragmatic and model-  
1157 based ~~study participants pointed out~~.  
1158 Yes of course: it is often better to see than ~~to~~hear to easily understand~~ing~~ and understand  
1159 everything by looking at a picture: I think it would be better if he did the vegetables or other

1160 *things diet in pictures (Midwifery professional, female, IDI)*

1161 *If you give pretend or picture-based lessons or drama-assisted lessons, women understand easily*  
1162 *(Public health professional, male, IDI)*

1163 *“Our education should be unique, which means that if we are pregnant, for example, from pre-*  
1164 *pregnancy to pregnancy, our education should not be the same as the previous by saying “listen*  
1165 *to her”, I mean it should be practical” (Public health professional, male, KII)*

1166  
1167 Participants suggested several strategies to increase awareness and uptake of PCC, emphasizing  
1168 the use of various media. Broadcast media like radio and television are particularly effective due  
1169 to their widespread availability. ~~Additionally, Print~~ media, including posters, billboards, and  
1170 leaflets, should be used at both community and facility levels. While HEWs play a crucial role,  
1171 media influence is even more critical, as HEWs cannot reach every area. One participant noted  
1172 that media can significantly raise awareness, stating that if people hear about PCC on the radio or  
1173 television, they are more likely to seek health services and receive education through printed  
1174 materials.

1175 *“The greatest power is the media. Whether it is through television, radio and magazines, the*  
1176 *media is very crucial if you want to change the perception of the community about the PCC”*

1177 *(~~General practitioner professional~~MD, male, IDI)*

1178 *“Media has a big role. Our community follows the media. Although the role of HEWs is the*  
1179 *biggest, the influence of media is more critical than anything because they can’t reach every*  
1180 *corner” (Nursing professional, female, IDI)*

1181 Although orientation on PCC has recently commenced, it remains a new program. Consequently,  
1182 nearly all individuals involved in the healthcare system, from HEWs to district health experts,

1183 possess limited knowledge about PCC. Therefore, both short-term and long-term training are  
1184 essential ~~for the effective~~effectively ~~provision~~ providing ~~of~~ these services. All participants  
1185 emphasized that training and guidelines are crucial for the successful delivery of PCC services.

1186 *“Training on PCC packages is required for all actors involved in the health care system, starting  
1187 from the HEW to district/woreda health experts (health care professionals)” (Family health  
1188 professional, female, KII)*

1189 ~~**Community based PCC services:** The services should be accessible to the community with a  
1190 reasonable distance, because distances to health facilities and transportation access were hinder  
1191 mothers from seeking the services. A sizable portion of the study participants pointed out that, to  
1192 enhance the unreasonable poor level of awareness of the community providing education to the  
1193 community using the existing community platforms like women development army, women’s  
1194 affairs network, community gatherings and pregnant women forum through house to house.~~

1195 ~~*“We can provide education in their respective communities using the already existing platforms,  
1196 such as the women's development army, the women's affairs network, community gatherings, and  
1197 the pregnant women forum. We can reach the community through their already established  
1198 networks and house to house” (29 years old mothers, 10<sup>th</sup> grade, IDI)*~~

1199 **Community engagement:** Some participants emphasized that creating significant awareness  
1200 about preconception care at the community level requires special efforts, ~~mainly~~particularly  
1201 focusing on extensive information dissemination and community engagement.

1202 *Special efforts are required, including robust community mobilization and active participation  
1203 (HEW, female, IDI)*

1204 **Community health facility linkage:** in general, participants noted that establishing a linkage  
1205 between the community and the health facility, as well as within the health facility to selected

1206 units providing PCC, using referral slips, would be vital for enhancing the uptake of PCC  
1207 services and reducing delays in the health facility.

1208 An MCH expert said: ~~a r~~Referral slip is ~~necessary~~important. Once the eligible ~~woman~~women is  
1209 identified, the referral slip can be used to link to the service. But one thing that needs to be put in  
1210 to consideration is if it is going to be free service or not. Maybe it could have some effect if it is  
1211 payable service (Public health professional, male, KII)

1212 Use high-risk mothers as role models ~~for awareness creation~~education: Some participants  
1213 suggested that mothers with a history of APOs could serve as role models to educate women in  
1214 women's development groups, pregnancy forums, and similar platforms. This approach could  
1215 motivate the community to improve awareness and uptake of PCC.

1216 “I consumed three or four beers until I gave birth while I was pregnant. Here, I found myself  
1217 teaching others and myself about mental retardation, a health issue that my child had developed.  
1218 Even if you have to consider it before getting pregnant, you should not drink while pregnant.  
1219 However, since my son experienced it, ~~I have been telling people about it once more.~~I am telling  
1220 ~~people about it once more.~~ Since a baby is like a piece of paper and can be easily injured, I think  
1221 that my son's alcohol abuse contributed to his mental retardation” (27 years old mother, 10<sup>th</sup>  
1222 grade, IDI)

1223  
1224  
1225 “She also influenced other women who had difficulty conceiving. i.e., other women also seek  
1226 health facilities after taking experience from my sister” (30 years old mother, diploma, FGD)

1227 **Need focus from government**

1228 ~~A sizable portion of study participants observed that while there was limited orientation or~~

1229 information provided about PCC, the government should prioritize PCC on par with ANC and  
1230 delivery services. There is an urgent need to enhance future PCC practices, encompassing ANC,  
1231 family planning, and delivery services, to elevate community awareness. It is essential to foster  
1232 meaningful engagement and collaboration among the government, stakeholders, political leaders,  
1233 influential individuals, elders, and religious figures to improve awareness of and uptake in PCC.

1234 *“A kind of orientation or information was given about PCC by partners, but they still do not get*  
1235 *that much focus from the government or partners on PPC like the other health care services.*  
1236 *Through education, the community shows behavioural change in relation to child and maternal*  
1237 *nutrition” (Family health professional, female, KH)*

1238 **Deploy healthcare providers:** Participants emphasized that deploying healthcare providers,  
1239 particularly HEWs, is essential for raising awareness of PCC through community platforms.

1240 **Preconception care services would be free of charge:** It ensures that all individuals, regardless  
1241 of their economic status, can access essential care that improves maternal and child health,  
1242 reduces healthcare costs, and promotes equity and public health. Participants emphasized that  
1243 PCC services should be free of charge, similar to other MCH services, to effectively reach  
1244 mothers who face high rates of maternal and child health complications and have low  
1245 socioeconomic status, as they might not be able to afford these services.

1246 *“The service should be free of charge. If it has a cost, those who cannot afford it would miss the*  
1247 *service, which could contribute to the occurrence of maternal and child health complications*  
1248 *that could have been prevented otherwise” (29 years old mother, 10<sup>th</sup> grade, IDI)*

1249  
1250 *“The cost of service for PCC should be free, similar to the service provided for ANC. If there is a*  
1251 *fee, the community will refuse it. The government should provide subsidies and exempt services*

1252 ~~related to PCC” (HEW, female, IDI) ———~~

1253 ~~A healthcare provider working at MCH said since provide free of PCC services is also difficult~~  
1254 ~~to the health facility balanced payment may be good for sustain the services.~~

1255 ~~“If it is a free service, the health facility may also suffer, but it should be at a reasonable price.~~

1256 ~~For example, a sugar test results in 70 or 80 birr. This should be reduced” (Public health~~  
1257 ~~professional, male, IDI)~~

1258

### 1259 Services integration

#### 1260 Participants’ view on PCC services provision:

1261 ~~**Responsible professionals:** Participants noted that since the service encompasses various~~  
1262 ~~interventions, multidisciplinary professionals such as nutritionists, gynecologists, midwives, and~~  
1263 ~~nurses would be responsible for the program. However, because HEWs frequently contact the~~  
1264 ~~community during home visits, midwives and gynecologists who encounter many women with a~~  
1265 ~~history of APOs should be given priority.~~

1266 ~~“For example, a gynecologist is needed, and you will need a nutritionist, and you will also~~  
1267 ~~involve him if you need one from him. For example, it is multidisciplinary because it involves~~  
1268 ~~others in the community, and I think PCC should be delivered by multiple professionals. For~~  
1269 ~~example, nutritionists, gynecologists, midwives, and nurses” (General practitioner professional,~~  
1270 ~~male, IDI)~~

1271

1272 ~~HCPs unanimously recommended integrating PCC into existing services, including VCT, FP~~  
1273 ~~units, cervical cancer screening, youth-friendly services, ANC, ART clinics, post-abortion care,~~  
1274 ~~EPI, and under-five clinics. This approach aims to provide services to educate women of~~  
1275 ~~reproductive age who visit health facilities for other reasons, using the RLP tool to identify those~~

1276 eligible for PCC services effectively.

1277 *“All people who visit a health facility should get information on PCC. We can use health*  
1278 *facilities as a means to disseminate information and create awareness” (HEW, Female, IDI)*

1279  
1280 *“As a PCC, I believe that any female patient in the reproductive age group should be able to see*  
1281 *you whenever they need something, like an abortion, an STI test, an FP, a pregnancy test, or a*  
1282 *PNC. Right now, all women should receive PCC counseling” (MD, male, IDI)*

1283  
1284 ~~**Integration of PCC into existing health services:** A sizable portion of the study participants~~  
1285 ~~suggested that PCC should be integrated or linked with existing health services. These services~~  
1286 ~~include ANC, VCT, ART clinics, FP units, post-abortion care units, cervical cancer screening~~  
1287 ~~units, youth friendly services, EPI, and under five units. The integration should focus on women~~  
1288 ~~of reproductive age who visit the health facility for other reasons, using the reproductive life plan~~  
1289 ~~tool as a triage method to identify eligible women for PCC services.~~

1290 ~~*“VCT, ART clinic, family planning unit, post-abortion care unit and cervical cancer screening*~~  
1291 ~~*unit are the favorable places/units where reproductive age group women are found” (Obstetrics*~~  
1292 ~~*and gynecology professional, male, KII)*~~

1293 ~~**Standalone PCC services:** Some participants suggested that PCC services should be provided as~~  
1294 ~~standalone services in room, as this would be more user-friendly. Integrating PCC with other~~  
1295 ~~services might make women uncomfortable. However, due to limited space, staff, and resources,~~  
1296 ~~offering PCC under the ANC unit could be beneficial, as it allows for the observation and advice~~  
1297 ~~on pregnancy-related abnormalities. Some participant suggests that PCC services could be~~

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1298 offered alongside family planning services, where women typically seek to prevent pregnancy,  
1299 providing an opportunity to discuss PCC.

## 1300 **Discussion**

1301 This study examined the experiences, challenges, and opportunities of PCC services in Tigray, Ethiopia,  
1302 ~~Our uniquely explores the perspectives on PCC services in Tigray, Ethiopia,~~ following the  
1303 government's prioritizationendorsement of PCC as a key strategy and the development of new  
1304 guidelines (23) (34) (35). (23) (31) (32). While previous qualitative research on PCC focused solely on  
1305 barriers to its uptake (36), this study took a broader approach by exploring the awareness, experiences,  
1306 challenges, and opportunities related to PCC services from the perspectives of various participants.

1307 The study identified key themes related to PCC services, including awareness (information and  
1308 perceived benefits) and experience (practices of PCC interventions and home-based preparation).  
1309 Participants also explored perceived challenges, such as traditional beliefs and misconceptions,  
1310 fragmented service delivery, reluctance to disclose conception intentions, inadequate counseling  
1311 on contraceptive services, societal norms, heavy workloads, high costs, and shortages of  
1312 medicines and medical equipment. Additionally, they noted perceived opportunities, such as a  
1313 strong interest in PCC services and the availability of community platforms. Suggestions for  
1314 improvement included implementing home-based initiatives, adopting diverse communication  
1315 strategies, involving high-risk mothers as role models, fostering community engagement,  
1316 strengthening links between communities and healthcare facilities, and integrating PCC services  
1317 within the healthcare system.

1318 ~~We explored women's experiences and healthcare providers' knowledge of PCC services,~~  
1319 ~~uncovering key challenges such as low awareness, misconceptions, workloads, costs, poor~~  
1320 ~~quality services, and fear of contraceptive side effects. To improve awareness and increase~~

1321 uptake, participants suggested promoting home-based preparation, integrating the SMART Start  
1322 model, leveraging community platforms, offering free services, using high risk mothers as role  
1323 models, and focusing on diverse communication strategies.

1324 In the study, except a few high-risk mothers, most mothers lack awareness of PCC services, which is  
1325 consistent with previous studies (21, 36-38). Most women were unaware of PCC, but some high risk  
1326 women recognized its benefits and prepared at home. These women received fragmented care,  
1327 and HCPs believed PCC should prioritize them by ensuring access to information, a finding  
1328 consistent with other studies (21, 33-35). Many people may be unfamiliar with PCC services because  
1329 the program was introduced only recently (23) (34) (35) and has not yet been fully integrated into the  
1330 healthcare system. This is especially evident within the health extension program, which is vital for  
1331 increasing community awareness. This study highlights the issue, showing that HEWs possess less  
1332 information about the program compared to other HCPs. The study found that although most HCPs  
1333 recognize the benefits of PCC in reducing APOs, they primarily offer limited PCC interventions  
1334 to high risk mothers. Although included in health policy, HCPs treat PCC as an extra benefit  
1335 rather than a routine practice, leading to minimal investment and delayed care seeking until  
1336 pregnancy is confirmed. Additional challenges include poor awareness among women, a lack of  
1337 dedicated HCPs, inaccessible guidelines, limited government focus, inadequate training, and  
1338 insufficient knowledge among frontline healthcare providers. Participants suggested promoting  
1339 home-based preparation, using varied communication methods, and highlighting high risk  
1340 mothers as role models. Research, including a study from Ethiopia (33), emphasizes the need for  
1341 new communication strategies to raise awareness of PCC. These findings are consistent with a  
1342 study conducted in South Africa (36). Additionally, PCC in six European nations (37) focuses on  
1343 high risk women, while others receive it opportunistically. In the United states, PCC services are

1344 recommended as part of routine healthcare for all women, regardless of pregnancy intention or  
1345 risk (38). This study found that healthcare providers did not practice most of the PCC interventions  
1346 recommended by the WHO and Ethiopia's national PCC guidelines (2) (32) consistent with findings from  
1347 other studies in LMICs like Ethiopia (22).

1348 Furthermore, HCPs often view PCC as an optional benefit rather than a standard service, leading  
1349 to limited investment and delayed care-seeking until pregnancy is confirmed. Such neglect can  
1350 hinder health-seeking behavior and the utilization of services. Overall, participants emphasized  
1351 that enhancing PCC awareness should be a government priority, leveraging community  
1352 engagement through social networks like civic organizations, women's groups, and farmers'  
1353 associations, which are effective for mobilization and information sharing. Home-based  
1354 preparation was identified as a promising foundation, alongside diverse communication methods  
1355 and integrating PCC services into healthcare facilities to improve awareness and utilization.  
1356 Evidence also showed that to enhance PCC awareness, massive public awareness campaigns and  
1357 education through print media, social forums, and government-led initiatives including  
1358 integrating PCC into the healthcare services (19, 39).

1359 This study revealed that while most HCPs had some knowledge of PCC services, their practice  
1360 was limited. The services mainly focused on specific components targeting high-risk mothers  
1361 such as contraceptive counseling for pregnancy delay, medication safety, substance use  
1362 counseling, and folic acid supplementation. However, most interventions recommended by the  
1363 WHO and Ethiopia's national PCC guideline were not practiced (2) (35). This is consistent with  
1364 previous findings from African countries, where PCC was implemented under inaccessible  
1365 guidelines and primarily driven by initiatives targeting high-risk women with a limited focus on  
1366 interventions such as dietary modification counseling (22) (40) (41). The limited practice of PCC

1367 is influenced by several factors such as the presence of a relatively new program, HCPs' lack of  
1368 adequate training, and PCC guidelines not being easily accessible. Moreover, the government  
1369 prioritizes ANC over PCC, leading healthcare providers to view PCC as a supplementary rather  
1370 than a routine service. Evidence suggests that accessible guidelines and regular use of RLP tools  
1371 can help HCPs prioritize PCC and emphasize preconception care for women (19) (22). Hence,  
1372 prioritizing PCC and integrating package-based services into routine care for all women of  
1373 reproductive age using RLP tools could significantly enhance awareness and utilization.

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1374  
1375 ~~The study found that misconceptions about conception, family planning, and alcohol~~  
1376 ~~intake pose challenges to PCC awareness and uptake, negatively impacting maternal and~~  
1377 ~~child health. Additionally, HEWs' focus on ANC and institutional delivery may cause~~  
1378 ~~these issues to be overlooked. Integrating PCC with family planning services and raising~~  
1379 ~~awareness about these misconceptions is crucial, as family planning clinics can enhance~~  
1380 ~~preconception health by screening for pregnancy intentions using a reproductive life plan~~  
1381 ~~tool (39). This integration helps women prepare for pregnancy and enables healthcare~~  
1382 ~~providers to routinely screen for pregnancy intentions using a reproductive life plan tool.~~  
1383 ~~Asking, "Would you like to become pregnant in the next time?" is more acceptable than~~  
1384 ~~other methods for measuring pregnancy intention (40). This question helps healthcare~~  
1385 ~~providers decide whether to offer PCC or other reproductive health services, at~~  
1386 ~~community and facility levels, a practice recommended and supported by other studies.~~  
1387 ~~Participants in this study also recommended this approach, which is supported by other~~  
1388 ~~studies (36). A study in China supported the integration of planned pregnancy and~~  
1389 ~~preconception care services (41).~~

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1390 Evidence indicates that, without adequate counseling, clients often turn to friends and family for  
1391 information. Unfortunately, this information is frequently influenced by misinformation (44). For  
1392 example, in this study, misconceptions about contraceptives, such as the Depo-Provera injection,  
1393 have led many women to be discouraged or even prevented from using them. These  
1394 misconceptions, including unfounded fears that contraceptives may cause infertility or congenital  
1395 anomalies, present significant challenges to raising awareness about PCC and improving its uptake.  
1396 HEWs also give due emphasis to the maternal continuum of care; however, they do nothing for PCC as a  
1397 package that could be considered a missed opportunity. Evidence shows that family planning unit is  
1398 vital in improving preconception health by assessing pregnancy intentions and addressing  
1399 misconceptions through tools like the RLP (45). Therefore, integrating PCC into family planning  
1400 and antenatal services strengthens the HEP with culturally sensitive education, and utilizing  
1401 health visits for PCC education can significantly enhance services and reduce misconceptions  
1402 about contraceptive use.

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1403 The study revealed that traditional beliefs often compel women to keep their conception desires private  
1404 avoiding discussions about PCC. Pregnancy is commonly regarded as a divine gift from St. Mary or God,  
1405 and many women believe that expressing a desire to conceive before pregnancy contradicts divine will,  
1406 making such discussions socially and personally taboo. The present study highlighted that  
1407 undisclosed conception desires pose a major challenge for PCC service utilization. Even when  
1408 women plan their pregnancies, they often hesitate to seek or discuss PCC due to cultural  
1409 influences and a reluctance to share their plans with others, including health professionals. The  
1410 study found that, with few exceptions, most women prefer to keep their desire to have a child  
1411 confidential. They often conceal their pregnancies during the early months until they rule out the  
1412 risk of miscarriage, and they typically discuss their plans only with their husbands and a very  
1413 close friend. Women avoid discussing pre-pregnancy care because it is often considered taboo or

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1414 embarrassing. Additionally, many view pregnancy as a divine gift from St. Mary or God, and  
1415 they believe disclosing the desire to conceive before pregnancy contradicts divine will. This  
1416 ~~finding aligns with the results of a previous study conducted~~ is consistent with other studies  
1417 ~~elsewhere (36, 42), indicating that women often perceive conception as a natural event requiring no~~  
1418 ~~preparation, resulting in limited communication with healthcare providers and missed opportunities to~~  
1419 ~~utilize PCC services. Evidence suggests that addressing traditional beliefs about conception requires~~  
1420 ~~collaboration between health institutions and religious organizations (36). Additionally, integrating~~  
1421 ~~preconception health discussions into routine healthcare, beginning with school-based services, has~~  
1422 ~~been proposed as a potential solution (43). (33) (35) (42). In this study participants noted improve~~  
1423 ~~awareness and to decrease the cultural belief of disclosure of conception using the existing~~  
1424 ~~community platforms mainly HEP of HEWs and WDGs home to home visits strengthen PCC, as~~  
1425 ~~some women may feel uncomfortable discussing their desire to conceive openly. In this study,~~  
1426 ~~P~~participants suggested that women prefer receiving PCC at health posts and health centers, as  
1427 well as through in addition to community-based services, because these settings align with  
1428 cultural norms and are closer to home, making it easier for women to disclose personal matters.

1429  
1430 Involving husbands in PCC through screenings and counseling is vital for reducing risks and  
1431 promoting healthier pregnancies, as emphasized by Ethiopian (35) and Chinese national  
1432 guidelines (46). Furthermore, women who made decisions independently or in partnership with  
1433 their husbands were more likely to utilize PCC services (47) (48) our findings showed that~~In the~~  
1434 ~~study, husbands often frequently opposed women's PCC uptake in rural area, especially in rural~~  
1435 ~~and less educated settings. Other studies found that women who made decisions independently or~~  
1436 ~~jointly with their husbands were more likely to use PCC than those who could not decide for~~  
1437 ~~themselves (43). The study highlights the lack of husband involvement in pregnancy planning,~~

1438 ~~especially in rural areas, and suggests couple-based services to address this issue. Involving~~  
1439 ~~husbands in PCC through screenings and counseling is crucial for reducing risks and promoting~~  
1440 ~~healthier pregnancies, as supported by Ethiopian (32) and Chinese national guidelines(41). Poor~~  
1441 ~~parental behaviors before conception are linked to increased illness and mortality in offspring,~~  
1442 ~~while healthier habits can significantly improve pregnancy outcomes. Paternal preconception~~  
1443 ~~care emphasizes men's direct contributions to child health, such as genetic and epigenetic~~  
1444 ~~factors, lifestyle choices, and environmental exposures, as well as indirect influences through~~  
1445 ~~partner health and relationships (49). The paternal origins of health and disease model defines~~  
1446 ~~(50) the preconception population as all reproductive-age men and women, highlighting the~~  
1447 ~~importance of paternal health. Given men's crucial role in reproductive health decisions, couple-~~  
1448 ~~based counseling is strongly recommended (44).~~

1449 The study found that poor socioeconomic status, including service costs and distance, hinders PCC use,  
1450 with some viewing pregnancy as a luxury due to basic needs and regional conflicts. These findings align  
1451 with results from various other studies (33) (44). The implication is that even when women  
1452 acknowledge the need for PCC and wish to access it, they face additional challenges such as service  
1453 charges and transportation costs. Participants suggested that women prefer receiving PCC at health  
1454 posts and centers, alongside community-based services. They feel more comfortable discussing personal  
1455 matters in culturally familiar, local settings rather than hospitals. This preference helps address  
1456 transportation costs, offers clearer education, and overcomes barriers related to disclosing pregnancy  
1457 intentions, which is a major obstacle to PCC utilization. Besides, the current study emphasizes that  
1458 healthcare providers and mothers strongly advocate for making PCC services free, as they are  
1459 part of the maternal continuum of care. This could improve access, particularly for low-income  
1460 mothers, enhance maternal and child health, reduce costs, and promote equity. Other study in

1461 China support this, with China's National Free Preconception Health initiative, for example,  
1462 reaching over 95% of target couples with preconception health education (46). Additionally, free  
1463 maternal healthcare including PCC aligns with the WHO's recommendation to eliminate  
1464 financial barriers and ensure equitable access to healthcare for all. It supports achieving SDG  
1465 3.1, which aims to reduce maternal mortality to fewer than 70 per 100,000 live births by 2030  
1466 (53).

1467

1468 To enhance awareness of PCC and uptake ~~of PCC~~, the study suggests using marriage certificate  
1469 settings to provide couples with information and pre-counseling, thereby connecting eligible  
1470 women to health facilities. This approach could be ~~practical~~effective—if the Ethiopian  
1471 government, in collaboration with religious leaders, commits to issuing marriage certificates,  
1472 particularly for newly married couples. This recommendation aligns with findings from a study  
1473 in Bangladesh (45). Marriage certificate settings present an ideal opportunity to introduce PCC  
1474 services; as couples are often in the early stages of planning their future. This universal process  
1475 provides an equitable platform to educate couples on reproductive health, family planning,  
1476 genetic risks, and the importance of preparing for a healthy pregnancy.  
1477 In Ethiopia, the PCC program was integrated into the reproductive health strategy for 2020–  
1478 2024/25(23), and the components of PCC interventions were incorporated into the 2022 ANC  
1479 guidelines (34). Additionally, the 2024 PCC guidelines recommend providing integrated services  
1480 to women planning to conceive within three months (35). However, in this study, PCC services  
1481 were only partially implemented hindered by the absence of PCC guidelines, limited government  
1482 focus, inadequate training, and fragmented service delivery which heavily relied on women's

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1483 initiation. PCC services were neither prioritized nor adequately resourced, resulting in  
1484 inconsistent practices and insufficient attention to this critical care area. High-risk women were  
1485 often not offered PCC unless they explicitly requested it, and PCC was not routinely utilized to  
1486 assess reproductive intentions even for women who had stopped using contraception to conceive.  
1487 These findings align with studies from other parts of Africa (41, 55). In contrast, studies (46, 56)  
1488 indicated that fully implemented services supported by established protocols and strong  
1489 government backing, improve service utilization compared to fragmented approaches. Overall,  
1490 the Ethiopian government should prioritize PCC and ensure its full implementation by  
1491 integrating it into the existing healthcare system. This requires the inclusion of comprehensive  
1492 PCC guidelines, protocols, and assessment tools as part of routine clinical practice.

1493 According to the Motivational Theory of Role Modeling, role model-based interventions are  
1494 highly effective in encouraging others to accept new services (57). In our study, participants  
1495 suggested that high-risk mothers could act as role models to enhance awareness and encourage  
1496 using PCC services.

1497  
1498 ~~In the study, all participants agreed that PCC services should be free, ensuring access for all,~~  
1499 ~~particularly low income mothers, to improve maternal and child health, reduce costs, and~~  
1500 ~~promote equity. This is supported in other study (46).~~ In the study, many participants suggested  
1501 integrating PCC with existing health services like ANC, VCT, ART clinics, FP units, and more,  
1502 targeting women of reproductive age using the ~~reproductive life plan~~RPL tool. This is also in  
1503 concurrent with other studies in Africa. Concurrent with other studies in Africa (4, 5). (4, 5).  
1504 Most preconception counseling was provided opportunistically by HCPs working in gynecology  
1505 clinics or family planning settings (58). Integrating services can improve access for women with

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1506 limited awareness of available options, those not actively planning or considering pregnancy,  
1507 those with low health-seeking behaviors, and those without identified health issues. By routinely  
1508 offering these services to all women of reproductive age through an integrated approach that  
1509 includes the RLP tool, the uptake of PCC services can be improved (19, 22).

1510

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1511 **Study limitations and strengths and limitations:** This first study in Ethiopia explores PCC  
1512 services from multiple perspectives, including front-line HCPs in urban and rural areas. The  
1513 findings significantly contribute to developing locally appropriate programs to increase  
1514 awareness of PCC and uptake~~The findings significantly contribute to the development of locally~~  
1515 ~~appropriate programs aimed at increasing PCC utilization.~~ However, due to resource constraints,  
1516 our study did not explore, ~~the study has limitations. Resource constraints prevented us from~~  
1517 ~~including the views of~~ husbands, religious leaders, and women without pregnancy histories,  
1518 highlighting the need for further research. To maintain trustworthiness, we held open discussions  
1519 and regular meetings among the researchers. However, because the name of the services is  
1520 unfamiliar to the community, some women may have confused PCC with ANC, potentially  
1521 leading to exaggerated responses.

1522 **Conclusion and recommendations:** ~~This study reveals~~ ~~Most~~ that most women lack  
1523 awareness ~~of about~~ PCC, ~~though some high risk women are informed and make home based~~  
1524 ~~preparations before pregnancy.~~ HCPs deliver fragmented PCC interventions without using  
1525 standardized guidelines or assessment tools focusing mainly on high-risk cases. Key challenges and  
1526 opportunities identified include fragmented PCC services, traditional beliefs and misconceptions,  
1527 inadequate counseling on contraceptive services, social influences, perceived demand for PCC, and the

1528 potential to leverage existing community platforms. Integrating services into the existing community  
1529 platforms, particularly within the HEP, is recommended to enhance awareness of PCC. Diverse  
1530 communication strategies, including media campaigns and educational initiatives, should address  
1531 traditional beliefs, misconceptions, and low community awareness.~~Both women and healthcare~~  
1532 ~~professionals agreed that contraceptive counseling, folic acid supplementation, and substance use~~  
1533 ~~counseling are commonly practiced components of PCC interventions. However, providers often~~  
1534 ~~apply these services in a fragmented manner, primarily targeting high risk women. The study~~  
1535 ~~highlighted some of the challenges to PCC services, including low awareness, misconceptions,~~  
1536 ~~fear of contraceptive side effects, and poor quality family planning.~~

1537 ~~To enhance PCC awareness and uptake, package based services are essential. Participants~~  
1538 ~~recommended using diverse communication strategies, such as training, media platforms, and~~  
1539 ~~educational initiatives, to address misconceptions and gaps in knowledge. Participants also~~  
1540 ~~suggested strengthening home based preparation, using high risk mothers as role models, and~~  
1541 ~~integrating the SMART Start model into services. Additionally, they emphasized incorporating~~  
1542 ~~PCC into the HEP and routine services, identifying eligible women with the RLP tool, including~~  
1543 ~~them in family folders, and linking them to health facilities with referral slips.~~Additionally,  
1544 participants suggested to strengthening the existing home-based initiatives and leveraging high-  
1545 risk mothers as role models to promote awareness of PCC. Moreover, a package-based approach  
1546 need to be implemented by integrating PCC as a continuum of maternal care. Introducing the  
1547 concept of RLP is essential, enabling routine use of RLP tools to identify eligible women for  
1548 these services. These findings provide valuable insights for Ethiopia's Ministry of Health,  
1549 guiding policymakers, and program designers to enhance PCC utilization. Additionally,

1550 innovative interventions should focus on establishing package-based services, creating demand,

1551 and strengthening service linkages for better outcomes.

1552 **Abbreviations**

1553 ANC: Antenatal Care

1554 APOs: Adverse Pregnancy Outcomes

1555 ART: Anti retro-viral therapy

1556 CDC: Centers for Disease Control and Prevention

1557 EPI: Expanded Program Immunization

1558 FP: Family planning

1559 HCPs: Healthcare providers

1560 HEP: Health Extension Program

1561 HEWs: Health Extension Workers

1562 MNCH: Maternal, Neonatal and child health

1563 OPD: Out Patient Department

1564 PCC: Preconception Care

1565 RLP: Reproductive Life Plan

1566 SDGs: Sustainable Development Goals

1567 VCT: Voluntary counseling Test

1568 WDGs: Women Development Group

1569 WHO: World Health Organization

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**Title:** Awareness and uptake of preconception care services in Tigray, Northern Ethiopia – a qualitative exploration of experiences, challenges, opportunities, and prospects

By: Gebremedhin Gebreegziabher Gebretsadik<sup>1, 2\*</sup>, Alemayehu Bayray Kahsay<sup>2</sup>, Andargachew Kassa<sup>4</sup>, Amanuel Gessesew<sup>3</sup>, Zohra Lassi,<sup>5,6</sup> Afework Mulugeta<sup>2</sup>

To: PLOS one

Dear Editor,

We, the authors of this manuscript, express our gratitude to the journal editors and reviewers for their thorough review, insightful comments, and valuable suggestions that significantly enhanced the quality of our work. We have rigorously revised the manuscript as per your questions and comments. We have included the point-by-point response in the table below, framed as reviewers' comments/questions and authors' responses. The detailed revisions and changes we made in the main document are prepared with track changes attached separately. We expect our revision will enable the manuscript to fit the journal better. Should you have any further inquiries, please feel free to contact us at your convenience.

**Point-by-point Responses to Editor's and Reviewers Comments**

<b>Editors and Reviewers' comments</b>	<b>Authors' Response</b>
<b>Editor comments</b>	
3. In the ethics statement in the Methods, you have specified that verbal consent was obtained. Please provide additional details regarding how this consent was documented and witnessed, and state whether this was approved by the IRB	Thank you for your valuable comment. We incorporated your comments in the document. We stated that after fully explaining the study's objectives, risks, and benefits, informed consent was obtained from all participants, and the verbal informed consent was also approved

	by the IRB of the college.
<b>Reviewer #1: PONE-D-24-41198_Review comments</b>	
<b>Title</b>	
1. I suggest removing “policy implications” from the title as the manuscript does not speak to policy clearly. The current title does not align well with the stated aim of the study to explore experiences, challenges and opportunities. I suggest something along these lines “ <i>Awareness and uptake of preconception care services in Tigray, Northern Ethiopia – a qualitative exploration of experiences, challenges and opportunities</i> ”.	I really appreciate for your perspective and your suggestion is duly accepted.
<b>Methods</b>	
<b>Study design:</b> 1. The sentence “ <i>Since 2020, Ethiopia has strategically integrated PCC into its health system, guided by newly developed guidelines (6, 7).</i> ” will fit better in the introduction rather than in the study setting. If available data on the service delivery so far can be provided.	Thank you very much for your critical insight and your comments are well taken and incorporated in the document. The data about PCC services in Ethiopia was included in the introduction (Page 5, line 99-100).
2. “With” needs to be deleted in this statement. “ <i>These zones include 591,481 women of reproductive age (23.5% of the population) and employ 1,731 healthcare providers, including 350 with Health extension workers (HEWs).</i> ”	Thank you once again for your comment. We have addressed it and made the necessary corrections in the document.
3. The reference to a war in the statement “ <i>However, the war damaged over 80% of health facilities, leading to a 40% decline in maternal and child health services, including institutional deliveries (26).</i> ” needs to be clarified better. It may be useful to include a paragraph in the introduction describing the state of health services before and after the war including dates and possible reasons for the unrest. This will enable readers to understand the context better.	Thank you once again for your comment. We accepted your suggestion and incorporated it in the introduction (Page 4-5, line 86-93).

<p><b>Recruitment of participants:</b></p> <p>1. The statement “<i>We identified participants communicated with HEWs and women development group (WDGs) from HEW registers using purposive sampling, considering their pregnancy and risks.</i>” is unclear; the sentence appears incomplete.</p>	<p>Thank you for your comment. We accepted your suggestion and modified the statement accordingly in the document line (Page 7, line 143-145)</p>
<p>2. How did the authors determine the “intention to become pregnant”? Was there any screening questionnaire? Where were potential participants identified? The health facility or within the community? Who identified the participants in either instance?</p>	<p>Thank you for your valuable comment. Mothers intending to become pregnant were specifically identified using a single reproductive life plan (RLP) tool: "Would you like to become pregnant in the next six months?" This tool is considered more acceptable than other pregnancy intention checklists (1). Hence, participants were identified and contacted through HEWs and WDGs in the community using the RLP tool mentioned above.</p>
<p>3. Similarly, how did the authors identify the women who had a history of adverse pregnancy outcomes?</p>	<p>Thank you very much and we really appreciate your insight. High-risk mothers who participated in the IDI were selected and contacted through HEWs together with WDGs. In our context (Ethiopia), HEWs are expected to perform their role in the health post, community, and households by creating a linkage with WDGs.</p>
<p>4. What do ESOGA &amp; EMA mean?</p>	<p><b>Thank you again for your comments</b>  ESOGA is an abbreviation described as Ethiopian Obstetrics and Gynecology. Besides, EMA is named the Ethiopian Midwives Association. This is also incorporated in the manuscript (Page 7, line 152-153).</p>
<p>5. What strategies did the research team apply to “bracket” their prior experiences?</p>	<p>In explorative qualitative research, bracketing is a crucial process where researchers set aside their presuppositions, biases, assumptions, and prior experiences to objectively observe and describe a phenomenon. It requires researchers to remain honest, vigilant, and self-reflective about their perspectives, pre-existing beliefs, and evolving hypotheses throughout the study. To minimize biases related to prior experience of the research team(bracket)  We considered the following strategies</p>

1. During data collection, the team held daily debriefing sessions to address emerging issues and spent extended time with participants to gain deeper insights. We extended the research period to gain an in-depth understanding of the phenomena. We shared participant transcripts for verification and incorporated their feedback
2. Member checking , involving participants in the research process by seeking their feedback on findings and interpretation can help ensure that research do not impose their own meaning on to the data. for example in this study we conducted member checking with four participants, each representing a distinct group: HCPs, MNCH experts, and the two groups of mothers
3. While conducting participant interviews, we conducted independently coding for creating codes, and organizing these codes into categories and themes, the researcher team bracketed their prior experiences and knowledge to enhance the quality of the results
4. Training was conducted to all research team mainly data collection methods and the concept of reflexivity
5. We pretested the topic guide in a similar setting before starting data collection with revisions made based on feedback.
6. We used participants who have different perspective and IDIs, KIIs, and FGD s data collection methods the concept of triangulation of the study.

For detailed description, we have incorporated the trustworthiness of the qualitative study into the Methods and Materials section (page 9, lines 188–206).

<p><b>Ethics approval and consent to participate:</b> The statement “<i>Before data collection, we attached a one-page consent form to the questionnaire, explaining participants’ autonomy</i>” implies that a survey was conducted whereas the study is described as qualitative. Was there a questionnaire survey in addition to the qualitative data collection? The methods need to be clarified appropriately.</p>	<p>Thank you very much for your concern. In this study we only conducted qualitative research, and the statement included was corrected and included in the document (page 11, line 230-234).</p>
<p><b>Results</b></p>	
<p>1. What is the justification for including teenagers in the study? Table 1 shows that there are two intending mothers between 15 and 19 years old.</p>	<p>Thank you very much for your insight. Based on the Ethiopian demographic health survey(3), the age category is presented starting from 15 years. However, unfortunately in this study the minimum age was 18 years (there were no mothers whose age less than 18 years). In general we did not include teenagers in the study.</p>
<p>2. Figure 1 – conceptual framework: please provide a brief description of the relationships between the concepts in the framework. A legend describing the directions of the different arrows included will also be helpful.</p>	<p>. Thank you once again for your valuable comments. We have made corrections to the themes and sub-themes, rearranged the figure to include arrows that effectively illustrate the relationships between concepts, and incorporated all modifications into the document accordingly (page 15, lines 260–268).</p>
<p>3. The triangulation of results can be improved. Some sections are fairly clear with opposing ideas around the same theme well presented. In other sections the presentation is not well aligned. It will also be useful to compare the opinions of health care providers and the different groups of women on the points rose to make the discussion more robust.</p>	<p>Thank you very much for sharing your valuable perspective. Based on your suggestion, we have made the necessary modifications to the document.</p>
<p>4. In some places the authors have written <i>St Mary</i> and in others <i>St Merry</i>. If this is a</p>	<p>Thank you once again for your suggestion. We have consistently updated and corrected the</p>

reference to the same religious figure the spellings should be aligned.	term to "St. Mary" throughout the document.
<b>Discussion</b>	
1. The “ <i>SMART Start model</i> ” is mentioned in the results and again in the discussion. Is this a model described in the Ethiopian health care system? It would be useful to provide some explanation of the model and proffer possible suggestions on why it was mentioned as a potential strategy for delivery of PCC care in the study.	The Smart Start model, launched by PSI as part of Ethiopia's National Adolescent and Youth Health Strategy (2021–2025), is a girl-centered reproductive health initiative aimed at improving pregnancy outcomes and overall well-being. The program serves as an entry point for couples to address health risks and economic challenges by integrating contraceptive education, counseling, and financial preparedness. Additionally, it advocates for the use of contraceptives among adolescent girls and promotes awareness before pregnancy. The program is implemented by health extension workers at the kebele or tabia level, Ethiopia's smallest administrative units, following “kettena” or “kushet”.  ( NATIONAL ADOLESCENTS AND YOUTH HEALTH STRATEGY (2021-2025))
2. It would be useful for the authors to proffer possible solutions to the challenges to PCC service provision and uptake identified in the study rather than only restate the issues already highlighted in the results.	Thank you very much for your grate insightful suggestion and based on your suggestion we did it.
3. Some of the themes in the results can be rephrased as strategies and opportunities for PCC services.	Thank you very much and we did it.
<b>Reviewer #2:REVIEW FOR PONE</b>	
It would have been better if there were line numbering for easy reference.	Thank you very much and we did it.
<b>Abstract</b>	
1. Restructure this sentence. It is too long. ‘Some women have an awareness of PCC services, mainly among high risk; the majority of healthcare providers, especially gynecologists, and doctors, have some knowledge of PCC and understand its importance and provide some components of	Thank you again for your comment. We modified in the document (page 2, line from 36 to 40)

PCC interventions in a fragmented way, primarily targeting high-risk women.	
<b>INTRODUCTION</b>	
2.Add more information about what is known about Experiences, Challenges, and Opportunities in Ethiopia	Thank you again for your suggestion In Ethiopia, the concept of PCC especially package based services is a new concept and as far as our knowledge is concern, there is little evidence about Experiences, Challenges, and Opportunities of PCC services in Ethiopia.
<b>METHODS</b>	
3. How was trustworthiness ensured?	Thank you for your valuable comments.  We ensured the trustworthiness of the study through: a. During data collection, the team held daily debriefing sessions throughout data collection time to address emerging issues and spent extended time with participants to gain deeper insights. We extended the research period to gain an in-depth understanding of the phenomena. We shared participant transcripts for verification and incorporated their feedback.  b. In this study we conducted member checking with four participants, each representing a distinct group: HCPs, MNCH experts, and the two groups of mothers c. While conducting participant interviews, we conducted independently coding for creating codes, and organizing these codes into categories and themes, the researcher team bracketed their prior experiences and knowledge to enhance the quality of the results d. Training was conducted to all research team mainly data collection methods and the concept of reflexivity e. We pretested the topic guide in a similar setting before starting data collection with revisions made based on feedback. f. We used participants who have different

	<p>perspective g. We used IDIs, KIIs, and FGD s as data collection methods to improve triangulation of the study</p> <p>For detailed description we incorporate trustworthiness as separate section in the methods and materials section (page 9, lines 188–206).</p>
4. Which qualitative method checklist was used for this study?	Thank you for your comment. We followed the PLOS one guidelines for reporting qualitative research using the consolidated criteria for reporting qualitative research (COREQ) checklist.
<b>RESULTS</b>	
5. This section needs a complete overhaul	Thank you very much for your valuable comments. In response to your comments, we have made significant revisions to the results section, including the subthemes, and we incorporated the updated results into the document.
6. Change results to findings	Thank you for your concern but the guidelines for PLOS one recommends using comment. results rather than findings
7. Table 1 is so confusing; it could be made better	Thank you for your feedback. Based on your suggestion, we have revised and separated the content into two tables, which have been incorporated into the document (page 12-14)
8. In Table 2, in the narratives, you mentioned 5 themes, but the table contains only 4 themes. In the same vein, you mentioned 29 subthemes, but the table contains 30 subthemes.	Thank you very much for your comment. We accepted your comment and rearranged and incorporated in the document (page 14-15 )
9. The subthemes are simply too much, some of them are unnecessary and can be merged. You need to go back and redo your analysis to make the themes and especially the subthemes better. How can you have awareness, poor awareness, and knowledge as three different subthemes?	Thank you for your valuable suggestions. We made a significant modification and incorporated in the document (page 14-15 ).

<p>10. What do you mean by ‘Deliver in a fragmented’ as a subtheme? Each subtheme should make sense</p>	<p>Thank you again for your comment. The phrase “Deliver in a fragmented manner” was included as a challenge in the subtheme. We categorized this to refer specifically to PCC services provided without a structured guideline, no responsible healthcare provider, no specific unit, meaning no package-based services are in place. Healthcare providers may deliver services inconsistently, relying solely on the information they have at hand or without any proper guidance. We have revised this to clarify it as “fragmented services.”</p>
<p>11. Influence of elder persons and religious leaders can be merged with the Husband's opposition to PCC</p>	<p>Thank you once again for your valuable comments. We have revised and merged the significant subthemes, including those previously identified, and collectively named them “Social Influences.”</p>
<p>12. I still fail to understand what this home-based preparation is all about. To me, it looks more like birth preparedness and has nothing to do with any component of PCC</p>	<p>The main aim of identifying home-based preparations for pregnancy is to assess whether community-based preparations align with preconception care interventions commonly practiced at the community level. The study found that mothers made preparations in areas such as economics, nutrition, alcohol intake, and psychological readiness, all of which are related to preconception care. These experiences can be used to educate women and raise awareness of preconception care components within the community. Preparation in these areas is essential to ensure a risk-free conception by addressing nutrition, alcohol, psychological issues, and other lifestyle risks ultimately improving pregnancy outcomes. While home-based preparation focuses on preconception care, birth preparedness occurs during pregnancy, mainly through antenatal care (ANC). Both are part of the maternal continuum of care and play a significant role in reducing adverse pregnancy outcomes.</p>
<p><b>DISCUSSION</b></p>	
<p>13. What do you mean here by ‘Our uniquely explores the perspectives on PCC services in Tigray’</p>	<p>Thank you very much again for your comment and your suggestion is duly accepted. (page 39, line 797-798).</p>
<p>14. Write this in full when you first</p>	<p>Thank you for your comment</p>

introduced it SMART	Smart Start Inc., established in September 1992 in America, and transformed Title X family planning guidelines by reducing barriers to contraceptive access. In 1993, regulatory changes allowed oral contraceptives to be provided without a full medical exam. Developed by the Family Planning Council of Southeastern Pennsylvania, SMART START enabled teens to delay certain medical services, fostering early access to care, improved contraceptive use, and reduced teen pregnancy rates(4). In Ethiopia, the Smart Start model, launched by PSI as part of Ethiopia's National Adolescent and Youth Health Strategy (2021–2025), is a girl-centered reproductive health initiative aimed at improving pregnancy outcomes and overall well-being. The program serves as an entry point for couples to address health risks and economic challenges by integrating contraceptive education, counseling, and financial preparedness.
15. There is no justification for any of your findings	Thank you very much for your comments. We have made significant revisions to the discussion section and incorporated them into the document.

1. Baldwin MK, Overcarsh P, Patel A, Zimmerman L, Edelman A. Pregnancy intention screening tools: a randomized trial to assess perceived helpfulness with communication about reproductive goals. *Contraception and reproductive medicine*. 2018;3:1-5.
2. Tufford L, Newman P. Bracketing in qualitative research. *Qualitative social work*. 2012;11(1):80-96.
3. Yigezu B. Ethiopian demographic and health survey. Central Statistical Agency. 2016.
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