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Barriers and facilitators of maternal health care services use among pastoralist women in Ethiopia: Systems thinking perspective

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Abstract

We explored the barriers and facilitators of maternal health care service use among women in the pastoralist region of Ethiopia.

We used a mixed methods design—focus group discussions, key informant interviews, review of the literature and Participatory Ethnographic Evaluation Research (PEER) methods followed by a household survey among randomly chosen pastoralist women of reproductive age ($n = 1,499$). We used multi-variable regression analyses, and a p value ≤ 0.05 was set to determine statistical significance. In addition, we analysed qualitative data thematically and developed a causal loop diagram using dynamic synthesis methodology to analyse non-linearity, intricate relationships of the variable of interests.

In this study, 20.6% of women used modern contraceptive methods, 44.6% had four or more antenatal visits and 38.4% of sampled women received skilled delivery services. We observed multiple individual and community related factors such as education, income and women's and their partner's knowledge, perceptions, husband approval, social norms and value-expectations and providers' gender preferences and health systems factors such as access to health facilities, place of living, provider's cultural competency skills, supplies, delivery positions, economic and political stability, and provider's attitude were linked to maternal health care services utilization among women in pastoralist regions.

Approaches towards pastoralists' health care delivery systems should be responsive to their cultural and political ecology and human agency.

Keywords: Borena, Guji, Delivery services, health care system, contraception

Introduction

Over the last two decades, Ethiopia has been committed to reducing maternal and child mortality through expansion of primary health care and strengthening community health programmes (CHP) (Assefa et al. 2019) (Rieger et al. 2019) (Tarekegn et al. 2014). However, health service inequity remains one of the main challenges between and within regions (Onarheim et al. 2015) (Memirie et al. 2016). While improvements have been observed among highland regions, higher-income groups and educated and urban residents (Onarheim et al. 2015), pastoralist communities have been disproportionately marginalized and access to health services is extremely low (Tarekegn et al. 2014) (Kebede and Teklehaymanot 2016) (Birmeta et al. 2013) (Zepro and Ahmed 2016) (Biza and Mohammed 2016).

The causes of health disparities are multi-factorial and are related to structural and proximal determinants of health such as education, wealth and lack of health care

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system that fits to the pastoralist context and communities (Biza and Mohammed 2016) (Jackson et al. 2017) (King et al. 2015). Although previous studies are useful in understanding factors that hinder or enable the uptake of maternal health services in pastoralist Ethiopia, there is relatively little research that describes the intricate and complex relationships of factors from the demand or user side perspectives (e.g. community perspectives) and the supply side (health system perspectives) as a whole. Most of these epidemiologic studies also used statistical models that assume linear modelling approaches without considering the intricate complexities of pastoralism, community behaviours and health care system.

Nonetheless, the features of health care systems and pastoralism assume the characteristics of complex adaptive systems (Catley and Iyasu 2010) (McAllister et al. 2006) (Lansing 2003). Furthermore, pastoralist communities have their own unique contexts such as culture, social norms, traditions, attitude and values (Biza and Mohammed 2016) (Zepro and Ahmed 2016) (Elemo 2006) (Belda et al. 2017) which may affect their health care service utilization and health status. Previous interventions, however, were not holistic and designed from reductionist perspectives whereby the health care delivery model largely focused on providing access to basic health services without taking into account the social determinants of health. Thus, understanding what works for pastoralist communities remains less explored (King et al. 2013) (King et al. 2015). Moreover, the health care delivery system in pastoralists' settings is very weak; service providers, if present, lack cultural competency skills (Biza and Mohammed 2016). The continuum of Reproductive Maternal Neonatal Health (RMNH) care emphasizes time and place to deliver essential health services by integrating homes, communities and facilities. However, the model failed to take pastoralists' living patterns, cultural ecology and physical and environmental challenges into account (McDougal et al. 2017). These warrant more holistic approaches that acknowledge the complexity of pastoralism and health care delivery system using systems thinking perspective. For instance, studies from Uganda demonstrated that systems thinking provides a means to understand health care delivery system complexity by understanding the linkages, interactions, feedbacks and processes between the elements that comprise the whole system (Rwashana et al. 2014). Therefore, we assumed pastoralism is a complex system, which constitutes several components such as material, technological, social, economic, political and cultural dimensions that are inter-dependent and characterized by series of emergence. Similarly, women in the pastoral communities live in complex social, cultural and environmental settings organized in unequally structured co-evolving systems. Our goal was, therefore, to explore and document barriers and facilitators of maternal health care service use from both community and health care delivery model perspectives and to understand the inter-dependence, interaction and feedbacks of these factors. We adapted systems thinking perspective to examine and understand a host of factors and their complex interactions in determining the use of RMNH services among women in pastoralist communities in Ethiopia.

The remainder of the paper is structured as follows. The "Methods" section outlines the methods and approaches employed in the study. Results of the qualitative study, statistical analysis and the system dynamic model are presented in the "Results" section. This is followed by a discussion in the "Discussion" section and a conclusion and recommendation in the "Conclusion and recommendations" section.

Methods

Study settings

Ethiopia's estimated pastoral or agro-pastoral areas constitute about 63% of the total land area (Biza and Mohammed 2016), and their livestock production contributes up to 20% to the country's Gross Domestic Product (GDP). This study was conducted in two pastoralist districts (*woredas*) of Oromia Regional State, Ethiopia: Gorodola *woreda* (located in Guji zone) and Dhas *woreda* (Borana zone). The two *woredas* (Gorodola and Dhas) are found in the southern part of Ethiopia at 549 and 742 km from Addis Ababa, respectively. The area is characterized by low and erratic rainfall, high temperatures, high evaporation rates, recurrent drought and socio-economic problems. Livestock is the main livelihood in both *woredas*. Maternal health service utilizations in both *woredas* are very low. However, the broader social and economic context in which maternal health service decision-making takes place, including gender dynamics and relationships, is less understood.

Study design

The aim of the study was to explore factors that facilitate or hinder RMNH service utilization and examine the complex interaction of the factors. To that end, we used a mixed methods design which involves qualitative and quantitative methods of data collection and analysis. These include exploratory and consultative qualitative methods such as review of literature, key informant interviews (KIIs), focus group discussions (FGDs) and Participatory Ethnographic Evaluation Research (PEER) to investigate the behavioural and social determinants of RMNH service utilizations, experiences of the pastoralist communities, their desires and social systems at different levels. These qualitative exploratory approaches were followed by a household survey and building and testing a complex system model. The following sections

("Literature review and qualitative research methods", "Household survey", "Data collection and management" and "Model building") provide additional details on the approaches used in the study.

Literature review and qualitative research methods

Review of literature

We conducted a review of published articles on the topic of maternal health care service use among pastoralist women. This was not a systematic review in line with well-established guidelines such as the Cochrane review. However, we searched electronic databases and summarized key findings from the studies we identified (Supplementary Table 1). The results offered information on the current understanding of factors that influence the use of maternal health care services and highlighted existing gaps in the literature. The results were also used to contextualize our findings.

Key informant interviews (KIIs) and focus group discussions (FGDs)

We did a total of 24 KIIs among health extension workers (HEWs), health care professionals, local administrators and community and religious leaders and 20 FGDs among women of reproductive age group to understand the magnitude and underlying determinants of health care service use and to elicit problems, perceptions, behavioural practices and challenges of health care system and community health programmes in such settings.

Participatory Ethnographic Evaluation Research (PEER)

To investigate the deep-rooted socio-cultural facilitators and barriers of RMNH service utilizations (behavioural, social determinants), experiences of the communities, their desires and social systems at different levels, we used a Participatory Ethnographic Evaluation Research (PEER) method (Price and Hawkins 2002) (King et al. 2013). Several qualitative approaches that have been used to understand maternal health care service use in Ethiopia do not explain the contextualized understanding of the complexity of health system factors, social institutions and cultural practices in which women in pastoralist communities practise maternal and child health-related behaviours. While ethnographic methods or participatory research can offer alternatives by involving participants in various stages of the research to contextualize and interpret the data, classical anthropological approaches require some amount of time to build trust, ownership and positive relationships with the communities by the researchers. Therefore, we used PEER to provide a contextualized understanding of maternal health issues in the pastoralist region of Ethiopia. PEER is a rapid, participatory qualitative method which is based upon training members of the target group to carry out in-depth interviews about factors associated with RMNH service utilization among their peers or own social network. It enables community members to design and conduct interviews and analyse data by training these community members as "PEER researchers". PEER researchers have already an established relationship of trust with the other community members who they are interviewing. In our case, we selected health extension workers and other trusted community members and trained in PEER methods by the research team. For this study, we selected 12 PEER researchers to interview three of her peer members, and a total of 36 interviews were conducted at each *woreda*.

Household survey

We conducted a household (HH) survey among a sample of 1499 reproductive-age women. We estimated the sample size using the two proportions formula and employed a systematic sampling procedure to select eligible respondents. First, a list of *kebeles* (localities) with respective population estimates was obtained from each *woreda (smallest administrative unit)*, and then, the cumulative population of the *kebeles* was computed. The sampling interval was calculated and a random starting number was chosen between 1 and the sampling interval (inclusive). Beginning with the random number, all households (HHs) with eligible target group were identified using the sampling interval at each *kebele*. Because of the lack of uniformity in numbering households, the use of random numbers for the whole *kebele* was not practical in this context. Hence, the *kebeles* were first divided into manageable size of households using the already existing structure (*gote*). On average, there are seven *gotes* per *kebele* with an estimated 45 HHs per *gote*. Then, the "reference HH" was identified. Once the reference HH was selected, the interview was conducted in the HH which is nearest by walking distance to this reference HH and continued until the final required sample is completed. One respondent from each target group was then selected from each sampled household. Respondents provided answers to our questions related to FP, ANC and delivery care service use.

Data collection and management

Data collection and quality assurance

A structured questionnaire prepared in the Afan Oromo language was used to collect the data. Data were collected using a smartphone with Open Data Kit (ODK) tool, which was controlled centrally to check for and ensure data quality. Data were instantly transferred from the field to the central IT unit at Jimma University. This was followed by immediate extraction and submission to the research team using an appropriate XML form. A total of 20 enumerators took part in the data collection. In order to prevent measurement bias, the study

hypothesis was kept secret from both the community and data collectors (double blinding). Data collection followed standard procedures; training was provided for interviewers; quality control checks were employed using lots of quality assurance sampling techniques. The research team supervised the data collection process. For the PEER study, at the end of each week, responsible supervisors interviewed PEER researchers on the interviews they had carried out during the week and recorded detailed notes of the narratives. During the supervision process, the supervisors were able to develop a strong rapport and relationship of trust with the PEER researchers enabling them to probe more deeply into issues raised in the interviews.

Data management and analysis

To analyse qualitative data, we employed thematic analysis. Selected quotes from participants were included in the results to highlight the emerging points. PEER data were analysed at two stages. First, PEER researchers were encouraged to conduct their preliminary analysis. This was followed by brainstorming sessions of PEER researchers to probe key issues emerging from the interview and a series of in-depth interviews by the social analyst with each of the PEER researchers. Finally, two members of the research team thematically categorized those factors at individual, community and health system levels. We used NVivo-10 software to analyse qualitative data.

For the household survey, we checked data for completeness and consistency and exported to STATA 16.0 software for further analysis. The primary outcomes were descriptively summarized with frequency, mean and standard deviation. In addition, we performed multi-variable logistic regression analyses to examine factors associated with the use of maternal health care services.

Model building

We analysed and generated important variables that are associated with RMNH service use and develop a causal loop diagram (CLD) model to understand and depict the feedback mechanisms that are generated within complex systems which include the relationships, dynamics and delays associated with outcomes of interests. We used CLDs and the system dynamic modelling (DSM) method based on key findings from the qualitative and statistical approaches. With the CLDs, we draw the direction of relationships in the same (+) or opposite (-) direction. That is, a link from element A to element B may be positive (A →(+) B) if a change in A produces a change in B in the same direction, or negative (A →(-) B) if a change in A produces a change in B in the opposite direction. A change in element A which produces a change in element B only after a delay is denoted by A ⟶‖ B. We also showed balancing and reinforcing feedback loops. Balancing loops apply where there is an attempt to solve a problem or achieve a goal. Reinforcing loops represent a growing action where each action adds to another and may be referred to as virtuous cycles when they produce desirable effects or vicious cycles when they produce negative effects. We then validated the causal loop diagram in collaboration with regional health officers, federal ministry of health officers and other relevant key stakeholders. The validated results were used for further simulation and what-if scenario analysis of policy and programme interventions.

Ethical considerations

We obtained ethics approval from the Ethical Review Board of the Faculty of Public Health, Jimma University. In addition, administrative clearance was obtained from the selected *woreda* health offices. Informed verbal consent was obtained from respondents after data collectors explained the objectives of the survey, the benefits and harms and the confidentiality of information to the study participants. Verbal consent was the preferred way given the study areas are rural communities and most participants tend to be illiterate. Participation in the study was totally on a voluntary basis and participants were informed about their right not to respond or withdraw any time during the interview. This paper draws from a project on the determinants of RMNH service use among pastoralists conducted by Jimma University with funding from the Department for International Development (DFID, UK) through grants to the Ethiopian Federal Ministry of Health (MoH). However, the funding organizations had no role in the design and implementation of the study as well as the interpretation of data and writing of the paper.

Results

Characteristics of study participants

The mean age of the women was 26.9 years (*SD* ±6.9). There was a statistically significant difference between the two *woredas* by wealth status ($p < 0.001$), maternal education ($p < 0.001$), parental education ($p < 0.001$), food insecurity status ($p < 0.001$), head of the household ($p < 0.0001$), total family size ($p < 0.001$) and religion ($p < 0.001$). However, no difference was observed in terms of maternal age ($p = 0.51$), mean age at first marriage ($p = 0.054$) and decision-making power ($p = 0.41$). The average number of pregnancies a woman had in her lifetime was 4.6 (3.1), and about 10.1% of women were pregnant at the time of the survey (Table 1).

Table 1 Demographic characteristics of study participants by district, among women living in pastoralists, Ethiopia, 2016

Variables	Total (*n* = 1499)	Dhas (646)	Gorodola (853)	*p* value
Religion				< 0.001
Wakefata	405 (27.0)[1]	403 (62.4)	2 (0.2)	
Muslim	672 (44.8)[2]	183 (28.3)	489 (57.3)	
Orthodox Christian	28 (1.9)	15 (2.3)	13 (1.5)	
Protestant Christian	394 (26.3)	45 (7.0)	349 (40.9)	
Ethnic group, Oromo	1390 (92.7)	643 (99.5)	747 (87.6)	< 0.001
Maternal age (years)	26.9 ± 6.9	27.0 ± 7.3	26.8 ± 6.7	0.51
Age at marriage	17.1 ± 2.4	17.0 ± 2.3	17.2 ± 2.4	0.054
Husband age (years)	36.4 ± 11.4	38.8 ± 12.9	34.7 ± 9.8	< 0.001
Marital status, married	1414 (94.3)	579 (89.6)	835 (97.9)	< 0.001
Household head education				< 0.001
No formal education	682 (55.8)	399 (67.5)	283 (44.8)	
Primary education	317 (25.9)	38 (6.4)	279 (44.1)	
Secondary and above	224 (18.3)	154 (26.1)	70 (11.1)	
Total family size	7.3 ± 3.1	5.5 ± 2.4	8.6 ± 3.0	< 0.001
Under-5 children	1.8 ± 0.9	1.5 ± 0.6	2.0 ± 1.0	< 0.001
Household wealth				< 0.001
Lowest	500 (33.4)	260 (40.2)	240 (28.1)	
Middle	500 (33.4)	207 (32.0)	293 (34.3)	
Highest	499 (33.3)	179 (27.7)	320 (37.5)	
HFIAS				< 0.001
Food secure	387 (25.8)	118 (18.3)	269 (31.5)	
Mildly food-insecure access	96 (6.4)	42 (6.5)	54 (6.3)	
Moderately food-insecure access	420 (28.0)	147 (22.8)	273 (32.0)	
Severely food-insecure access	596 (39.8)	339 (52.5)	257 (30.1)	
Decision-making autonomy score	5.5 ± 2.0	5.4 ± 2.1	5.5 ± 1.9	0.41

HFIS household food-security status
[1]Number (%), all such values
[2]Mean ± SD, all such values

Maternal health care service utilizations and associated factors

Five hundred fifty (44.6%) of women had four or more ANC visits during their latest pregnancy and 429 (34.8%) had their first ANC visits during their first trimester. Regarding delivery care (DC) use, 576 (38.4%) of women used DC services. On the other hand, only 20.5% of the mothers had used modern contraceptive methods (Table 2).

Factors associated with modern contraceptive method use

Women whose age at first marriage was delayed (> 17) were 1.64 more likely to use a modern contraceptive method than their counterparts (*AOR* = 1.64, 95% *CI* 1.22, 2.20), and women whose partner attended secondary education were two times more likely to use contraceptive methods (*AOR* = 2.00, 95% *CI* 1.33, 3.01) (Table 3). Women living in middle-income (*AOR* = 1.73, 95% *CI* 1.16, 2.59) and highest income HHs (*AOR* = 2.02, 95% *CI* 1.31, 3.11) and had a history of ANC (*AOR* = 2.21, 95% *CI* 1.45, 3.36), previous experience of delivery (*AOR* = 1.40, 95% *CI* 1.02, 1.91) and knowledge about family planning (FP) (*AOR* = 1.45, 95% *CI* 1.30, 1.61) were more likely to use contraceptives than their counterparts (Table 3).

Factors associated with ANC use

The majority of women asserted that it is not customary to use ANC services (40.5%) and others stated it is not necessary to use ANC (14.6%). Other factors such as distance (12.0%), absence of traditional cultural practices at health facilities (5.2%) and facility-related factors (5.2%) were also mentioned by women (Fig. 1). Table 3 describes the determinants of ANC utilization. Primary education (*AOR* = 1.60, 95% *CI* 1.03, 2.49), secondary education (*AOR* = 1.62, 95% *CI* 0.89, 2.97), women autonomy (*AOR* = 1.16, 95% *CI* 1.07, 1.25), highest income (*AOR* = 1.62, 95% *CI* 1.09, 2.42) and knowledge about

Table 2 Reproductive health history and maternal health care service use by district, among women living in pastoralist regions, Ethiopia, 2016

Variables	Total (1499)	Dhas (646)	Gorodola (853)	*p* value
Current pregnancy prevalence	151 (10.1)[1]	41 (6.3)	110 (12.9)	< 0.001
Trimester				0.180
First	22 (14.6)	8 (19.5)	14 (12.7)	
Second	43 (28.5)	13 (31.7)	30 (27.3)	
Third	86 (57.0)	20 (48.8)	66 (60.0)	
Gravidae, mean ± SD	4.6 ± 3.1[2]	3.9 ± 2.7	5.1 ± 3.3	< 0.001
Parity, mean ± SD	4.2 ± 2.8	3.5 ± 2.3	4.7 ± 3.1	< 0.001
Desire for future pregnancy	1213 (80.9)	546 (84.5)	667 (78.2)	0.002
Unwanted pregnancy (current $n = 151$)	20 (13.2)	9 (22.0)	11 (10.0)	0.054
History of unwanted pregnancy	92 (6.1)	27 (4.2)	65 (7.6)	0.006
Ever had pregnancy-related complications	658 (43.9)	244 (37.8)	414 (48.5)	< 0.001
History of abortion	254 (16.9)	137 (21.2)	117 (13.7)	< 0.001
Number of abortions, mean ± SD	1.5 ± 0.9	1.5 ± 0.8	1.5 ± 1.0	0.640
History of still birth	100 (6.7)	44 (6.8)	56 (6.6)	0.850
Contraceptive prevalence rate	260 (20.5)	104 (19.2)	156 (21.5)	0.32
Purpose of current FP utilization				0.15
Spacing birth	237 (91.2)	98 (94.2)	139 (89.1)	
Limiting birth	23 (8.8)	6 (5.8)	17 (10.9)	
Ever used FP during last 3 years	385 (25.7)	176 (27.2)	209 (24.5)	0.230
HEW visit for FP in last 12 months	851 (56.8)	490 (75.9)	361 (42.3)	< 0.001
ANC utilization during recent pregnancy	1232 (82.2)	537 (83.1)	695 (81.5)	0.410
Gestational age during first ANC booking				< 0.001
< 3 months	429 (34.8)	285 (53.1)	144 (20.7)	
> 3 months	803 (65.2)	252 (46.9)	551 (79.3)	
Number of ANC visits attended				< 0.001
Only once	89 (7.2)	21 (3.9)	68 (9.8)	
Twice	188 (15.3)	60 (11.2)	128 (18.4)	
Three times	405 (32.9)	155 (28.9)	250 (36.0)	
Four and above	550 (44.6)	301 (56.1)	249 (35.8)	
IFA supplementation pregnancy	806 (53.8)	388 (60.1)	418 (49.0)	< 0.001
Intake of IFA 90+ capsules	152 (18.9)	108 (27.8)	44 (10.5)	< 0.001
Delivery service utilization	576 (38.4)	341 (52.8)	235 (27.5)	< 0.001
Birth				
Birth weight taken	433 (28.9)	277 (42.9)	156 (18.3)	< 0.001
PNC service utilization during recent birth	605 (40.4)	393 (60.8)	212 (24.9)	< 0.001
Time of first PNC check-up				< 0.001
Immediately after birth	649 (80.9)	324 (74.3)	325 (88.8)	
Within 2 days after birth	117 (14.6)	96 (22.0)	21 (5.7)	
3–7 days after birth	20 (2.5)	8 (1.8)	12 (3.3)	
7–28 days after birth	8 (1.0)	6 (1.4)	2 (0.5)	
More than 1 month after birth	8 (1.0)	2 (0.5)	6 (1.6)	

[1]Number (%), all such values
[2]Mean ± SD, all such values

Table 3 Predictors of maternal health care service utilizations among women living in pastoralist regions, Ethiopia, 2016

	Antenatal care			Delivery care			Modern contraceptive use		
Variables	**No**	**Yes**	***AOR****	**No**	**Yes**	***AOR****	**No**	**Yes**	***AOR****
Woreda (district)									
Dhas	109 (40.8)	537 (43.6)	1 (reference)				253 (28.3)	393 (65.0)	1 (reference)
Gorodola	158 (59.2)	695 (56.4)	0.67 (0.47, 0.94)[1]			0.15 (0.10, 0.21)[3]	641 (71.7)	212 (35.0)	0.15 (0.11, 0.19)[3]
Religion									
Wakefeta				237 (25.7)	168 (29.2)	1.44 (0.96, 2.14)	324 (30.5)	55 (19.4)	1 (reference)
Muslim				438 (47.5)	234 (40.6)	2.51 (1.59, 3.97)[3]	493 (46.3)	98 (34.5)	1.00 (0.64, 1.56)
Christian				248 (26.9)	174 (30.2)	1.44 (0.96, 2.14)	247 (23.2)	131 (46.1)	2.64 (1.68, 4.15)[3]
Ethnic group									
Non-Oromo							93 (10.4)	16 (2.6)	1 (reference)
Oromo							801 (89.6)	589 (97.4)	2.30 (1.27, 4.17)[2]
Maternal age (years)									
< 25	111 (41.6)	652 (52.9)	1 (reference)						
> 25	156 (58.4)	580 (47.1)	0.64 (0.46, 0.90)[2]						
Maternal education									
No formal education	220 (82.4)	836 (67.9)	1 (reference)	719 (77.9)	337 (58.5)	1 (reference)	554 (52.1)	76 (26.8)	1 (reference)
Primary education	31 (11.6)	214 (17.4)	1.60 (1.03, 2.49)[1]	154 (16.7)	91 (15.8)	1.41 (0.99, 2.02)	218 (20.5)	53 (18.7)	1.41 (0.90, 2.21)
Secondary and above	16 (6.0)	182 (14.8)	1.62 (0.89, 2.97)	50 (5.4)	148 (25.7)	3.40 (2.16, 5.34)[3]	240 (22.6)	131 (46.1)	2.00 (1.33, 3.01)[2]
Household wealth									
Lowest	117 (43.8)	383 (31.1)	1 (reference)	364 (39.4)	136 (23.6)		410 (38.5)	53 (18.7)	1 (reference)
Middle	96 (36.0)	404 (32.8)	1.12 (0.82, 1.54)	326 (35.3)	174 (30.2)	1.57 (1.16, 2.13)[2]	359 (33.7)	89 (31.3)	1.73 (1.16, 2.59)[2]
Highest	54 (20.2)	445 (36.1)	1.62 (1.09, 2.42)[1]	233 (25.2)	266 (46.2)	2.18 (1.55, 3.07)[3]	295 (27.7)	142 (50.0)	2.02 (1.31, 3.11)[2]
Food insecurity	8.8 ± 6.6	6.9 ± 6.4	0.97 (0.95, 0.99)[1]				7.8 ± 6.5	6.5 ± 6.3	0.98 (0.96, 0.99)
Maternal autonomy	4.9 ± 2.0	5.6 ± 1.9	1.16 (1.07, 1.25)[3]	5.2 ± 1.9	5.9 ± 1.9	1.08 (1.01, 1.15)[1]	5.2 ± 2.0	5.8 ± 1.9	1.11 (1.04, 1.19)
Gravidae									
< 2				202 (21.9)	283 (49.1)	1 (reference)	214 (23.9)	271 (44.8)	1 (reference)
> 3				721 (78.1)	293 (50.9)	0.48 (0.36, 0.63)[3]	680 (76.1)	334 (55.2)	0.64 (0.48, 0.85)[2]
ANC utilization									
No				232 (25.1)	35 (6.1)	1 (reference)	229 (25.6)	38 (6.3)	1 (reference)
Yes				691 (74.9)	541 (93.9)	4.23 (2.82, 6.34)[3]	665 (74.4)	567 (93.7)	4.88 (3.29, 7.24)[3]
Age at first marriage									
< 17							672 (63.2)	131 (46.1)	1 (reference)
≥ 17							392 (36.8)	153 (53.9)	1.64 (1.22, 2.20)[2]
Under-5 children							1.8 ± 0.9	1.6 ± 0.8	0.82 (0.68, 0.99)[2]
HEW visits for FP									
							476 (44.7)	101 (35.6)	1 (reference)
							588 (55.3)	183 (64.4)	1.34 (0.97, 1.84)
Delivery service use									
							688 (64.7)	123 (43.3)	1 (reference)
							376 (35.3)	161 (56.7)	1.40 (1.02, 1.91)[1]
Knowledge about FP							1.9 ± 1.5	2.9 ± 1.3	1.45 (1.30, 1.61)[3]

[1]*p* value < 0.05, [2]*p* value < 0.01, [3]*p* value < 0.001

*Adjusted for religion, ethnicity, maternal age, partner age, partner education, marital status, desire for future pregnancy, ever had pregnancy-related complications, ever had history of abortion, knowledge about danger sign and perceived pregnancy-related risk

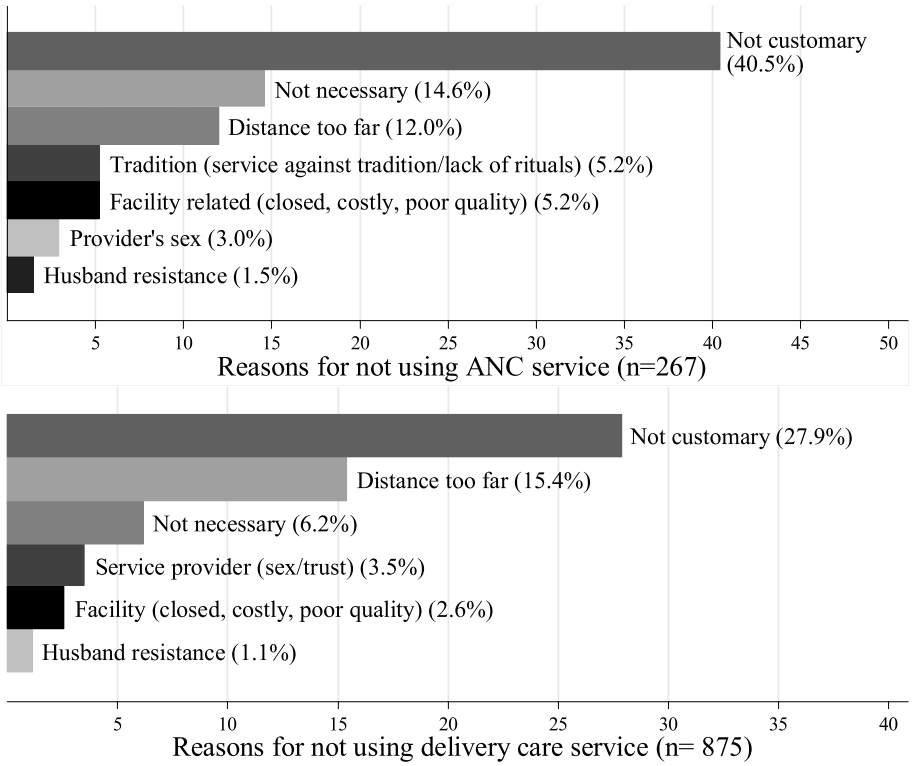

Fig. 1 Reasons for not using ANC and delivery care services among women living in pastoralist regions, Ethiopia, 2016

FP (*AOR* = 2.35, 95% *CI* 1.56, 3.54) were positively associated with ANC utilization. In contrast, older women (*AOR* = 0.64, 95% *CI* = 0.46, 0.90) and women living in food-insecure HH (*AOR* = 0.97, 95% *CI* 0.95, 0.99) were less likely to use ANC (Table 3).

Factor associated with delivery care

The most commonly cited reason (27.9%) for not using delivery care services was that facility-based delivery was not their custom, followed by distance was too far (15.4%) (Fig. 1). Factors positively associated with delivery care utilization include secondary education (*AOR* = 3.40, 95% *CI* 2.16, 5.34), highest income (*AOR* = 2.18, 95% *CI* 1.55, 3.07), previous use of ANC services (*AOR* = 4.23, 95% *CI* 2.82, 6.34), women's autonomy (*AOR* = 1.08, 95% *CI* 1.01, 1.15) and good knowledge of DC (*AOR* = 1.78, 95% *CI* 1.21, 2.60) (Table 2). In contrast, older women (*AOR* = 0.45, 95% *CI* 0.32, 0.63) and more gravidae (> 3) (*AOR* = 0.48, 95% *CI* 0.36, 0.63) were less likely to use delivery care services (Table 3).

Qualitative findings

Barriers for family planning/modern contraceptive use

Lack of awareness, misconceptions and perceptions In this study, we found that pastoralist women had little awareness about family planning (FP) and there are also misconceptions related to the modern contraceptive method use. As one of the informants said: "Generally, awareness about contraceptives methods is low among women in our communities. A few women knew different types of contraceptives methods mainly injectable, pills and implants" [in-depth interview, Gorodola]. Such awareness was also influenced by poor perceptions, myths and misconceptions about contraceptives. For instance, one of the respondents mentioned that: "They perceived that contraceptive are not suitable for 'busy women' like them" [in-depth interview, Dhas]. Some also associate the nature of pastoralist lifestyles and diet quality as one of the reasons for not using contraceptive methods. In one of the FGDs, a woman said that "Women need to eat good and enough food and should not do heavy loaded activities like fetching water from long distances if she uses contraceptives. Contraceptive is not suitable for us[women in pastoralists] since our life style is demanding" [FGD with mothers, Gorodola].

Looking for respect and love Most of our discussants believed that having a large number of children cherished them respect and love from their partners. "Most women in the community aren't ready to limit the number of children. They want to have as many children as they can because they think that the more children they

have, the better their husbands love them and more stable their marriage will be" [KII, Dhas].

Husband disapproval Spouses disapprove of using such services and using. Some women hide the use of contraceptives from their husband. One of the reasons is fear of husband betrayal or divorce,

"The women are not confident to use FP due to the fear of confidentiality. If their husband learned that his wife uses any modern contraceptive, he may betray and proposes to divorce". [in-depth interview, Gorodola].

"Everything is in the hands of 'waaqa'/God" According to the respondents, fertility is a blessing and sterility is a curse. If a married woman did not have a child, her neighbours and relatives may label her as "Hasidaa" (*meaning barren or infertile cursed women. Therefore, she needs reconciliation with God through practising some rituals*).

"Everything is in the hands of Rabi/God", one of the FGD participants explained [FGD with women, Dhas]. "He (God) who creates human being has everything to feed and grow. We perceive those human beings are born not only with mouth to eat, but also with hands to work" [FGD with their husband, Gorodola]. They repeatedly mentioned: *Waaqni keenyas hori, faca'i, balladhu jetti* which literally means "Our God says may you reproduce, expand and fill the land". One of the mothers also said *Yoo mammaakan Afaan sooraaf uume waan keessa kaa'u Rabbitu beeka* [He (God) who created the mouth, knows what to put in.] [FGD with mothers, Gorodola].

Large family as a "survival strategy" and means of economic security According to the respondents, having more children is not an end by itself but a means for household economy and family security. Children contribute to the economic activities of the family/households: "If one keeps cattle, the others keep camel, goats and sheep and others also help on household activities like fetching water". [FGD with women, Gorodola].

Large family as a protection from enemies A large family is also perceived as a means to secure protections from enemies. One of our respondents said that "Children are valued as sources of social security, peace keeper and fighters for their communities in times of difficulties such as conflicts" [in-depth interview, Dhas].

Therefore, a large family size is perceived to provide the needed security in a community which is prone to conflicts. One of the participants said: "Having many children was considered as the source of social respect. Enemies cannot easily attack those large families" [FGD with their husbands, Gorodola].

Past experiences One of the barriers to the use of modern contraceptive methods is the rumours which hover around the communities by previous users. They sometimes associated menstrual irregularities to contraceptive use. "There were women who suffered from continuous bleeding and menstrual irregularities. They fear that the same fate may happen to them" [KII, Gorodola].

Health system factors Although contraceptive methods are available in health facilities and provided for free, most women do not use contraceptive methods due to a lack of professionalism and ethics among health care workers. It discourages the mothers to use contraceptive methods. "Whenever women reported perceived pain or discomfort associated with the use (e.g., Implanon) and came here to remove it, the health professionals were not willing to do so. Instead, they belittle, insult and sometimes beat them". [KII, Gorodola].

Reasons for not using ANC services

Lack of knowledge and awareness Some pastoralist women do not use ANC follow-up because they lack awareness about the service and its importance.

> Most of the women do not have awareness about ANC [in-depth interview, Gorodola].

Household division of labour/chores Women mainly give priority to look after their children and family members at the cost of their health. One discussant said:

> Most women are busy with household activities such as cooking, feeding, cleaning and caring for family members. Hence, they have no time to attend the awareness creation meetings organized by the health extension workers. [FGD with women, Gorodola].

Husband disapproval and disinterest In this study, husband's lack of interest and willingness to support attending ANC was repeatedly mentioned by women during their discussion:

> Some husbands consider that there is no need for their wives to visit health care providers under normal circumstance or without health complications. [FGD with women, Gorodola].

Community beliefs and perceptions In this study, there is a widely accepted social belief among the communities that "pregnancy is not a sickness" and hence

there is no need for a woman to visit health institutions under normal circumstance. For example, one of the discussants uttered "only sick people visit health facilities". [FGD with women, Gorodola].

Beliefs that "God has determined destiny" It is believed that God, who creates the womb, protects it from any damage and thus it is better to pray to him. One of the discussants said that "They (the health professionals) are not God. They cannot create or save our lives as that is already determined by God. So, why do we long for their support? Above all, it is better to surrender oneself to the Almighty than bothering too much". [FGD with women, Gorodola].

Women's decision-making power Women's autonomy to use health care services is also one of the major determinants. Culturally, a woman has limited power to decide on aspects of family life. Without her husband's approval, she cannot go anywhere, even to buy necessary materials for birth preparedness.

Lack of supplies such as drugs and equipment One of the most frequently mentioned issues that limit women's ANC follow-up is the absence of drugs in health facilities. Most women complained that they "only get prescriptions" from the health facilities. Hence, they think visiting the health institution for ANC is "just wastage of time". "If we do not get what we want, why do we go there (health centers) … we prefer to go to the private clinics than simply wasting time at health centers". [FGD, with women, Gorodola].

Health professionals' lack of ethics and cultural competency skills The other issue repeatedly mentioned as barriers to pregnant women is that some health professionals were not welcoming. "The language" they use was offensive and they were not respectful and compassionate. Hence, most women said that it is "better to stay at their homes instead of being humiliated and mistreated by the health professionals". [FGD with women, Dhas].

Providers do not give women a chance to ask questions and get clarifications. Rather, they simply told the women what to do.

> The health professionals in health centers often belittle and shout at clients especially women from the rural areas. [KII, Dhas].

Transportation Most of the women claimed their inability to afford transportation cost: Even if some women are interested to go for ANC, the centres are too far. It is very difficult for them to travel such a long distance on foot.

Reasons for not using health facility delivery

Lack of awareness and misconceptions Women do not use delivery services for various reasons. One of the reasons that emerged in this study was the lack of information. One of the KIIs said that "they have not got adequate information on the benefits of delivery care". Even if they have got awareness, "some women also fear that they may get injured if they deliver at a health center". Delivery at health centres is a last resort only after they tried at home by traditional birth attendants.

Past experience In this study, we found that negative experience of a child's or woman's death results in poor utilization of the services. "The health professional cut and removed the child's umbilical cord inappropriately resulting in death of the baby". Such rumours were widely circulated in the community and they develop fear to go to a health centre for delivery.

Taboo of "Don't show private parts" to male A woman feels ashamed of showing her private parts to male health care providers during delivery. Culturally, it is not allowed to expose their bodies including reproductive parts to someone (health care providers) they did not know before and who is younger than their age. They are comfortable only with significant others such as their mother, close friends, relatives and the husband.

Less involvement of significant others Even though women preferred their partners/relatives to stay with them during delivery, health professionals do not allow their significant others to stay in the delivery room. Furthermore, assisting the birth in a group is strange for them and shameful, according to their culture: "On the contrary, they (the health professionals) came in group and attend the birth process and see woman's private part which is very shameful". [FGD with women, Dhas].

Birth positions Most women were not comfortable with horizontal delivery positions. They preferred kneeling, squatting and sitting on bed during labour than lithotomy position. One of the discussants raised this issue as "Women dislike such kind of delivery positions which expose their private body part to strangers ("the health care professionals") particularly, males and those they do not know before" [FGD with women, Gorodola].

Health care professionals' gender preference Women repeatedly mentioned that they prefer to be assisted by a female than a male health care worker. It is a shame for them to be seen "naked" by male health care providers.

> They repeatedly told us they would prefer to be assisted by female health care workers. [KII, interview, Dhas]

Husband involvement — past experience as a frame of "reference" "…Nothing is new with my wife, why should I take her?", asked one of the discussants during the group discussion. Most of the participants argued that their mothers and grandmothers never had attended antenatal care or delivery care. Thus, most husbands prefer home in the same *way their grandmothers and their mothers* used to. "They perceive that may expose the mother and the infant to various health risks".

Misconception of health risks The community perceives that delivery at health center expose the mother as well as the newly born infant to risks. According to their norms, a newly delivered woman should stay at home for at least three months with her child. In contrast, the health centers discharged the mothers within short period of time. [in-depth interview, Dhas].

Belief on labour: Concepts and its process (norms) According to the norms, even her husband should not hear the voice of his wife while she is in labour. For instance, there is a traditional saying, *Manni moggaa si hindhaga'in* which means "May your neighbor never hear your voice during your labour". *Siree ati irra ciiftu illee sihin dhaga'in* which means "May even your bed never hear your voice", i.e. the woman should hold the pain while she is in labour. They said *Ciiniinsuun hin lallabamtu*, which literary means "We don't shout louder on labour". They also said, "There is no pain more than this in any of one's life. If she fails to hold it, it means she is not courageous". During the discussion, in some contexts, the birth process is a "sign of bravery or endurance" if a woman kept silent while giving birth. Shouting or crying was described as "Weakness".

Cultural practices Failures of the modern health care institutions to be responsive to their cultural needs were repeatedly mentioned as the main reasons why they do not use the services. Most of these practices were not practised or accommodated at the health facility level, hence discouraging women from using delivery care services. The cultural practices include:

- *Okolee uuluu* and *ittittuu obaasuu* to increase inter-abdominal pressure, to ease delivery process and to expel the placenta.
- *Gubbifachuu* was *practised* right after the birth of the baby. Her husband should tie pieces (called *samaxee*) of sheets of clothes on his head to notify the locals that his wife gave birth. It is a sign of respect that must be practised within the first 3 days of delivery. However, if a woman delivered at a health facility, they would miss this practice and the child is said to miss respect from the community when he/she grew up.
- *Arguugaa eelmachuu* (literally mean milking a cow): This cultural practice lets the father to milk a cow for three consecutive days. It is a sign of blessing and wishes for the new baby to have more wealth when he/she grows up.
- *Eerbee Fannisuu* (waving animal skin): Following the delivery of a baby boy, there is a culture of flagging/waving the animal "skin/hide" in front of their door. It is a sign that showed the birth to a "baby boy". In so doing, it guides neighbours, families and relatives to choose the special saying/songs they should sing while congratulating the mother and the family.
- *Ayyaana dabarsuu* (transversion of the spirit): According to Borana's culture, the community take into account the day, time and condition at which the baby was born and define the baby's *Ayyaana* (the spirit) as *Ayyaana bitaafi Mirgaa* (the spirit of right and the spirit of left). If the baby's spirit (*Ayyaana*) is categorized under *Ayyaana bitaa* (the spirit of left), the family is expected to go to *Ayyaana Hedduu/Lakkooftuu* (fortune tellers) to transverse into *Ayyaana Mirgaa* (the spirits of rights). Otherwise, it is believed that the child's fate and destiny will be complicated.
- *Hidhaa buufachuu* (easing ties): When labour starts, her husband should unfasten his tie and belts and wear a towel (*fooxaa marxifachuu qaba*) as well as loosen any other tied materials in the house (*Waantoota qadaaddii ykn kiddoo qaban/waantoota hidhamanii mana keessa jiran mara bubuqqisuu ykn hiikuu*, i.e. when the labour starts, all tied/closed things/materials in the household must be opened). They associate this with helping women get relief from their labour pain and being made comfortable, and shorten the labour duration
- *Dhadhaa dibuu* ("Butter on abdomen"). When contractions reach its peak, her husband is expected to put butter on her abdomen. This is believed to relieve her pain and shorten the contractions.
- *Obbaatii Marsachuu*: The community perceives that the placenta is the main part of the foetus. Without it, the baby never exists so it should be respected and buried under *Sunsuma* and not to be burned and/or given to dogs. This is reflected by the communities' saying *Kun sareef mucaa darbachuu jecchuu dha*, which means "throwing the placenta is

like giving our baby to dogs". They perceive that the child may abandon his family if the placenta is not buried according to their cultural practices.

Lack of transportation One of the main reasons FGD participants repeatedly raised for low delivery care uptake by respondents was the lack of transportation or ambulance services.

"There was only one ambulance for the 22 kebeles. These kebeles are very far away from each other and even far from the health centers up to 60 kms". One ambulance is not enough given the size of our *woredas*, within a 100-km radius. Second, the way in which ambulances are giving the service was difficult. Moreover, the absence of transportation services between their living place and health centres

"…. they were afraid of both the cost and lack of transportation after delivery. These women come to health centers by ambulance but were forced to take a motorbike or "Bajaj", a three-wheel drive at high price (200-300 birr) which was not affordable" [in-depth interview, Gorodola).

Lack of ethics and professionalism among health workers Some health care workers insult and even slap women while on labour. "They humiliate and treat us like animal. We need delivery at health centers only as the last resort. We prefer our home where our relatives and friends encourage and help us with humble heart, where we deliver with respect". More importantly, some of them were culturally incompetent, use languages that are sensitive and women found intolerable or unacceptable.

Inaccessibility of service and infrastructures According to key informants, a myriad of factors such as lack of blood transfusion and neonatal unit, limited delivery couches in health facilities, the lack of linen for the couches, the absence of light and space for attendants and medication were influencing delivery-seeking behaviours of women. Most of the community members did not have a mobile phone to call for services; those who have mobile even do not have access to power to charge their battery. The absence of medications in the health centres was another factor affecting the use of delivery services. Most of the time, women were referred to private clinics to buy medicine outside.

Role of community health workers Community health extension workers were supposed to stay in contact with communities for more than 75% of their working time. However, pastoralist women reported that they had less contact with HEWs: "The health extension workers and other health professionals have not done adequate effort to raise the awareness of women on these issues" [KII, Gorodola].

System dynamic analysis

Unlike the traditional epidemiologic approaches that have focused on isolating the causal health effect of a single factor, we assumed pastoralism and health care system by their own are complex systems. Thus, the focus of our understanding about why poor maternal health care service use should take the function of both systems as a whole. The main aim of the system dynamic analysis was to offer a practical way to understand the inter-related parts and the cause-effect linkages for the low utilization of RMNH services and explain the mechanisms within complex systems which include the relationships, dynamics and delays associated with the variables that generate them. That is, the effect of a single factor may depend on the state of other factors in the system and be affected by feedback loops and dependencies. Understanding fundamental relationships is also essential for identifying appropriate intervention points to address these factors and for anticipating the potential impact a new programme will have when introduced into a pastoralist community. Accordingly, we have identified three balancing loops: (B1) health care delivery approaches, (B2) the role of past experiences and (B3) population factors. For instance, lack of health care workers' skills and cultural competencies could influence the perceived quality of care in a health care institution resulting in low RMNH service use. Past experiences of the mothers influence their attitude towards male health care providers resulting in poor satisfaction and promote low RMNH service use. Regarding the reinforcing loops, we have, for instance, shown how religion influence positively their social norms and the social norms also influence individual perceived norm/attitudes resulting in poor RMNH service utilization (R1). The effect of distal factors in contributing to low RMNH service use is also shown (R2). Most of the distal determinants could take some time. For instance, the more educated the mother is, the higher she uses the RMNH services. However, educating a mother through formal education may take more than a decade. An increase in awareness of these mothers about RMNH could improve the service use, but the motives to know something are highly influenced by their perceived social norms (see Fig. 2).

Discussion

This study explored the structural and proximal determinants of RMNH service use among pastoral communities of Ethiopia using systems theory. Understanding

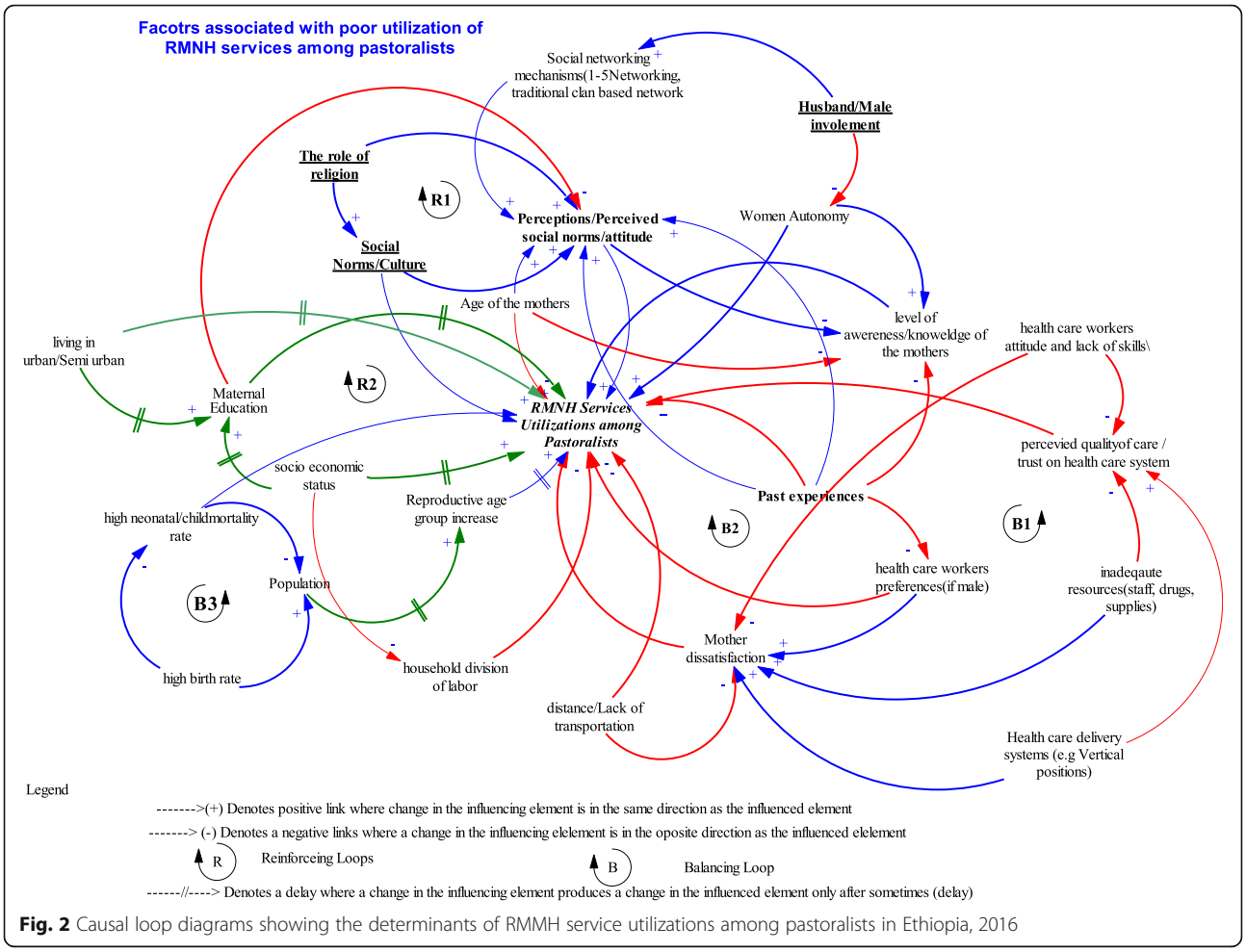

Fig. 2 Causal loop diagrams showing the determinants of RMMH service utilizations among pastoralists in Ethiopia, 2016

factors influencing decisions about the use of RMNH services from broader perspectives helps to explain why pastoralist women continue to stay at home during their pregnancy, delivery and post-natal period, and this information can be used to inform the development of policies and programmes tailored to this challenging environment in more holistic ways than looking into simple mechanistic parts, thereby improving the RMNH of pastoralist communities. Although it is a powerful tool, the application of systems thinking at a broader level of Ethiopia's health system in general and pastoralists' health care remains untouched.

Many studies suggest that most maternal deaths and pregnancy-related complications can be prevented if pregnant women have access to good quality maternal health services, which include modern contraceptive use, focused ANC, care during delivery and immediate post-natal follow-up (Ronsmans, Graham, and group 2006). In this study, 20.6% of women had used contraceptive methods and the reasons why pastoralist women did not use modern contraceptive methods were associated with factors at individual, community and health system levels. For instance, distal factors were predominantly associated with utilization of RMNH services, i.e. education, higher income, younger age, urban residence or living near health facilities were the major determinants positively affecting the use of contraceptives. In addition, proximate determinants of contraceptive use such as attitude, knowledge and household food insecurity were among factors associated with low utilization of contraceptive use. The burden on women for household's activities also played a role in determining contraceptive use. More importantly, cultural and religious metaphor is the frame of reference for a woman to view the modern health care systems and her life, thus affecting her motivation to use or avoid not only contraceptives but also other RMNH services. Similar studies in Ethiopia have also indicated cultural and religious factors are the main reasons why women do not use modern contraceptive methods.

In this study, we found men/husbands are very influential in intra-household decision-making and in explaining maternal health care-seeking behaviour. Similar studies in Ethiopia showed that male involvement is

crucial in promoting modern contraceptive use. Therefore, whether the philosophical/strategic approaches of "pastoralism and development" or "development for pastoralism" is true, considering their development as a "best contraceptive" might work. To increase demand for and improve access to maternity services, the Ministry of Health has been providing maternal and child health services including ANC check-ups from the health system extended up to the community level through the Health Extension Program (HEP). However, utilization of ANC services remains very low by pastoralist women in Ethiopia. In contrast to previous studies, we found a high proportion of women had attended at least the recommended ANC visits. This could be due to the new structural enforcement interventions by the government which encourages a woman to go to the health institution for ANC and DC. However, whether the implementation of conventional HEP could fit to the context of the pastoralist population and acceptance of HEWs by the pastoralist community needs further investigation. On the other hand, despite continuous support by the government and developmental partners to improve access to RMNH services, pastoralist women continued to give birth at home attended by family members or traditional birth attendants (TBAs) and only resort to formal health care services in the event of complications, often when it is too late. These seem to be due to a range of factors such as living in a remote area, the need for cultural practices, perceived or actual low quality of services and values and expectations. Many women in sub-Saharan Africa do not receive skilled health care during pregnancy and delivery, with a large proportion delivering at home assisted by TBAs (Kedir 2014) (Tarekegn et al. 2014). Similarly, we found pastoralist women prefer to be assisted by traditional birth attendants due to the importance of cultural practices they are accustomed to during the birth process.

In this study, there are underlying barriers such as living in a remote area, lack of transport and provider's lack of cultural competency skills that influence the use of maternal health care services. Similar studies from sub-Saharan Africa also revealed women are prevented from obtaining quality of health care because of distance from health facilities, poor roads, lack of transport, poverty, cultural practices, lack of information and poor quality health services (Birmeta et al. 2013) (Jackson et al. 2017) (Biza and Mohammed 2016; Zepro and Ahmed 2016). Furthermore, social networks and cultural norms have played a significant role in creating a "paradigm" of "their known truth" within communities. In addition, proximate determinants such as attitude, values, perceptions and past experiences are the driving factors affecting the use of RMNH services. Although lack of awareness and misconceptions have been raised several times, the point of reference to know about something is highly influenced by their attitude, value expectations and perception and past experiences. We strongly argue that pastoralism and its health care systems need to be seen "as complex adaptive systems". We cannot separate the demand side "barriers" by ignoring health system-related factors (supply side) such as lack of adequate supplies and equipment and providers' skills and attitudes which also send "feedback" to the users/communities that could deter them from seeking the proposed RMNH care. For instance, the cultural competency of health care professionals needs reinvestigation. This includes understanding pastoralism by itself and integration of their culture into modern health care systems. Lack of skills, drugs and supplies in health facilities have further exacerbated the problems. Lastly, we found women's preference for delivery positions are of the traditional type such as squatting, kneeling and sitting. These delivery positions are also favoured by more progressive, "women-friendly" delivery care services as they would have been shown to aid natural delivery. Conversely, health facilities tend to favour horizontal lithotomy position, instead of allowing women to move around and choose their own position. The main reasons for the women not wanting to be in a lithotomy position were largely associated with taboos of being "naked", showing "private" parts. There is scant information on the effect of vertical delivery mode on the maternal health and birth outcomes in Ethiopia. Future studies can explore and compare the benefits of different delivery positions, examine their acceptability and design and evaluate alternatives of integrating such services to better accommodate the delivery needs of pastoralist women. This study also shed light on the importance of stability and how conflict is affecting pastoralist health and access to health care services.

This study has its own strength and limitations. The use of large samples, intensive training of data collectors, employing standard procedures to reduce bias and use multiple data collection methods were some of the strengths of the study. The study also used a participatory ethnographic method—PEER, which is, to the best of our knowledge, the first study to explore RMNH service use among pastoralists in Ethiopia using PEER. Furthermore, the study's mixed methods design including systems dynamic analysis that allowed us to explore underlying factors in the use of RMNH services from different perspectives and to examine their complex interplay. However, our study has some limitations. First, we might over-estimate the magnitude of contraceptive, ANC and DC use as compared to previous studies. These differences might be due to the interviewer or social desirability bias or survey interval duration where we asked delivery practices over the last 5 years compared to

other studies which asked within the last 12 or 24 months. Ethiopia's government massive community mobilization and structural law enforcement which obliged women to deliver at the health facility and if not punish them about 500 (~25USD) Birr by then might also play some role. Second, since the transcription and translation of audio was made by more than two individuals, the process of translation and transcription of qualitative data into English may have resulted in distortion of the original meaning. Third, although we trained lay researchers and supervise them, the quality of data collected by some of the PEER researchers seems of "a collection of facts" than the real problem analysis. We tried to analyse the difference in contradictions by comparing different discourse of different people with their own social network. Therefore, to improve the RMNH service use among pastoralist women, we suggest targeting the social determinants of health could play a vital role. We provide the general framework that might be considered as an entry to conceptualize what works for pastoralist communities (Fig. 3).

Conclusion and recommendations

This study showed socio-demographic characteristics, cultural practices, beliefs and health system-related factors considerably influence the utilization of RMNH services. The causes are multi-factorial and layered at different levels. In a nutshell, we identified barriers and facilitators for maternal health care service utilizations among pastoralist women. These include (a) micro-level factors which include women's perceptions, knowledge and values; (b) meso-level factors which operates largely at the *community level* such as socio-cultural ecology and norms, values, practices and beliefs, gender roles, preference for delivery positions and husband and significant others' approval; and (c) *macro-level factors* which include peace and security, conflicts, education level, economic hardship, long travel distance to the health posts/centres, difficult topography and climate, providers' lack of cultural competency skills, absence of cultural practices at health facilities, poor attitudes of health care workers and male health care workers' assistance for delivery discouraged women members from utilizing *health care services.* In addition, the costs of transportation play crucial roles. These identified factors can inform policy-makers and programme implementers to adopt socially and culturally appropriate interventions that can improve RMNH service use and thus contribute to the reduction of maternal and neonatal mortality and morbidity among pastoralist communities in Ethiopia. Our findings show the importance of considering comprehensive approaches towards the whole system rather than reductionist approaches. Interventions aiming to improve pastoralist health care delivery systems shall be responsive to societal needs, and the role of political ecology and human agency needs proper attentions. More importantly,

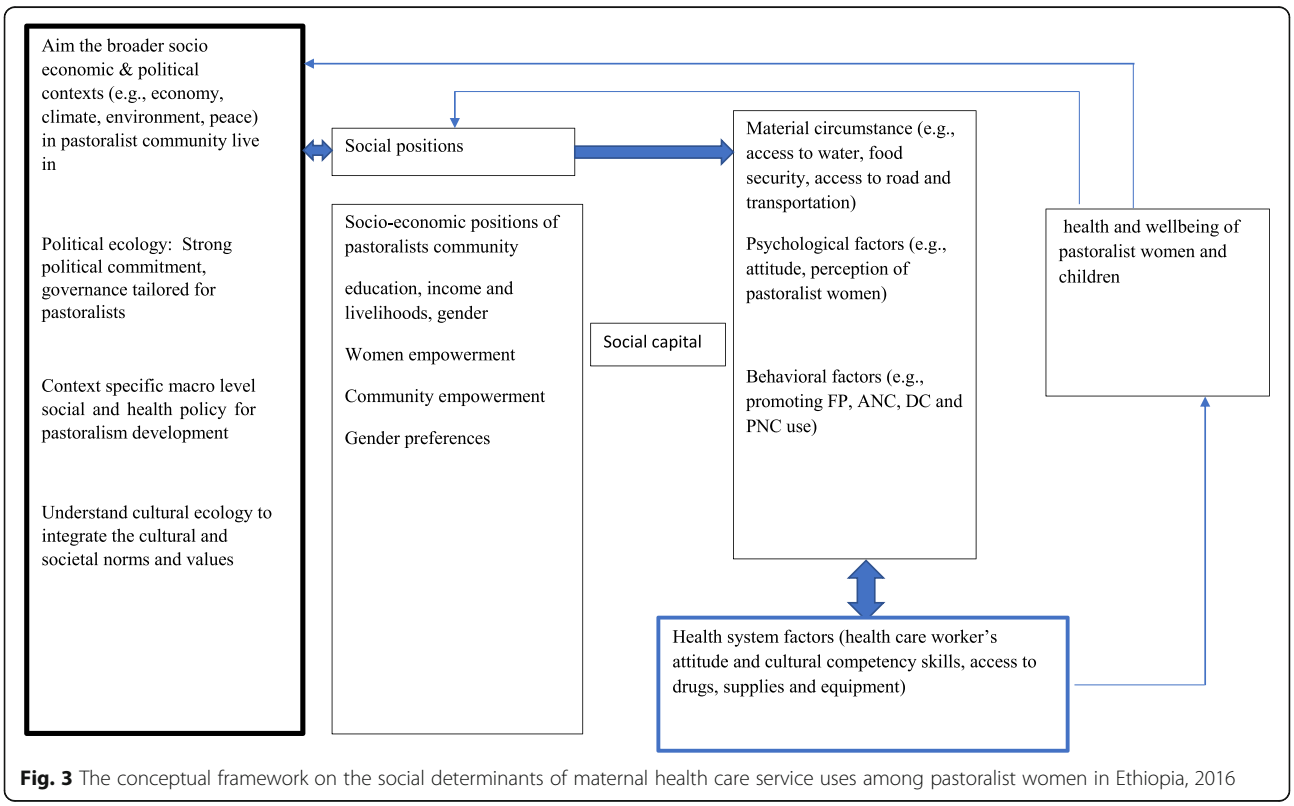

Fig. 3 The conceptual framework on the social determinants of maternal health care service uses among pastoralist women in Ethiopia, 2016

community-based interventions tackling barriers at the individual level, cultural ecology at the community level and simultaneously working on improving on health care system factors such as improving health care workers' attitudes and their cultural competency skills are crucial. Finally, designing culturally relevant strategic communication is highly recommended.

Abbreviations

AOR: Adjusted odds ratio; ANC: Antenatal care; CLD: Causal loop diagram; DC: Delivery care; DSM: System dynamic modelling; FGD: Focus group discussion; HEP: Health Extension Program; HEWs: Health extension workers; RMNH: Reproductive Maternal Neonatal Health; KII: Key informant interview; PEER: Participatory Ethnography Evaluation Research; TBAs: Traditional birth attendants

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13570-022-00236-6.

Additional file 1: Supplementary Table 1. Summary of findings from previous studies, maternal health care services use among pastoralists women in Ethiopia

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Authors' contributions

MGJ, KT, SB, RJ and GA participated in the conceptualization of research idea, method design, data analysis, validation, supervision, fund acquisition and project administration, review and editing; MTE, AT, YA, YK, AH, MD, BAB, EA, ChT, MY and GM reviewed the manuscripts and gave feedbacks. The authors read and approved the final manuscript.

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Availability of data and materials

The datasets used during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Ethical Review Board of the Institute of Health, Jimma University. Informed verbal consent was obtained from the women after explaining the aims of the survey, benefits, harms and their right to decline and withdraw from the study.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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References

Assefa, Yibeltal, Yalemzewod Assefa Gelaw, Peter S. Hill, Belaynew Wassie Taye, and Wim Van Damme. 2019. Community health extension program of Ethiopia, 2003–2018: Successes and challenges toward universal coverage for primary healthcare services. *Globalization and Health* 15 (1): 1–11.

Belda, Semere Sileshi, Mekonnen Tegegne Haile, Abulie Takele Melku, and Abdurehaman Kalu Tololu. 2017. Modern contraceptive utilization and associated factors among married pastoralist women in Bale eco-region, Bale Zone, South East Ethiopia. *BMC Health Services Research* 17 (1): 1–12.

Birmeta, Kidist, Yohannes Dibaba, and Desalegn Woldeyohannes. 2013. Determinants of maternal health care utilization in Holeta town, Central Ethiopia. *BMC Health Services Research* 13 (1): 1–10.

Biza, Nejimu, and Hussein Mohammed. 2016. Pastoralism and antenatal care service utilization in Dubti district, Afar, Ethiopia, 2015: A cross-sectional study. *Pastoralism* 6 (1): 1–7.

Catley, Andy, and Alula Iyasu. 2010. Moving up or moving out? A rapid livelihood and conflict analysis in Mieso-Mulu Woreda, Shinile Zone, Somali Region, Ethiopia. Feinstein International Centre, Tufts University Addis Ababa and Mercy Corps, Addis Ababa. https://fic.tufts.edu/assets/moving-up.pdf. Accessed 10 Nov 2021.

Elemo, Ibrahim Amae. 2006. *Socio-cultural factors affecting sexual & reproductive health: The roles of traditional institutions among the Borana pastoralists of Oromiya*. Southern Ethiopia: Addis Ababa University.

Jackson, Ruth, Fisaha Haile Tesfay, Tesfay Gebregzabher Gebrehiwot, and Hagos Godefay. 2017. Factors that hinder or enable maternal health strategies to reduce delays in rural and pastoralist areas in Ethiopia. *Tropical Medicine & International Health* 22 (2): 148–160.

Kebede, Alemi, Kalkidan Hassen, and Aderajew Nigussie Teklehaymanot. 2016. Factors associated with institutional delivery service utilization in Ethiopia. *International Journal of Women's Health* 8: 463–475.

Kedir, Abbi M. 2014. Inclusive growth and inequalities in the context of structural transformation: Evidence from Ethiopia. *Development* 57 (3): 512–520.

King, Rosemary, Ruth Jackson, Elaine Dietsch, and Asseffa Hailemariam. 2015. Barriers and facilitators to accessing skilled birth attendants in Afar region, Ethiopia. *Midwifery* 31 (5): 540–546.

King, Rosey, Ruth Jackson, and Elaine Dietsch. 2013. *Researching maternal, neonatal and child health service use in rural and pastoralist Ethiopia: A key informant research approach*. Geelong: Alfred Deakin Research Institute, Deakin University.

Lansing, J. Stephen. 2003. Complex adaptive systems. *Annual Review of Anthropology* 32 (1): 183–204.

McAllister, R. R J, N. Abel, C. J. Stokes, and I. J. Gordon 2006. Australian pastoralists in time and space: the evolution of a complex adaptive system. *Ecology and Society* 11 (2): 41. http://www.ecologyandsociety.org/vol11/iss2/art41/.

McDougal, Lotus, Yamini Atmavilas, Katherine Hay, Jay G. Silverman, Usha K. Tarigopula, and Anita Raj. 2017. Making the continuum of care work for mothers and infants: Does gender equity matter? Findings from a quasi-experimental study in Bihar, India. *PLoS One* 12 (2): e0171002.

Memirie, Solomon Tessema, Stéphane Verguet, Ole F. Norheim, Carol Levin, and Kjell Arne Johansson. 2016. Inequalities in utilization of maternal and child health services in Ethiopia: The role of primary health care. *BMC Health Services Research* 16 (1): 1–8.

Onarheim, Kristine Husøy, Mieraf Taddesse, Ole Frithjof Norheim, Muna Abdullah, and Ingrid Miljeteig. 2015. Towards universal health coverage for reproductive health services in Ethiopia: Two policy recommendations. *International Journal for Equity in Health* 14 (1): 1–12.

Price, Neil, and Kirstan Hawkins. 2002. Researching sexual and reproductive behaviour: A peer ethnographic approach. *Social Science & Medicine* 55 (8): 1325–1336.
Rieger, Matthias, Natascha Wagner, Anagaw Mebratie, Getnet Alemu, and Arjun Bedi. 2019. The impact of the Ethiopian health extension program and health development army on maternal mortality: A synthetic control approach. *Social Science & Medicine* 232: 374–381.
Ronsmans, Carine, Wendy J. Graham, and Lancet Maternal Survival Series Steering Group. 2006. Maternal mortality: Who, when, where, and why. *The Lancet* 368 (9542): 1189–1200.
Rwashana, Agnes Semwanga, Sarah Nakubulwa, Margaret Nakakeeto-Kijjambu, and Taghreed Adam. 2014. Advancing the application of systems thinking in health: Understanding the dynamics of neonatal mortality in Uganda. *Health Research Policy and Systems* 12 (1): 1–14.
Tarekegn, Shegaw Mulu, Leslie Sue Lieberman, and Vincentas Giedraitis. 2014. Determinants of maternal health service utilization in Ethiopia: Analysis of the 2011 Ethiopian demographic and health survey. *BMC Pregnancy and Childbirth* 14 (1): 1–13.
Zepro, Nejimu Biza, and Ahmed Tahir Ahmed. 2016. Determinants of institutional delivery service utilization among pastorals of Liben zone, Somali Regional State, Ethiopia, 2015. *International Journal of Women's Health* 8: 705.

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