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Mobile health service as an alternative modality for hard-to-reach pastoralist communities of Afar and Somali regions in Ethiopia

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Abstract

Background Mobile Health Service (MHS) has been introduced as an alternative strategy to make health care services easily accessible in the Somali and Afar regions of Ethiopia to reach the mobile and hard-to-reach communities. However, the implementation status and effectiveness of the MHS program are not evaluated. Thus, this study aimed at exploring the dynamics and causes of poor health care utilization and implementation barriers and facilitators of MHS in the two regions, i.e. Somali and Afar regions of Ethiopia.

Methods This study employed the Reachness, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework to understand the health care services utilization in pastoralist settings. Furthermore, the study demonstrates the proposed MHS programme components and their challenges encountered during the implementation phase. The researchers collected data from eighteen key informants and eight focused group discussions (FGDs). The data were categorized, coded, entered, and analysed using the NVIVO version 11 software.

Results The results of this study revealed that health service coverage increased in the districts of Somali and Afar regions where MHS was implemented. According to the results of this study, MHS provision has also increased access to and utilization of health services in general and RMNCH services in particular. The study indicated that the MHS provided the following main health care services: family planning, nutrition supply, timely referral with free transportation, immunization, and treatment of malnourished children. The MHS programme is considered as an effective health service modality in pastoralist areas compared to other modalities. This is mainly because it provides health services following the footsteps of settlement and movement route of the community in search of grazing land and water. However, the study revealed that the MHS programme lacks guidelines for procedural adoption to implement it both at national and regional levels.

Conclusion The Mobile Health Service has been a useful and effective mechanism to deliver Reproductive, Maternal, Newborn and Child Health (RMNCH) and family planning (FP). Hence, it also facilitates nutrition services to hard-to-reach communities with limited or no health facilities in the targeted woredas of the Somali and Afar regions. Based

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on the findings, the study recommends the MHS needs to be institutionalized and owned by the government as an alternative health care service delivery modality.

Keywords Mobile Health Service, Pastoralists, Hard-to-reach, Health care, Implementation, Adoption Ethiopia

Introduction

Ethiopia demonstrated success in meeting the Millenium Development Goals (MDG) for health (Gammino et al. 2020). In line with this, the government of Ethiopia has recognized reproductive, maternal, newborn, and child health and nutrition (RMNCH) services as essential health services for improving maternal, neonatal, and child health (Federal Ministry of Health (FMoH). Essential Health Services Package of Ethiopia 2019. Addis Ababa 2019). Moreover, it has implemented a number of health programmes that support the disadvantaged segments of the population resulting in considerable improvements of maternal and child health services, such as health extension programme, health development army, and scale up of community-based health insurance schemes (Admasu et al. 2016). However, the literature shows there is still health disparity within and among regions of the country (Bobo et al. 2017). For instance, some regions in Ethiopia seem to be left behind in the progress towards achieving improvements in population health and child survival. Besides, many preventable deaths are still occurring in some parts of the country.

One of the precarious areas where death is still ongoing in Ethiopia is connected to mobile pastoralists. Mobile pastoralists are among the last populations to be reached by health services (Agency and (CSA) Ethiopia and ICF. 2016). The highland regions outperform in improving essential health services while pastoralist regions are lagging (Republic and of Ethiopia (FDRE). Pastoral development policy and strategy 2017; Federal Ministry of Health (FMoH). Health sector transformation plan 2015. Addis Ababa 2015). In order to narrow the disparity, the Federal Ministry of Health (FMOH) of Ethiopia gave priority to addressing inter- and intra-regional inequalities, with a focus on areas with pastoral population (Federal Ministry of Health (FMoH). Health sector transformation plan 2015. Addis Ababa 2015).

The aggravating reasons for the regional disparity in health services are complex and multifactorial. Both health service utilization and maternal and child health outcomes are influenced by distance to the nearest health facility from the location of residence (Memirie et al. 2016). Thus, the lack of access to health care due to geographic factors largely contributes to such inequity. For instance, physical health infrastructure coverage is 68% in the Somali region and 76% in the Afar region. Moreover, the universal health coverage (UHC) service capacity and access coverage were only 3.7% in the Somali region of Ethiopia (Eregata et al. 2019). The settlement pattern of Afar and Somali regions is characterized by sparse and scattered across the different woredas (an administrative division of Ethiopia, that is managed by a local government, usually labelled under the third level of the administrative divisions, i.e. after zones and the regional states) of the regions. Consequently, this often makes access to social services a difficult task. Mobility patterns coupled with the social determinants of health are among the equity factors influencing access to health care services (Republic and of Ethiopia (FDRE). Pastoral development policy and strategy 2017; Fedral Ministry of Health (FMoH). Realizing universal health coverage through primary health care: A roadmap for optimizing the n.d; Federal Ministry of Health (FMoH). National health equity strategic plan 2021). As a result, the neonatal mortality rates in the Somali and Afar regions of Ethiopia are high compared to the national and regional figures (Elmi Farah et al. 2018; Woday Tadesse et al. 2021).

In order to ensure equitable access and utilization of quality essential health services for all population segments is the main target of the Health Sector Transformation Plan (HSTP) (Federal Ministry of Health (FMoH). Health sector transformation plan 2015). Hence, the Ministry of Health (MoH) of Ethiopia is undertaking several initiatives to narrow the prevailing gaps on key health outcomes between pastoralist regions and national average. After the recognition of the first health sector transformation plan (HSTP-I 2016–2020) on the disparity, MoH developed the National Health Equity Strategic Plan to guide programmes. In addition, the programme excels to narrow health inequity and strengthen initiatives that had been started in the past (Federal Ministry of Health (FMoH). Health sector transformation plan 2015. Addis Ababa 2015; Federal Ministry of Health (FMoH). National health equity strategic plan 2021). In collaboration with different stakeholders, Afar, Somali, Gambella, and Benishangul Gumuz regional states were identified as candidates for interventions to bring equitable development by MoH. Since the health services could not reach the pastoralists (Wild et al. 2020), MHS should be available, accessible, and acceptable through tailored and culturally sensitive approaches to effectively address the needs of populations in these regions (Ali et al. 2019).

Mobile Health and Nutrition (MHN) service was first introduced by UNICEF in 2004 in the Somali region to respond to a dire need for nutrition and health services to internally displaced communities because of drought. It was later expanded to selected geographic locations in few districts of Afar regional state to address similar conditions. The 2015 evaluation report by UNICEF emphasized the relevance of mobile health services as a transitional alternative health care delivery strategy in the Afar and Somali regions (Wild et al. 2020; UNICEF 2015). The FMOH and other development partners have taken such MHS initiatives to address equity as one of the health service provision modalities for hard-to-reach communities (Fedral Ministry of Health (FMoH). Realizing universal health coverage through primary health care: A roadmap for optimizing the n.d). For instance, the USAID-funded Transform Health in Developing Regions has been implementing RMNCH-FP in Afar and Somali regional states since May 2017 to make comprehensive mobile services available to hard-to-reach communities (6) (*see the programme theory of change presented in* Fig. 1). In this paper, we report the dynamics and causes of poor health care utilization, programme reaches, efficacy, implementation barriers, and facilitators of MHS in the Afar and Somali regions. The findings will help to draw lessons and recommendations for future interventions in these regions and similar settings.

Methods

Study contexts

Ethiopia is one of the eastern African countries that hosts a considerable proportion of pastoral and semi-pastoral communities (Gammino et al. 2020). The pastoralists inhabit 60% of the country's landmass and contribute 12–15% of the national population count (Republic and of Ethiopia (FDRE). Pastoral development policy and strategy 2017). The Afar and Somali regional states host the majority of the pastoral communities. The people are settled dispersedly, with an average density of 15 p/km^2 and experience a degree of seasonal mobility. The low pastoralist population density coupled with occasional unpredicted mobility made it difficult for health service providers to fulfil the requirements for bringing service to the proximity of inhabitants (Gele et al. 2010). Though pure pastoralist life is waning, several factors are still causing the movement of the pastoral communities like drought, inter-communal conflicts, floods, and search for pasture and water (Gruen et al. 2002).

In order to conduct this study, the data was collected from the Afar and Somali regions by the African Medical & Research Foundation (AMREF) as part of its programme monitoring activity. Reports show that the two regions lag far behind in health services uptake compared to the national average (Agency and (CSA) Ethiopia and ICF 2016). According to the 2016 Ethiopia demographic and health survey, contraceptive prevalence rate is 2%

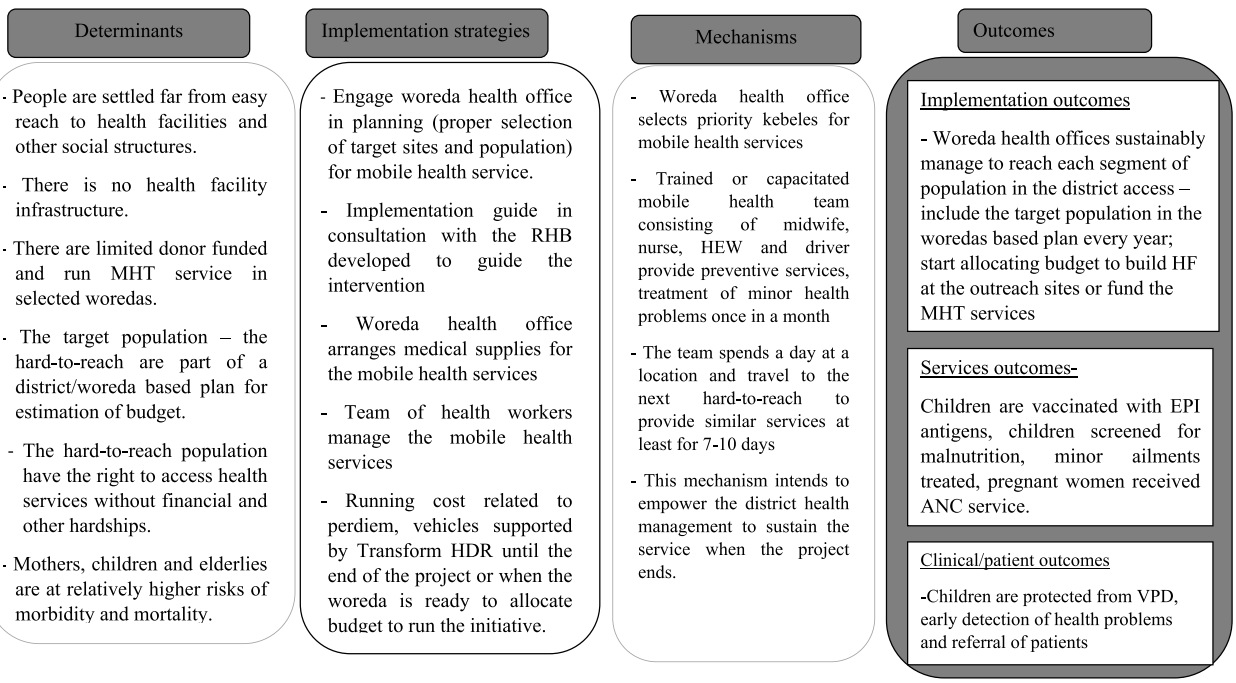

Fig. 1 Implementation research logic model of mobile health services interventions for hard-to-reach pastoralist communities in Ethiopia

in the Somali region, 11.6% in the Afar region, and 56% in Addis Ababa, and the national average is 36%. The percentage of women who received antenatal care four times from skilled providers was 20.6% in Afar, 11.8% in Somali, and 31.8% at a national level (Agency and (CSA) Ethiopia and ICF. 2016). A recent survey conducted by AMREF reported that 92% of women in zone 3 of the Afar regional state gave birth to their last child at home, and 90% of these home deliveries were attended by a traditional birth attendant (Yousuf et al. 2010) (Fig. 2).

Descriptions of the MHS interventions

USAID Transform health project was designed to implement high-impact quality RMNCH-FP services accessible both at health facility and community levels, complemented with health system strengthening activities. Informed by a Geographic Information System survey on 'Mobility and Settlement pattern', settlements/kebeles were identified jointly with respective woreda/district health offices. The mapping focused on health facilities, animal health services, water points, market centres, and mobility routes. The country office developed an implementation guideline with the participation of the regional teams. Discussion was held with the regional health office on the modality of the 'Mobile Health Service'—selection of woredas and priority kebeles within the woredas, service package (reproductive, maternal, neonatal, child health and nutrition services), service providing team (medical doctor, health officer, nurse, midwifery, pharmacist)—number and mix of professionals, logistic and supplies, respective responsibilities by implementers (regional health bureau—RHB, woreda/district health office—WoHO and health facilities, and Transform HDR). Finally, an agreement was reached to start the MHS in such a way that (a) the selected districts take responsibility to make available all the required supplies and human power and (b) Transform HDR project takes responsibility to cover the cost for per diem for the teams, make transportation available for the teams, and to organize need-based trainings.

The overall plan of establishing a mobile health outreach service was part of Transform HDR's service delivery modality to make RMNCH service accessible to women and children. In addition to the three woredas/

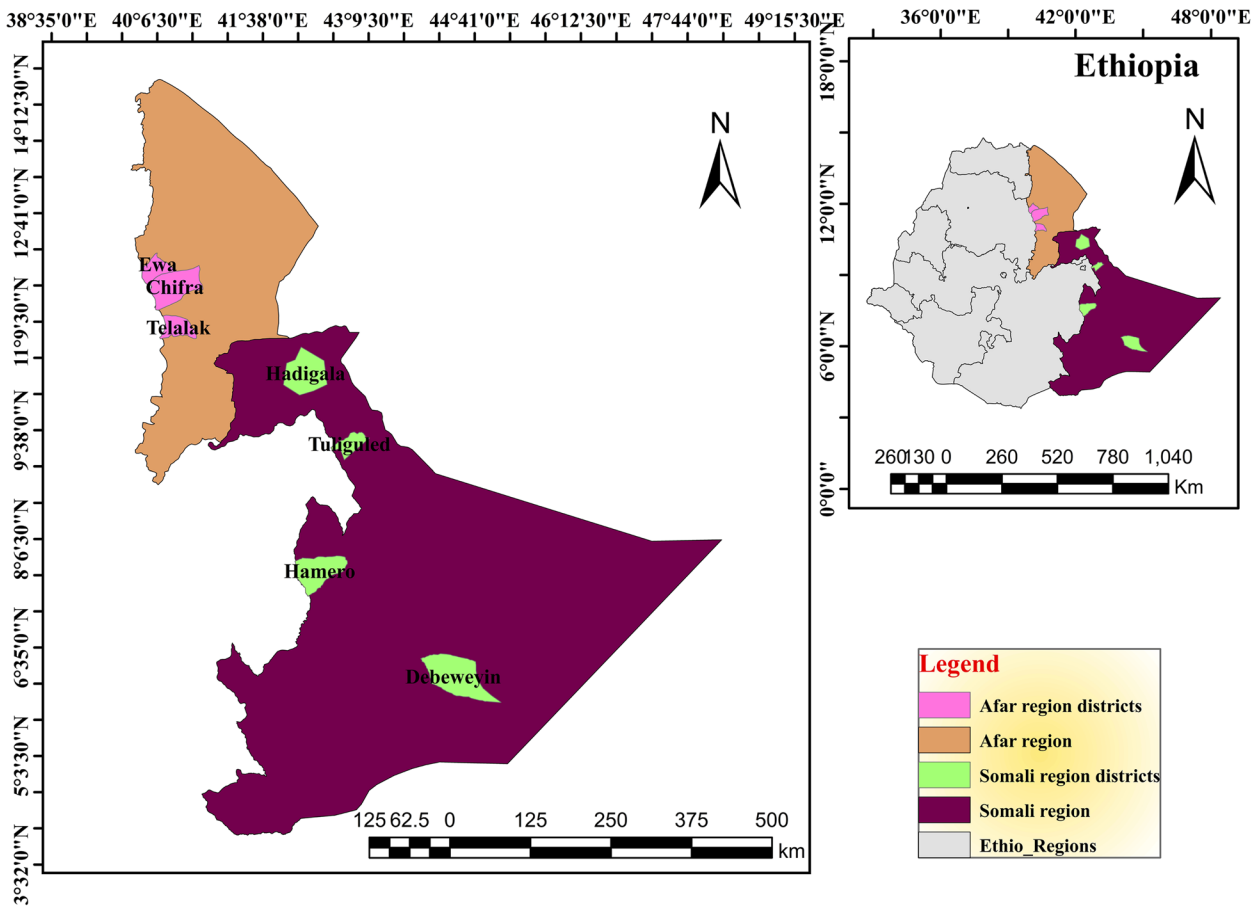

Fig. 2 Map of the study area

districts (Ewa, Chifra, and Telalak) selected from the Afar region in 2019 for the implementation of the project, four woredas/districts (Hadigala, Hamero, Debeweyin, and Tuliguled) were selected from the Somali region in 2021 in consultation with RHB. The purpose was to make comprehensive mobile health services available to most unreached kebeles. The service has a guideline for implementation with a supportive supervision checklist. The model is different from mobile health and nutrition services run by other implementation partners (IPs) like UNICEF. This model engaged the RHB and woreda/district health offices to facilitate ownership by making them responsible to avail drugs, vaccines, and other supplies while USAID Transform HDR provides logistics—vehicles and per diem for the mobile health team members. The service is delivered on a monthly basis to the study kebeles that are hard to reach and do not have health posts within reach. The team goes out for 7–10 days and sometimes extends their stay to 15 days to cover more kebeles. After each visit, the team produces a service delivery report to the district health office as well as to the Transform Health project.

Evaluation frameworks

This study was developed by analysing the data collected using a framework that allows to demonstrate the components and characteristics of the proposed MHS components and its implementation strategies. Factors influencing MHS implementation strategies (i.e., barriers and facilitators) and intended outcomes were explored during data collection and analysis. To this end, the RE-AIM framework's evaluation components and programme Reachness, Effectiveness, Adoption, Implementation, and Maintenance were employed.

In order to secure the quality evaluation components, it is effective to address some of the important terminologies, e.g. adoption, implementation, and maintenance. For instance, reach captures the people from a given population participating in a programme and describes the characteristics that refer to the positive and negative outcomes of the programme. Adoption is defined as the percentage of possible settings (e.g. organizations) and staff that have agreed to participate in the programme. Implementation is an indicator of the extent to which the programme was delivered as intended and its cost. Maintenance, at the individual level, reflects maintenance of the primary outcomes or the sustainability of the delivered programmes.

Evaluation design

The evaluation design employed a qualitative exploratory method using the RE-AIM framework. The data collection was conducted from April 1 to 30, 2022, and the data assisted to develop the current paper.

Data collectors and training

A total of seven data collectors were recruited to conduct the KII and FGD interviews. The data collectors were trained for 2 days on the data gathering tools and trained on how to conduct an interview and the entire interview sessions.

Qualitative data collection

The qualitative data at each district constitutes a total of 11 key informant interviews that used a semi-structured interview guide and 2 FGDs that used a discussion guide. Key informants include one RHBs RMNCH officer or director, two District Health Office Head and RMNCH officers, two mobile health care providers, two community leaders, two health extension workers, and two intervention implementing experts. Beneficiaries of the MHS (reproductive-age women) were invited for FGDs in each woreda of each of the two regions. Interviews were recorded and notes were taken during the process.

Data analysis

Because the study is purely qualitative, a thematic approach has been used for qualitative data analysis. The data were categorized as coded, entered, and analysed using the NVIVO version 11 software.

Ethics approval and consent to participate

Ethical clearance for the implementation of MHS and collection of data at various times for the purpose of monitoring and evaluation of the programme was obtained from the Federal Ministry of Health review board. We also obtained letters of research cooperation from RHBs of the Afar and Somali regions. Programme data collected as part of monitoring and evaluation was accessed with permission of the programme-leading institution (AMREF) to develop the current manuscript.

Operational definition

Woreda is the third level of the administrative divisions of Ethiopia—after zones and the regional states.

Kebele is the smallest administrative unit of Ethiopia, contained within a woreda.

Findings

We reported our findings in five parts based on the core themes/categories identified during the analysis. The first part presents access to and utilization of health services. The second part describes the effectiveness of the MHSs. The third part discusses the mobile health service adoption. The fourth part explains the implementation of the

MHS delivery programme, and the last part focuses on the sustainability of the MHS provision programme.

Access to and utilization of health services (programme reach)

The participants of this study explained that access to and utilization of both general health services and RMNCH services in the study area have been improved since the implementation of MHS. However, there are still critical gaps and challenges in the delivery and uptake of these health services.

Key informants from Somali and Afar stated that the utilization of both general health services and RMNCH services is better these days compared to the utilization in the previous times. Though health service coverage is increased recently, there are determinants that limit the utilization of health services in both regions. Some of the identified key determinants of health care service utilization were. lack of road access, lack of modern means of transportation, inaccessibility of health facilities (distance from the health facilities), inability to afford transportation cost, and higher cost for health service at health facilities. As a result, the hard-to-reach people especially the elders, children, and women were not getting health services in general and RMNCH services in particular.

The communities that most benefited from MHS were those in hard-to-reach areas with no access to health facilities. For instance, internally displaced people (IDP), women of reproductive age, newborn babies, children, and economically poor people are among the population sects that benefited from the MHS.

The services provided by the MHS were identified as ANC, family planning, EPI, OTP, nutrition supply, timely referral with free transportation, immunization, and treatment of malnourished children. Most of the health services delivered by the MHS gear towards under-five children and women. In general, the MHS played a crucial role in providing equitable health service by reaching communities with no access to health facilities and achieving its goal of reaching hard-to-reach population. The use of different modalities of health service delivery also contributed to an increase in health service utilization. A key informant from Afar stated the issue as the following:

> *The health services are available in two ways; routine and outreach program. Routine is the way that community utilize health services in the health facility and outreach is mobile health program; providing medical care freely in the areas where communities are living. We are also preparing to provide service by CBHI (community based health insurance) program in collaboration with regional health bureau and NGOs. These different modalities of health service deliveries contributed to an increase in health service utilization.*

In line with this, the FGD participants agree with an increase in health services utilization such as antenatal care, child immunization, and treatment of malnourished children through MHS and delivery at health facilities. According to these participants, this is mainly due to the implementation of MHS in an area. The mobile health team contributed to an increase in community awareness and reduced cost of transportation for health service utilizers as the team comes to their place.

> *The health care providers come to us when we have health problems. They come and serve us while we are at our homes. They treat mothers and children with health problem free of charge and no transportation cost. FGD participant*

However, the participants mentioned that there is a limitation in providing family planning service to the reproductive age group in these hard-to-reach areas. Religion, cultural barriers, and lack of experience in utilizing family planning methods were identified as factors for the low use of family planning. Moreover, there are woredas that are not reached at all by the MHS programme as the woredas are too vast and there is no road for the mobile team to travel to these areas. The mobile health system does not cover teenage females (unmarried girls) who need family planning services. This was explained by one of the FGD participants as follows:

> *We are still not using family planning services due to many reasons. For instance, our religion does not support the services, our husbands also do not support the services and most of the women can't decide by themselves.*

Effectiveness of the Mobile Health Service programme

The effectiveness of mobile health care programmes (in comparison with other health service delivery modalities—for instance, health service delivery at health institutions) in increasing the utilization of health services, benefiting the communities, and achieving its goals in Somali and Afar is presented as follows.

The key informants and FGD participants explained that mobile health care programme is very effective in increasing the utilization of general health services and RMNCH services especially in hard-to-reach areas. The FGD participants in particular indicated that the MHS has improved their access to health care services. Without the implementation of the MHS in the area, the communities had no access to health care. It is believed by

the participants that the MHS dramatically changed the health status of the communities, especially the communities in hard-to-reach areas.

> *As a community, we are very lucky because the mobile health service was implemented, while we are surrounded by many challenges such as drought, conflicts, and lack of health services at all. FGD participant*

In general, it changed the way the community think about health service utilization and increased their health-seeking behaviour. Compared to the health services at health facilities, hard-to-reach (remote kebeles) are now able to get health services with the support from mobile health service programme.

The Mobile Health Service is highly effective in reaching the underserved population and had no option for health services at all. This is because it provides health services for hard-to-reach people particularly those communities where pregnant mothers deliver 'under trees' and maternal death is high due to complications related to delivery.

According to the participants, the MHS increased immunization coverage, maternal and child health services, institutional delivery, and to some extent family planning utilization in hard-to-reach areas. The referral system was improved where referred patients were transported for free using the vehicle for the mobile health service programme. Most importantly, the programme improved the linkage between the community and health service facilities. Moreover, it saved the time and money of the community that they spend to get health services.

Most importantly, the MHS programme is considered as effective health service modality compared to other modalities for it provides health services following the movement routes of the community in search of grazing land and water. For instance in Afar, from 11 kebeles in a woreda, 4 kebeles are with sites hard to reach which is served by mobile health service.

> *As our people are migrating from place to place in search of grazing land and water, MHS is a good modality that provide health care service following the route of community's movement. KII participant*

However, the key informants mentioned that the effectiveness of the mobile health service programme depends on the awareness of communities and the mobilizing capacity of community leaders. In kebeles where leaders effectively mobilized all the target population and increased community's awareness, the mobile health service programme was very effective. In some kebeles, there are no road accesses which resulted in the interruption of MHS especially during the rainy season.

Adoption of the mobile health services delivery programme

Adoption of mobile health service programme can improve health service utilizers especially to provide health services in hard-to-reach areas. According to the key informants, the mobile health service is initiated by non-government organizations namely, USAID and AMREF.

The key informants both from Somali and Afar regions explained that the programme lacks both national and regional guidelines to adopt the programme in such a way that it gets ownership by the government. However, there is an agreement of the woreda health office in planning the intervention for the implementation of the MHS in woredas with hard-to-reach sites. Apart from the woreda health office, there are different bodies that are involved in the implementation of the MHS.

> *The guideline for this program is not yet prepared, even at national level. We didn't have an experience on this program, but as residents of the Woreda, we have heard about the Mobile health program provided by UNICEF in other Woredas. KII participant*

According to the participants, the woreda health office head, woreda finance head, woreda administrator, health professionals, HEWs, community leaders, and different community structures are aware of the importance of the MHS and take part in either mobilizing the community for the health service provided by the programme or facilitated the implementation of the programme.

The programme trained an adequate number of health care providers, and they were participating in MHS in a rotation. This modality allowed most of the health care providers in woredas to participate in the implementation of the programme. This helped the health care providers to share their workload among themselves. In some cases, they were able to cover fourteen kebeles in a woreda. Moreover, other stakeholders such as religious institutions and schools participated in the programme, especially through mobilizing the communities for the health service provided by MHS programme.

> *The team is composed of five members including a midwife, nutrition nurse, doctors, and health officers. We have adequately trained health care providers which help us to share the workload between health workers and mobile teams by conducting staff rotation. This team covers fourteen kebeles. KII participant from Afar*

The result of this study documented that the MHS is taken up well both by the health offices and the community. The woreda health offices are happy that the programme covers areas which were not possible to cover

due to inaccessibility, lack of transportation, limited health professionals in the woreda, and lack of modality to reach hard-to-reach communities. The health care providers also take up the programme for there is an incentive in terms of per diem during their visit hard to reach areas. The community's acceptance of the programme is also another factor for the programme to be adopted and implemented. However, the rotation of the health professionals and health professionals' lack of local language affected the adoption of the programme.

Mobile health service implementation in hard-to-reach areas

The key informants said that the MHS was provided according to the programme policy. They elucidated that the programme is being consistently implemented by the mobile health team as far as there is a provision of medical supplies by woreda health office and per diem and vehicles are availed by Transform HDR. Each mobile health team member provided health services based on their professional expertise. The mobile health team has the required minimum educational qualifications.

> *The program is almost implemented according to the program policy without making any modification on the interventions. KII from Somali region*

According to the key informants, the intervention plan and daily travel sites are prepared by the mobile health teams, and all targeted health professionals participated in the intervention. The interventions include primary health care services to pregnant women and children aged under five years. These include ANC, PNC, newborn care, nutrition and breastfeeding counselling, maternal and childhood vaccinations, ultrasound scan for pregnant women, and treatment of sick children.

According to the key informant from Afar, the MHS is very costly. It costs nearly birr 900,000.00 equals USD 16,562.70 for 1 month, which is delivered in 10–15 days. The mobile health team was expected to spend a day at a site and travel to the next hard-to-reach site. However, because of the need for a large population to be served at a location, there were days that the team spends more than a day at a site. This results in modification of the plan and stays of the mobile health team for more days than planned.

> *They (mobile health team) used to provide the service according to the program policy; everyone was working based on his/her profession. Around 900,000.00 ETB was needed for one month which includes health care provider peridium and car rent. KII participant from Afar*

The important facilitators for the implementation of the MHS were identified as commitment of the government, community leaders' involvement in mobilizing the community, support from partners and NGOs, incentives to the mobile health team, commitment of the mobile health team, acceptance of the programme by the community, collaboration of the woreda health office with partners, active involvement of established committees to work with the mobile health team, respectfulness of the mobile health team to the community, and being able to serve people in need of health services,

On the other hand, the participants identified barriers such as lack of roads to reach hard-to-reach areas, geographic barriers, lack of cars, shortage of logistics, supplies and drugs, work overload of the mobile health team, use of rental cars, lack of budget allocated for this programme by the government, more demands from the community from the service, continuous movement of the community, low-level awareness of the community to the health services, lack of supply to treat malnourished children, and lack of specific location and facility to provide mobile health service. The challenges were explained by one of the key informants as follows:

> *The major challenges are shortage of medical supplies and drug. All drugs were used to be given by the woreda health office. If the drugs are out of the woreda's stock, there is no other source because the partners only cover the health care providers' perdiem and cost of fuel for cars. A delay of the rented cars for the services is another challenge as this affects the provision of the service as per the plan. Sometimes before finishing the services, the agreement period to use rental car is over and the service gets interrupted. It is good if they can make the car rental for one month rather than fifteens days or the partners should assign a car that provide only mobile health services. There are some areas with no road and makes it difficult to provide mobile health service during rainy seasons. There is no fixed place to provide the service; we provide the services under the trees. Some of the barriers that affect the service are lack of Health Post in the kebele or available Health Post with no refrigerator to provide immunization services.*

Likewise, lack of budget for car maintenance and fuel purchase, shortage of ambulance, shortage of skilled manpower to provide the health service, absence of HEWs, lack of commitment from community leaders, lack of clear communication channel during vaccination (sometimes there is no network for communication), inability of health workers to communicate in Afari language (many people in the area do not understand the

Amharic language), shortage of drugs, and other supplies at woreda level are mentioned as the factors hindering the implementation of the MHS.

The other challenge is damage caused to the various health facilities and some of the vehicles during the conflict in the northern part of the country, and there is no more electricity service in the area. There are times that cars are used for different purposes by the district offices without giving priority to mobile health service.

Sustainability of the mobile health service programme

The participants enlightened that there is no clear strategy to sustain the MHS. The programme is running with the support of the stakeholders especially with budget and logistics. According to the participants, sustaining the MHS without the budget and logistics from the funding organizations is hardly possible. To sustain the programme, the participants suggested that there should be a plan to sustain the programme and a budget needed to be allocated by the government for such services to reach hard-to-reach areas. In general, most of the respondents do not believe that the service will be maintained when the implementation of mobile health services with support from stakeholders phases out.

The researchers mapped the facilitators and barriers for implementing mobile health services accordingly (Table 1).

Discussion

Health service delivery through mobile health service modalities has been documented as a promising strategy to provide health services for hard-to-reach and pastoralists (Edmond et al. 2020; Montavon et al. 2013; Ongwae et al. 2017; Schelling et al. 2007). These studies indicated that mobile health services improved coverage of primary health care for women and children in hard-to-reach areas, and the findings were supported by previous studies in the Ethiopian Somali region (Ashish et al. 2017; Oladeji et al. 2021). Our current finding showed that the MHS increased the health service utilization for hard-to-reach people. The utilization of RMNCH, family planning, and nutrition services for malnourished children increased for hard-to-reach communities as a result of the implementation of the MHS.

Compared to health services that marginalized people who would have received health services from the health facilities, the MHS benefited hard-to-reach (remote kebeles/settlements) without which these communities have had no health care services. This finding is in line

Table 1 Summary of facilitators and barriers for implementing mobile health services in the study area of Somali and Afar regions

Themes/categories	Supply side: health systems and macro level	Community level and environmental factors	Individual-level factors
Reach	Expansion in health centres and health services coverage	Understanding the benefits of health services	Cooperative religious figures
	Continuous awareness creation programme	Community participation and engagement	
	Improvement in the number of health professionals		
	Incentives to the health professionals		
	Increment in hours of health services delivery operations		
	Improvements in medical equipment and supplies		
	Transportation services		
	Collaboration of the regional health bureau with different partners		
	Supportive supervision and accountability	Awareness of communities	
		Mobilizing capacity of kebele leaders	
	Road accesses		
Adoption	Ownership by the government		Lack of local language knowledge by health professionals
	Availability of guideline		
	Use of health care providers in rotation		
Maintenance	Strategy to sustain the MHS		
	Budget and logistics		
	District annual health plan should include Hard-to-reach communities	Community feedback, empower the community to ask for their right	

with a previous study in which the MHS provided health care to the disadvantaged population with inadequate or no access to health care (Gruen et al. 2002). This indicates that the existing health service delivery modalities are less likely to bring equitable access for people living in hard-to-reach areas of the country which is a strong public health message to MoH, regional health bureau, and woreda health offices. Though the MHS increases health services in general (Neke et al. 2018; Thapa et al. 2020), it did not reach all groups of the population especially family planning services for the reproductive age group. Religion (Kea et al. 2018), socio-cultural values and practices, and lack of family planning experience (Miller et al. 2021) were identified as factors that hinder family planning use in an area. It is essential to consider family planning for these groups as one of the mobile health services for it contributes to improvements in health-related outcomes.

The findings in this study showed that there are conditions that lead to the effectiveness of mobile health services for hard-to-reach communities. These conditions include increased awareness of health services utilization (King et al. 2016; Medhanyie et al. 2018; Tareke et al. 2020; Yebyo et al. 2015), use of existing community structure to mobilize communities for mobile health services (Gammino et al. 2020; Yebyo et al. 2015), support from stakeholders (Nxumalo et al. 2013; Sadegh et al. 2018), incentives to health care providers (Chowdhury et al. 2022; Gopalan et al. 2021; Labrique et al. 2013), and acceptance of the programme by the community (Ebrahimi et al. 2018). However, this study showed that there was a shortage of medical supplies and equipment from the woreda health offices that negatively affected the effectiveness of the MHS which was also reported by previous studies (Kea et al. 2018; Miller et al. 2021).

A previous study documented that usefulness, convenience, and monetary values of MHS influence the adoption of the programme (Lee and Han 2015). In the current study, the MHS was useful and accepted by the communities. This was partly the result of involving different government offices and community structures to take part in the implementation of the programme either by mobilizing the community or by delivering the service. The modality is adopted because it is convenient for the service utilizers as the health services are provided to them at their locality with no transportation cost and free of charge. The health care providers were participating in MHS in a rotation which makes the programme taken up by most of the health care providers in a woreda. Other stakeholders such as religious institutions and schools participated in the programme, especially through mobilizing the communities for the health service provided by the programme. This study underlined the importance of involving woreda/district health office to solve the lack of medical supplies and equipment for mobile health service delivery. These are key ingredients that the woreda health offices expected to provide and their lack affects the RMNCH and family planning services provided by the mobile team.

The acceptance of the MHS by the communities and by the health care providers and the effectiveness of the modality in increasing health care services indicated that such programme needs to be sustained. However, there is no plan by the stakeholders to sustain the programme as the funding is a major concern. The mobile health service programme needs to be institutionalized in the health system of the government and should have a progressive financing system to provide health services in hard-to-reach areas.

Conclusion

The findings revealed that the contribution of mobile health services to hard-to-reach areas of the Afar and Somali regions is much more useful and effective. It plays a significant role by using as a mechanism to deliver RMNCH, FP, and nutrition services to the hard-to-reach woredas of the Somali and Afar regions. The study showed that these areas have very limited or no access to health facilities. MHS needs to be institutionalized and owned by the government as an alternative health care service delivery mechanism. By doing so, Mobile Health Service can effectively support primary health care services. This is possible when properly organized and given necessary response and support to the need of hard-to-reach areas. In fact, it also needs an effective good supply chain management system at woreda health offices. However, since there is no clear strategy from the government to sustain the programme, the stakeholders should make an effort to sustain the programme and encourage policymakers to address the missing policy issues.

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Authors' contributions
KE organized the data and wrote a draft. MG systematically reviewed the draft and put it into a manuscript format. YA, DT, ST, MA, AI, MS, SZ, and GM gave feedbacks. The authors read and approved the final manuscript.

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Declarations

Ethics approval and consent to participate
Ethical clearance for the implementation of MHS and collection of data at various times for the purpose of monitoring and evaluation of the programme was obtained from the Federal Ministry of Health review board. We also obtained letters of research cooperation from RHBs of Afar and Somali regions. Programme data collected as part of monitoring and evaluation was accessed with permission of the programme-leading institution (AMREF) to develop the current manuscript.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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References

Admasu, K., T. Balcha, T.A. Ghebreyesus. 2016. Pro–poor pathway towards universal health coverage: Lessons from Ethiopia. *Journal of Global Health* 6(1): 010305.

Ahmed AG, Dietz T, Salih MM, editors. African pastoralism: Conflict, institutions and government. Pluto 2001; 235–246.

Central Statistical Agency (CSA) Ethiopia and ICF. Ethiopia Demographic and Health Survey, Addis Ababa 2016:1

Ali, M., J.P. Cordero, F. Khan, and R. Folz. 2019. 'Leaving no one behind': A scoping review on the provision of sexual and reproductive health care to nomadic populations. *BMC Women's Health* 19: 1–14.

Ashish, K., V. Nelin, H. Raaijmakers, H.J. Kim, C. Singh, and M. Målqvist. 2017. Increased immunization coverage addresses the equity gap in Nepal. *Bulletin of the World Health Organization* 95: 261.

Bobo, F.T., E.A. Yesuf, and M. Woldie. 2017. Inequities in utilization of reproductive and maternal health services in Ethiopia. *International Journal for Equity in Health* 16: 1–8.

Chowdhury, M.A.K., F. Karim, M.M. Hasan, N.B. Ali, A.N.S. Khan, M.S. Siraj, S.M. Ahasan, and D.M.E. Hoque. 2022. Bottleneck analysis of maternal and newborn health services in hard-to-reach areas of Bangladesh using 'TANAHASHI framework': An explanatory mixed-method study. *PLoS ONE* 17: e0268029.

Ebrahimi, S., Y. Mehdipour, A. Karimi, M. Khammarnia, and J. Alipour. 2018. Determinants of physicians' technology acceptance for mobile health services in healthcare settings. *Journal of Health Management & Information Science* 5: 9–15.

Edmond, K., K. Yousufi, M. Naziri, A. Higgins-Steele, A.Q. Qadir, S.M. Sadat, A.L. Bellows, and E. Smith. 2020. Mobile outreach health services for mothers and children in conflict-affected and remote areas: A population-based study from Afghanistan. *Archives of Disease in Childhood* 105: 18–25.

Elmi Farah, A., A.H. Abbas, and Ahmed A. Tahir. 2018. Trends of admission and predictors of neonatal mortality: A hospital based retrospective cohort study in Somali region of Ethiopia. *PLoS ONE* 13: e0203314.

Eregata, G.T., A. Hailu, S.T. Memirie, and O.F. Norheim. 2019. Measuring progress towards universal health coverage: National and subnational analysis in Ethiopia. *BMJ Global Health* 4: e001843.

Federal Ministry of Health (FMoH). Essential Health Services Package of Ethiopia 2019. Addis Ababa

Federal Ministry of Health (FMoH). Health sector transformation plan 2015. Addis Ababa.

Federal Ministry of Health (FMoH). 2021. National health equity strategic plan, 2021–2025. Addis Ababa.

Fedral Ministry of Health (FMoH). Realizing universal health coverage through primary health care: A roadmap for optimizing the n.d. Ethiopian Health Extension Program 2020–2035. Addis Ababa.

Gammino, V.M., M.R. Diaz, S.W. Pallas, A.R. Greenleaf, and M.R. Kurnit. 2020. Health services uptake among nomadic pastoralist populations in Africa: A systematic review of the literature. *PLoS Neglected Tropical Diseases* 14: e0008474.

Gele, A.A., M. Sagbakken, F. Abebe, and G.A. Bjune. 2010. Barriers to tuberculosis care: A qualitative study among Somali pastoralists in Ethiopia. *BMC Research Notes* 3: 1–9.

Gopalan, S., R. Mohammed-Roberts, and H.C. Zanetti Matarazzo. 2021. Drivers of utilization, quality of care, and RMNCH-N services in Bangladesh.

Gruen, R.L., T.S. Weeramanthri, and R.S. Bailie. 2002. Outreach and improved access to specialist services for indigenous people in remote Australia: The requirements for sustainability. *Journal of Epidemiology & Community Health* 56: 517–521.

Kea, A.Z., O. Tulloch, D.G. Datiko, S. Theobald, and M.C. Kok. 2018. Exploring barriers to the use of formal maternal health services and priority areas for action in Sidama zone, southern Ethiopia. *BMC Pregnancy and Childbirth* 18: 1–12.

King, R., R. Jackson, E. Dietsch, and A. Hailemariam. 2016. Utilisation of maternal health services in Ethiopia: A key informant research project. *Development in Practice* 26: 158–169.

Labrique, A.B., L. Vasudevan, E. Kochi, R. Fabricant, and G. Mehl. 2013. mHealth innovations as health system strengthening tools: 12 common applications and a visual framework. *Global Health: Science and Practice* 1: 160–171.

Lee, E., and S. Han. 2015. Determinants of adoption of mobile health services. Online Information Review.

Central statistical agency (CSA)[Ethiopia] and ICF. 2016. Ethiopia demographic and health survey, Addis Ababa, Ethiopia and Calverton, Maryland, USA. 1.

Memirie, S.T., S. Verguet, O.F. Norheim, C. Levin, and K.A. Johansson. 2016. Inequalities in utilization of maternal and child health services in Ethiopia: The role of primary health care. *BMC Health Services Research* 16: 1–8.

Miller, N.P., F. Bagheri Ardestani, H. Wong, S. Stokes, B. Mengistu, M. Paulos, N. Agonafir, M. Sylla, A. Ameha, and B.G. Birhanu. 2021. Barriers to the utilization of community-based child and newborn health services in Ethiopia: A scoping review. *Health Policy and Planning* 36: 1187–1196.

Montavon, A., V. Jean-Richard, M. Bechir, D. Daugla, M. Abdoulaye, R. Bongo Naré, C. Diguimbaye-Djaibé, I. Alfarouk, E. Schelling, and K. Wyss. 2013. Health of mobile pastoralists in the Sahel–assessment of 15 years of research and development. *Tropical Medicine & International Health* 18: 1044–1052.

Neke, N.M., G. Gadau, and J. Wasem. 2018. Policy makers' perspective on the provision of maternal health services via mobile health clinics in Tanzania—Findings from key informant interviews. *PLoS ONE* 13: e0203588.

Nxumalo, N., J. Goudge, and L. Thomas. 2013. Outreach services to improve access to health care in South Africa: Lessons from three community health worker programmes. *Global Health Action* 6: 19283.

Oladeji, O., B. Oladeji, M.D. Omer, A.E. Farah, I.M. Ameda, R. Gera, A.S. Ismail, M. Ayanle, O. Nixon, and H.M. Diriye. 2021. Exploring opportunities to enhance effectiveness of mobile health and nutrition strategy for providing health and nutrition services amongst pastoralists in Somali region, Ethiopia. *African Journal of Primary Health Care & Family Medicine* 13: 1–7.

Ongwae, K.M., S.B. Bawa, F. Shuaib, F. Braka, M. Corkum, and H.K. Isa. 2017. Use of dedicated mobile teams and polio volunteer community mobilizers to increase access to zero-dose oral poliovirus vaccine and routine childhood immunizations in settlements at high risk for polio transmission in northern Nigeria. *The Journal of Infectious Diseases* 216: S267–S272.

Federal Democratic Republic of Ethiopia (FDRE). 2017. Pastoral development policy and strategy, Ministry of Peace.

Sadegh, S.S., P.K. Saadat, M.M. Sepehri, and V. Assadi. 2018. A framework for m-health service development and success evaluation. *International Journal of Medical Informatics* 112: 123–130.

Schelling, E., M. Bechir, M.A. Ahmed, K. Wyss, T.F. Randolph, and J. Zinsstag. 2007. Human and animal vaccination delivery to remote nomadic families. *Chad. Emerging Infectious Diseases* 13: 373.

Tareke, K.G., Y.K. Lemu, and G.T. Feyissa. 2020. Exploration of facilitators of and barriers to the community-based service utilization for newborn possible serious bacterial infection management in Debre Libanos District, Ethiopia: Descriptive qualitative study. *BMC Pediatrics* 20: 1–14.

Thapa, J., S.S. Budhathoki, R. Gurung, P. Paudel, B. Jha, A. Ghimire, J. Wrammert, and A. Kc. 2020. Equity and coverage in the continuum of reproductive, maternal, newborn and child health services in Nepal-Projecting the estimates on death averted using the list tool. *Maternal and Child Health Journal* 24: 22–30.

UNICEF. 2015. Evaluation of mobile health and nutrition teams in Afar and Somali regions. BIIC PLC.

Wild, H., E. Mendonsa, M. Trautwein, J. Edwards, A. Jowell, A. GebreGiorgisKidanu, R. Tschopp, and M. Barry. 2020. Health interventions among mobile pastoralists: A systematic review to guide health service design. *Tropical Medicine & International Health* 25: 1332–1352.

Woday Tadesse, A., Y. MekuriaNegussie, and S.B. Aychiluhm. 2021. Neonatal mortality and its associated factors among neonates admitted at public hospitals, pastoral region, Ethiopia: A health facility based study. *PLoS ONE* 16: e0242481.

Yebyo, H., M. Alemayehu, and A. Kahsay. 2015. Why do women deliver at home? Multilevel modeling of Ethiopian National Demographic and Health Survey data. *PLoS ONE* 10: e0124718.

Yousuf, J., T. Mulatu, T. Nigatu, and D. Seyum. 2010. Revisiting the exclusion of traditional birth attendants from formal health systems in Ethiopia. Discussion Paper No. 003/2010.

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