What is the Impact of Ante Natal Care (ANC) Attendance on the Subsequent Maternal Health Care Services Utilization in Conflict Affected Area

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Title page

What is the Impact of Ante Natal Care (ANC) Attendance on the Subsequent Maternal Health Care Services Utilization in Conflict Affected Area: -The case of Somalia

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Background: Somalia has registered 732 maternal mortality every 100,000 live birth; the uptake of maternal health care service is lowest in the world. The purpose of study is to understand social and economic factors that hinder or facilitate the uptake of maternal health care service during the pregnancy in Somalia.

Methods: Cross-sectional data was collected from 642 mothers of reproductive age in Mogadishu town through a community survey in November 2020. Descriptive data analysis and propensity score matching models were employed to measure association between the determinants of the uptake of required ANC, Skilled birth attendance and confounding factors. In addition, the impact of minimum ANC attendance on the uptake of mother health care services was evaluated

Results: The study indicated that ANC is at its lowest level, only 10% women reported attending 4-ANC[1], 23% didn't attend any ANC, and 61% attending 1 to 3 ANC; moreover, skilled birth attendance is low rate at 30%, against 67% average in Africa; 78% of women are unable to make decision to visit health clinic or hospital autonomously, rather the decision is made by other people, 44% decision is made by the husband and only 30% jointly by the woman and her husband. Contrary to the data on attendance, about 70% of the surveyed women were aware of health benefits of attending ANC. The cost associated with accessing health service at 31%, distance to health centers, 12%, and perception (ANC is not needed), 23% were the major reasons of not delivering at health institutions.

Conclusions: Thus, the number of ANC visits has an incremental positive effect on the probability utilization of skilled birth attendance and delivery at health facility. Access related factors are the most hindering barriers for the poor utilization of health care service as evidently indicated by the negative correlation of distance from health center. Improving access to health education, interventions targeting improved income and women empowerment lead to better maternal health outcome.

Keywords: Maternal health, Antenatal care, Skilled Birth Attendance, Health care utilization, Somalia

[1] According to WHO the minimum required number of ANC for better health outcome is 4.

Background information

According to World Health Organization (WHO) report, in 2017, every day approximately 810 women died from preventable diseases related to pregnancy and childbirth, almost two thirds (65%) maternal deaths occured in the African Region [1]. Increasing utilization of maternal and child health care service is among the primary agenda to reduce maternal and mortality rates as part of the Sustainable Development Goals (SDG) objectives. Somalia is among the countries with weak health system and health care service utilization is lowest in the world. Despite the slow progress in maternal death rate in 100,000 births; Somalia has registered 732 maternal mortality ratios (death per 100,000 live birth), about 30% improvement in 10 years from 1,044 in 2007. The highest mortality rate among the Eastern Mediterranean region, where 61% of the counties recorded less than 70 death[2] Ante natal and post-natal health care service are key aspect to improve the birth outcome. However, it is still estimated that more than half a million women lose their lives due to avoidable mortalities in developing countries [2].

Global community give foremost attention to improve the quality of maternal and child health care as the period around child birth is a critical time to reduce morbidity and mortality rates. Globally despite progress made in the past decades in coverage of birth at health facility, the decline in maternal and neonatal mortality still remain high. Thus, efforts to improve the uptake of pre-and and post-natal health care service is key step to save maximum number of maternal and newborn lives and prevent still birth [3], [1].

Increased uptake of skilled birth attendance and delivery at health facility leads to reduced maternal and newborn mortality, WHO advocates the uptake of skilled birth attendance, ANC, and institutional based delivery as the practices with greater potential to reduce maternal death [4]. Somalia has lowest SBA rates, 30% compared to 67% of African average [5]. According to WHO recommendation, a minimum of four ANC visits during pregnancy significantly reduces the chance of obstetric complication during delivery and results in improved birth outcome [3], [6], [7]. Reducing maternal mortality ratio (MMR) to 70 maternal death per 100,000 live birth by 2030, is the third objective of Sustainable Development Goals. Somalia is among the countries adopted the 3rd SDG goal; impetus to increase the access and uptake of health service delivery is on the rise. However, the county is far behind the 2030 SDG targets where the highest maternal death, 732, registered in 2017.

The uptake of maternal and child health care service is limited to both the supply side and demand side challenges, structural and social factors. Several attempts have been made to measure association between low uptake of SBA and BHF [4], [7]–[10]. Thus, an integrated and consolidated effort is required to understand the association between utilization and confounding factors to improve the uptake of health service. In Somalia several attempts have been made by the government and international actors to improve both access to and utilization of maternal health care by breaking the barriers to utilization of maternal and child health care services; however, the uptake is still low.

Hence, this study is aimed at generating evidence on enablers and barriers of maternal health care

[2] https://rho.emro.who.int/ThemeViz/TermID/148

utilization, and the impact of required level of ANC attendance on the uptake of skilled birth attendance and birth at health facility.

The major outcome variables considered in the study are: -visiting health center during and after the pregnancy, skilled health professional birth attendance and delivering at health facility [7], [9],. Receiving skilled birth attendant and birth at health facility, are likely to reduce the maternal death and improve live births. On the other hand, Antenatal care attendance create an opportunity for the woman to have greater interaction with health service providers and promotes awareness, early screen and diagnosis of the woman's health condition, and early detection and prevention of common preventable disease, concurrently improve pregnancy outcome by improving utilization of maternal health care service. Thus, it is important to investigate the association between the barriers of health care utilization and impact of required ANC attendance [11]–[13].

There is a dearth of health research in general and barriers of utilization of mother and child health care service in Somalia, our search resulted in limited of research around the barriers to utilization. Barrier that limits availability and access to quality maternal health care service must be identified, and intervention addressing such barriers should be implemented to improve the health system and maternal health outcome [1]. Thus, it is paramount to undertake a comprehensive study to understand barriers and enablers of the maternal health service utilization, and how the utilization of one of health service can promote the uptake of others, especially to examine how the ANC visits plays a vital role to break the barriers and improve the uptake for better utilization of available health. On the other hand, Skilled Birth Attendance has the potential to reduce maternal and new born mortality between 16–33% [5].

Confounding factors that improves/limit utilization of MCH were identified: Four dependent variables (place of deliver, skilled birth attendance, number of ANC, and at least 4-anc,) were assessed in the study. The hypothesis of the study is those who are going to attended at least 4-ANC are more likely to be educated, more empowered and have better decision-making autonomy, and to receive health service; income status: wealthier, younger; and those women who have good health awareness level, those who have less burden at home; were more likely to utilize health care service. Settled residence for longer period in one place create opportunity to attend the health service[14][15].

Method

Objective of the study

The general objective of the study is identifying barriers and enablers of mother health care service utilization and to provide recommendations to address the challenges. Specifically, the study aimed at generating evidence on the determinant maternal health service utilization on one hand and the impact of attending required level of Antenatal care service in uptake of the skilled birth attendance, and birth at the health facility.

Hypothesis test

Hypothesis tests: -Mother and child health care service utilization influenced both demand and supply side of the health care system. Thus, this study reviews the expected directional relationship.

Education

Education plays a central role as means of improved wealth and likelihood of utilizing improved maternal and child healthcare service, education positively influences the utilization of health service.

Autonomy

There is no common agreement in association between the women's autonomy in decision making and utilization of health care service. Some scholars argued there is strong positive relationship between autonomy and health care utilization [16]; others argue limited evidence on the association between women's empowerment and maternal health care [17]. Gender dynamics in decision making for women's health plays a central role; when women have autonomy in health decision making their use of maternal health care service improves; thus, we can't predict directional relationship between decision making power and uptake of the health care service**.**

Skilled Birth Attendant

Surveyed women were asked if they have received support from skilled health professional during their recent delivery. Two binary variables identified for the response receiving unit if received assistance from health professional doctors, nurse, midwife, health visitor midwife and community health workers and zero otherwise.

Delivery at Health Facility

Delivery at the health facility improved the likelihood of improved birth outcome, women were asked to indicate the place of delivery for the latest birth, there were two major places indicated at home and health facility. Dummy variable created receiving 1 if the delivery happened at health facility and 0 otherwise.

Antenatal care

Question posed to assess frequency of Antenatal care visit during your last or current pregnancy and how many times did you go/have you been to the health center to receive treatment or consultation. This variable receives count values from 0 to N…in our case the maximum number of ANC visit was 12. Antenatal care variables give three different indicators measures of ANC.

Number of visit and the second one is if they have done visit to the health center; Measuring the appropriateness of the frequency of visit, thus, according to WHO women who visited at least 4 ANC considered as appropriate number of ANC and likely to be protected from pregnancy related risk and complications during delivery. Variable created to capture if the woman made required number of ANC visit or not, coded 1 if the 4 or more-visit made to the health center during the

current or previous pregnancy and 0 otherwise, and third part is to measure if the woman visited at all. Such classification enables to examine the determinant of the number of ANC, probability of attending ANC, and the impact of attaining minimum number of ANC on utilization of other maternal health care services.

Empirical Estimation of impact required ANC utilization on uptake of health service

Decision to use any reproductive health service depends on the utility perceived from using it, thus, women has two (binary) option to utilize or not to utilize, and the decision influenced by several factors given to opt to use the service. If we assume the utility derived from utilizing a service is U_{j1} and not using is U_{j0}, then the probability of using the service is an be expressed as follows:

$$P(U_{j1} = 1) = P(U_{j1} > U_{j0})$$

Utility depends on several explanators factors

$$U_j = \alpha_j + \beta_i X_i + \varepsilon_{ij}$$

Thus, $P(U_{j1} = 1) = P(E(U_j) > 0) = P(E(\alpha_j + \beta_i X_i + \varepsilon_{ij}) > 0 = P(\beta_i X_i > 0)$

Where X_i represent a vector of explanatory variables that explaining the utilization of health service j, β_i ae coefficients measuring the change in probability of utilizing a health service attributed to unit change in explanatory variable X_i. The distribution of probability of utilizing the health service assumes probit model.

Result

Descriptive analysis

The descriptive analysis of the study women revealed that 23% of women didn't attended ANC (visiting health facility) during the latest pregnancy, only 10% visit four and more times (appropriate number of ANC); 61% received 1 to 3 ANC. Similar studies in Africa indicated 13% of women didn't; receive ANC services, but the proportion utilizing four or more ANC visit is about 53%; and 35% partially utilized antenatal care, younger and educated, and richer women were more likely to utilize ANC [18].

The study showed that on average 30% of women received skilled birth attendance during the latest delivery, 22% delivered at the health facility, 73% are aware of health benefits of maternal health care service utilization. Different channels indicated as source of health information 8% received health message from radio and 57% received health education from Save the children international programs through community-based awareness creation campaigns. The birth rate is relatively high survey women experienced on average 5.7 pregnancies including live birth and miscarriages. The average age is 26 years, and first married at the age of 14.9 years. The education level of women very low, which might have contributed to low uptake of maternal health service; only 9% can read a sentence, 95% of women who can't read and 91% those who can read where married before their 18th birthday. Child and early marriage are common in the study area the

average age at the first marriage is 15 years. and 92% classified as child marriage.; Internal displacement serious problem pertain for women health, 89% experienced at least one-time displacement, and lived about 19 years in current residence (Table 1).

Further analysis was conducted to gauge the difference in uptake of health care service between women who attend the appropriate level of ANC visits (4 and more ANC) versus those who don't (0 to 3 ANC). Understanding the difference between the two groups can highlight how the integrated social behavioral change during ANC visit brings an impact on the utilization of health care service utilization.

Table 1:-Variable used in the analysis and definition by the level of Ante Natal care visit

Variables	Less 4 ANC	Average	4+ANC	Average	Diff.	Overall
Skilled Birth Attendant	517	0.275	52	0.481	-0.206***	0.29
Delivery at health facility	585	0.198	57	0.439	-0.240***	0.22
Seek health care for newborn	585	0.385	57	0.614	-0.229***	.40
Immunized during pregnancy	585	0.726	57	0.965	-0.238***	.75
Lost pregnancy	583	0.192	57	0.298	-0.106*	0.20
Health awareness	556	0.737	56	0.696	0.041	0.73
Heard health message on radio	556	0.076	56	0.071	0.004	0.08
Heard heath message from SC	565	0.575	57	0.596	-0.021	0.58
Total number of pregnancies	585	5.624	57	6.509	-0.885**	5.70
Age in years	585	26.432	57	27.596	-1.164	26.54
Age at first marriage	585	15.029	57	14.579	0.450	14.99
Classified as married early	585	0.913	57	0.947	-0.035	0.92
Can read sentence	585	0.085	57	0.123	-0.037	0.09
Experienced displacement	585	0.899	57	0.825	0.075*	0.89
How many years lived here	585	18.733	57	20.667	-1.933	18.90

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Those women who attended the appropriate ANC visits were more likely to utilize the Health Care Service (HCS), 21, 24, and 5 percent point were more likely to receive SBA, HD, and are aware of health; ANC tend to have positive effect on number of pregnancy and chance of lost pregnancy (Table 1). Those women who attended four or more ANC visits were 24-perent point more likely to deliver at the health facility compared to those who received less than 4 ANC; 22-percent point to seek health care service for new born, immediately after the children birth; 24% likely to receive immunization during pregnancy, 21% more likely to received skilled birth attendance. But there is no difference in age at first marriage, literacy, and exposure to media (Table 1).

Clear positive trend was observed between the number of ANC visits and the proportion of women reporting delivering at health facility, receiving skilled birth attendant, and awareness of health education. The proportion of women reporting improved health service utilization increases as the number of ANC visit increases, reflecting the stronger influence of health-education and experience with the health facility towards improved mother health outcomes. The increment

effect of ANC visits on SBA and Health Facility Delivery (HFD) is more significant on average among women who didn't attend one ANC.

Further analysis indicated that women who have decision making autonomy on the health care were 5% more likely (P<0.066), to attend at least 4-ANC compared to those who don't have autonomy. Thus, decision making autonomy plays a role in improving health care utilization. Moreover, 24% more likely to have delivery at health facility (21% vs 26%) compared to those who don't have decision making power. Thus, gender consideration and empowering women to make decision on their own health plays a critical role in improving uptake of health care utilization Similar results reported in a study of Women's autonomy in health decision-making conducted in Senegal [16].

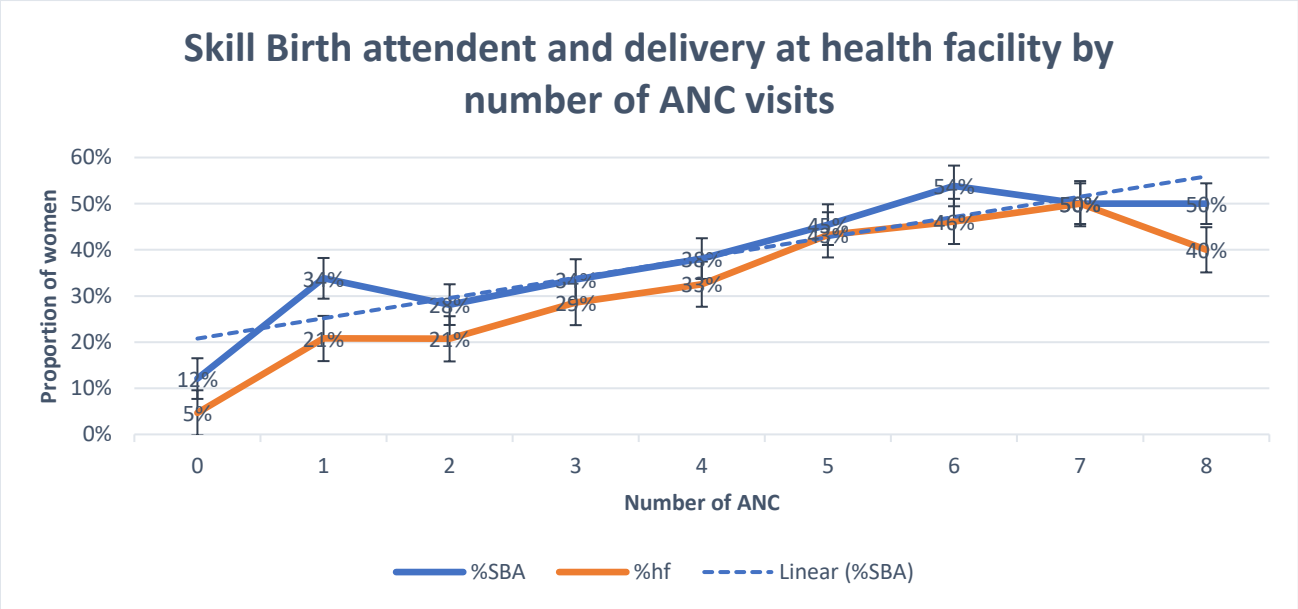

Figure 1 proportion of women receiving Skilled birth attendance and delivering at health facility by the number of ANC visits.

Number of ANC visits predicts the probability of skill birth attendance and seeking delivery at health facility.

Confounding factor analysis empirical analysis

Similarly, education (proxy can read and write a sentence) plays a central role in improving healthcare service and significantly affect the uptake of mother and child health care, for instance those women who can read and write were 22, 22, 19, and 15-percent point more likely to delivery at institution -health facility, attended by skilled labor, seek health care service for the newborn, and health care aware compared to their illiterate counter parts.

Variables	Illiterate	Mean illiterate	Literate	Mean literate	Mean Diff

Deliver at health facility	585	0.200	57	0.421	-0.221***
Skilled Birth Attendance	518	0.274	51	0.490	-0.216***
Seek healthcare for child	585	0.388	57	0.579	-0.191***
Immunization	585	0.744	57	0.789	-0.046
Healthcare aware	558	0.720	54	0.870	-0.150**
Health care decision	585	0.221	57	0.211	0.010

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; Mean diff. Difference in proportions

The other aspect explored in this study is the role attending the adequate level Antenatal care visits including the four outcome variables identified for measuring the uptake of maternal health care service in Somalia are: -Skilled Birth attendant, Delivery at health facility, immunization during pregnancy, and minimum Antennal care attendance. The study designed first to measure the determinants of uptake of each of the outcome variables, and followed by the modeling the impact of minimum ANC on the probability receiving particular health services.

Empirical results propensity score matching the effect of minimum ANC

Access related factors are the most hindering barriers for the poor utilization of health care service as evidently indicated by the negative correlation of distance from health center, the older age, work load at home, lost pregnancy, all negatively contributed to poor utilization of ANC, similarly, exposure to health and nutrition campaigning projects, income, education, settled residence positively contributed to the probability of visiting ANC.

Table 2:-mprobit analysis on the determinant of delivery at health facility, ANC attendance, and number of ANC

	Delivery place	Attended 4-ANC	At least 1 ANC	Received SKB
main				
Distance to health facility	-0.003*	-0.003*	-0.001**	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Attended at least 1 ANC	0.863**			
	(0.271)			
Received health intervention	0.368	0.262	0.932***	0.086
	(0.241)	(0.227)	(0.164)	(0.168)
Make decision to visit health facility	0.269	0.234	-0.071	0.154
	(0.211)	(0.178)	(0.156)	(0.148)
Monthly income 50-100 USD	0.291	0.117	0.336*	0.097
Monthly income above 100 USD	(0.232)	(0.209)	(0.159)	(0.158)
	0.606	-0.710	0.414	0.139
	(0.383)	(0.482)	(0.286)	(0.271)
health awareness	0.095	-0.297	-0.193	0.111
	(0.281)	(0.252)	(0.181)	(0.192)
Can read a sentence	0.811**	0.366	0.577*	0.519*
	(0.286)	(0.259)	(0.251)	(0.208)

Duration in current residence	0.008	-0.000	0.012**	0.006
	(0.005)	(0.004)	(0.005)	(0.003)
Experienced pregnancy loss	0.230	0.076	-0.149	0.279
	(0.211)	(0.190)	(0.161)	(0.150)
Fetch water delivery day	0.065	-0.007	-0.121**	0.080*
	(0.052)	(0.046)	(0.037)	(0.035)
Total number of pregnancies	0.009	0.045	0.044	-0.020
	(0.047)	(0.040)	(0.033)	(0.032)
Age in years	-0.005	0.293*	0.161*	-0.004
	(0.109)	(0.118)	(0.078)	(0.078)
Age square	0.000	-0.005*	-0.003*	0.000
	(0.002)	(0.002)	(0.001)	(0.001)
Have access to piped water	0.046	0.441*	0.087	
	(0.194)	(0.181)	(0.143)	
Constant	-2.081	-5.677***	-2.209*	-1.097
	(1.483)	(1.626)	(1.053)	(1.074)
N	547	547	547	490

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The further the distance the women live from the health facility is the lower frequency that the women will be having ANC attendance, delivery at birth facility and received skilled birth attendance. Similar study reviewing the association between distance to health facility and ANC in Africa, revealed negative association between distance to health facility and frequency of ANC visits. in the review of ANC determinants in SA Africa [10].

The predicted probability, estimated at margins presented in table 3 indicated that the probability of skilled birth attendant is only 23% if woman's ANC visit is 1 and increases to 63% if she visited health facility 8 times (keeping all other variables at average values). Similarly, the predicted probability of birth at health facility is 14% if woman's ANC visit is 1 and increases to 67% if she visited health facility 8 times (keeping all other variables at average values). Thus, number of ANC has an incremental positive effect on the probability utilization of skilled birth attendance; on material health care utilization.[3]

Table 3:-Propensity score matching on the impact adequate ANC on likelihood of delivery at health facility and Skilled birth attendance

	DHF	SBA
psmatch2: Treatment assignment	0.239***	0.209**
	(0.059)	(0.069)
Constant	0.206***	0.281***
	(0.019)	(0.022)
R-squared	0.027	0.016
N	555	497

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[3] https://stats.idre.ucla.edu/stata/dae/probit-regression/

Attending at least 4-ANC resulted in 24% increase in the delivery at health facility and 21% skilled birth attendant.

Discussion

Descriptive study on 642 women randomly selected from Mogadishu presented interesting findings from the barriers, enablers, and multiplier effects of attending appropriate level of Antenatal healthcare service by women. The rate of utilization of major maternal healthcare services is at the lowest level with only one-in-every 10 women attending 4-ANC visits, 23% didn't visit a health facility to seek pregnancy attendance in the recent or previous delivery. Moreover, traditional unskilled high risky homebased delivery dominates the delivery practice with more than 70% of women not receiving Skilled Birth attendance; and about 80% delivering at home. However, relatively, a better proportion, 74%, of women received immunization during the recent pregnancy. Cost associated with accessing health service, 31%, distance, 12%, perception (not needed), 23% where the major reasons for not delivering at health institutions. Furthermore, about 80% women were unable to make decisions on visit to health clinic or hospital autonomously, rather the decision was made by other people, husband at 44%, and only 30% jointly by herself and her husband. The socio-economic situation of the women further triggers for the low uptake of mother healthcare services in the country, literacy is very high, less than 10% can read and write; 95% of women who can't read and 91% those who can read where married before they turn 18, and the average age at the first marriage is 15 years.

Education plays a central role in improving the utilization of MCH and intensity of the utilization, those who can read and write were more likely to attended more than 4-ANC visits, deliver at health facility and receive skilled birth attended.

Conclusion

This study shades light on the importance of addressing both demand and supply barriers to improving the utilization of maternal health care service. Creating awareness on the importance of maternal healthcare service is as equally important as improved access to health facility through investment in the infrastructure.

The most effective approach, however, is ensuring that all pregnant women complete at least 4-ANC visits, which has further compounding effect on other healthcare service utilization, improved Skilled Birth attendance, health institution delivery and receiving vaccination during the pregnancy and after delivery. On the other hand, cost of accessing the health facility or health service including distance from the health centers, and cost of transportation and treatment are the hinderance limiting uptake of the health services. Thus, two approaches can improve the healthcare service utilization making healthcare affordable through increased health center coverage or taking the service to the community level, through community-based service.

Given that the low rate of ANC utilization, only one in ten pregnant women were attending the appropriate number of ANC and one in four didn't attended any ANC; about 70% are not receiving skilled assistance from skilled health professional during delivery; and 8 in ten women are delivering at home; it is clear that an assorted effort is needed to save lives of thousands of women and children dying of preventable disease associated with birthing by increasing the proportion of women who can adequately utilize ANC, one of the effective path to improve maternal health care utilization.

Awareness creation goes with improved adolescent education through mass media including radios, and community-based awareness creation campaigns. Education plays a central role both in creating awareness and utilization of ANC. The other aspect that needs close attention and effort from the government is engaging men in reproductive health intervention, as men have an upper hand to make decisions for women to visit health facility or not; a husband can not only encourage the woman to attended ANC but also provide support needed for the woman. Engaging men in maternal health care promotion initiatives should be part of the national health policy.

"Declarations"

i. Ethics approval and consent to participate

This study received Approval from Somalia Federal Republic Ministry of Health and Human service, Research & Ethics Committee on date 31st March 2021 with reference number MOH&HS/DGO/1600/12/2020. A verbal consent was obtained from all survey participants after the enumerators read out the consent form papers information explaining the nature, propose of the study, duration it will take to complete, and indicating that participation is fully voluntarily. If survey participants want to stop the interview they are free to do so at any stage. The national Ethics review process doesn't require written consent from participants for such kind of study with no-risk to participants. The approval obtained under the reference number MOH&HS/DGO/1600/12/2020 and attached document. The manuscript doesn't contain individual person's data in any form (including any individual details, images or videos).

Ethical Approval Letter[32652].pdf

The authors confirm that this study have been performed in accordance with the Declaration of Helsinki and received relevant approvals from local ethics committee.as attached in ii.

ii. Consent for publication

Not applicable

iii. Availability of data and material

The datasets used and analysed during the current study are available from the corresponding author on reasonable request. Raw and processed dataset used for this study and data analysis scripts can be obtained on demand from the principal author: temesgen.bocher@savethechildren.org.

iv. Competing interests

All authors included in authorship declare that there is no competing interests. There is no financial and/or non-financial competing interests related to this study.

v. Funding

This study benefited from the project implemented under BMZ/FFO. The data used in this study collection, analysis, and report writing manuscript supported by the fund by BMZ.

vi. Authors' contributions

TB. and AA: - Designed the study, prepared tools for the data collection, analyzed data and produced draft main manuscript.

JK: Provide data cleaning support and design tools for the data collection process.

MM: Provide technical review for the manuscript and facilitated financial support for the study.

ML: Review the papers for language consistence and layout.

All authors have read and approved the manuscript.

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Not applicable,

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