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The Role of Information and Communication Technology in Maternal Health Care Access in Somaliland: A Multilevel Ordinal Logistic Regression Analysis of SLDHS 2020

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Abstract

Background

Maternal health remains a critical challenge in Somaliland, where socioeconomic, geographic, and informational barriers make it hard to get care. Information and Communication Technology can make it easier for mothers to get health care by raising awareness and ensuring they get care on time. This study investigated the influence of ICT and socio-demographic factors on maternal healthcare access among women in Somaliland.

Methods

This cross-sectional study utilized data from 2,565 women of reproductive age (15–49 years) who participated in the 2020 Somaliland Demographic and Health Survey (SLDHS). Maternal health care access was classified as absent, moderate, or severe issue according to perceived obstacles to care. Exposure to ICT encompassed mobile phone ownership, internet usage, and the regularity of interaction with mass media (television, radio, newspapers). We used multilevel ordinal logistic regression to look at how ICT and socio-demographic factors affected access to maternal health care, taking into account clustering at the community level. We reported adjusted odds ratios (AORs) with 95% confidence intervals (CIs).

Results

Socioeconomic status, region, literacy, partner’s occupation, and ICT exposure had a big effect on access to maternal health care. Women in the highest wealth category were less likely to have access problems (AOR = 0.438; 95% CI: 0.24–0.80). On the other hand, women in remote areas like Sanaag were more likely to have access problems (AOR = 8.783; 95% CI: 4.84–15.94). There was a strong link between ICT exposure and better access. Women who used the internet or watched TV, listened to the radio, or read newspapers on a regular basis were much less likely to have access problems (AORs between 0.352 and 2.41). Having a cell phone by itself did not have a big effect on access.

Conclusion

Access to maternal health care in Somaliland is unfair and heavily affected by socioeconomic, regional, and informational factors. Exposure to ICT and mass media is very important for improving access. This shows that we need to focus on ICT-based

interventions and strategies that are specific to each region. Strengthening digital health literacy and ensuring equitable information dissemination can reduce barriers and enhance maternal health outcomes.

Background

Maternal health encompasses the physical and mental well-being of women during three critical stages: pregnancy (antenatal care), childbirth (birth care), and the postnatal or postpartum period(1, 2). It is a foundational component of population health, including family planning and preconception care, which are essential for the survival and economic productivity of both mothers and newborns(3). Despite the vital importance of these services, ensuring access to maternal healthcare remains a profound global challenge, particularly in resource-constrained environments(4). Approximately 99% of global maternal deaths occur in developing nations, with regions like Sub-Saharan Africa and Southern Asia facing the highest mortality ratios(5). In countries such as Nigeria, Ethiopia, India, and Indonesia, marginalized communities frequently face systematic barriers to care, including geographical remoteness, inadequate infrastructure, and severe shortages of trained healthcare professionals(4). Traditional service delivery models, which rely heavily on in-person facility visits or home visits by health workers, are often undermined by long travel distances, high transport costs, and excessive waiting times(5). Furthermore, high morbidity rates in these regions are often linked to unhealthy practices driven by misinformation or a lack of awareness regarding pregnancy complications(3, 6). The concept of health equity, an ethical imperative ensuring that no one is prevented from being healthy due to their underlying social or economic status, is central to addressing these disparities(7).

In Africa, less than 50% of moms get health care from trained delivery attendants, and 1 in 31 of these mothers will die. From 2009 to now, Uganda has seen a drop in the number of mothers who die during childbirth, from 336 to 189 fatalities per 100,000 live births. 2016 to 2015–2022, respectively(8). There were also similar drops in pregnancy-related mortality, from 438 to 228 per 100,000 live births from 2004 to 2011 and from 2015 to 2022 in that order. These ratios are still higher than the objective of 70 maternal deaths per 100,000 people established by the Sustainable Development Goals. The necessity of this research is to identify suitable solutions to enhance healthcare access based on empirical evidence(9). Information and Communication Technology (ICT) has emerged as a transformative tool to distribute healthcare resources more equitably. Its application in health, broadly termed eHealth, includes telemedicine, electronic medical records, and mobile health (mHealth)(10). mHealth specifically leverages portable electronic devices and wireless networks to provide real-time data communication and health information. Because mobile phones are increasingly portable, affordable, and accessible to real-time data communication and access to only available in remote areas, they offer a unique

platform to bridge the gap between rural populations and clinical expertise(11). Despite this potential, the implementation of maternal ICT interventions faces significant infrastructural and social hurdles, including unreliable power supplies, poor network connectivity, high hardware costs, and gender-based digital disparities(3).

Despite these potential benefits, the role of ICT in enhancing maternal health care access in Somaliland remains underexplored. Previous studies in LMICs have suggested that IT interventions can increase the utilization of maternal health services, improve patient-provider communication, and reduce delays in seeking care(12). Factors such as maternal education, household wealth, distance to healthcare facilities, availability of antenatal care, and digital literacy significantly influence the effectiveness of ICT-based interventions(13, 14). This study seeks to furnish credible information regarding the function of Information and Communication Technology (ICT) in enhancing access to maternity healthcare services in Somaliland. The results are meant to help shape policies and practices that can improve the health of mothers and babies. Additionally, this research aids in the attainment of multiple Sustainable Development Goals (SDGs), including SDG 3 on ensuring healthy lives and promoting well-being.

Methods and materials

Study setting

The research was carried out in Somaliland, a self-proclaimed independent nation in the Horn of Africa, with a population of almost 4.5 million. Somaliland is located between Djibouti, Ethiopia, and Somalia. It covers 176,119.2 km2, has an 850 km coastline, and has a wide range of terrain, from coastal plains to steep northern areas (1,800–2,100 m). There are both wet and dry seasons in the weather. Most of the people are Somali and Muslim. Moreover, a third of the people live in Hargeisa, the capital. Somaliland is made up of six regions and 22 districts that are in charge of running the country. Somaliland's economy is growing because of cattle exports, but it still has problems because it is a low-income country with few foreign investments and trade prospects. In 2018, remittances and livestock exports to the Gulf States added up to an estimated GDP of $2.5 billion and a per capita GDP of $566. However, the fact that other countries don't recognize it makes it much harder for the country to get bilateral agreements and direct donor investments.

Data Source and Study Period

The study included data from the 2020 Somaliland Demographic Health Survey (SLHDS), the inaugural nationally representative health survey in the nation. This cross-sectional poll was performed from August 2018 to December 2019.

Sample Size and Sampling

This study examined a weighted sample of 2,565 women of reproductive age (15–49 years) from the 2020 Somaliland Demographic Health Survey (SLHDS) dataset. These ladies had been pregnant within the five years preceding the poll. The SLHDS used a two-step sampling method. To begin, a Geographic Information System (GIS) was used to map out homes and establish enumeration areas (EAs), which are groups of homes having at least 50 and at most 149 homes. We digitized a total of 2,923 EAs, or primary sampling units (PSUs), which are made up of 1,869 urban and 1,054 rural areas. The final sampling frame included 2,086 PSUs, taking into consideration security concerns that made it impossible to visit some EAs. We used probability proportional to size (PPS) sampling to choose 35 EAs from each of Somaliland's six first-level administrative divisions in the first stage of sampling. After that, a full list of all the households in each of the 35 selected EAs was made to find out how many there were. Sample ground verification was also done to make the sampling frame better, if needed.

Study variables

Outcome Variable

The variable "maternal health care access" is derived from responses to questions in the SLDHS 2020 that measure barriers women face when seeking maternal health services. Specifically, the DHS asks women whether they experience difficulty with the following: obtaining permission to visit a health facility, the distance to the health facility, obtaining the necessary funds for treatment, and traveling to a health facility alone. Each item is answered with either “big problem” or “not a big problem.” Based on these responses, the outcome variable "maternal health care access" was constructed as an ordinal categorical variable with values of 1, 2, and 3. In the first model, women who responded “not a big problem” to all four questions were classified as having “no problem” (coded as 1). Those who reported that either distance to the health facility or the cost of treatment was a “big problem”, regardless of their responses to the other questions, were classified as having a “severe problem” (coded as 3). All remaining respondents were categorized as experiencing a “moderate problem” (coded as 2). In the second model, the criteria for the “severe problem” category were narrowed to include only women who reported a major issue in obtaining the necessary funds for treatment. Women who identified distance as a big problem were reclassified into the “moderate problem” group. This modification was made on the assumption that, while distance may be challenging, women can still overcome it with support from family or community, provided they can afford the cost of care.

Independent variables

The independent variables comprised a total of 12 explanatory factors, selected based on their theoretical relevance and prior research evidence. These included both sociodemographic and ICT-related variables. Sociodemographic variables consisted of maternal age, place of residence, region, literacy, maternal employment, partner's occupation, and household wealth index. ICT-related variables included ownership of a mobile phone, frequency of watching television, frequency of listening to the radio, frequency of reading newspapers or magazines, and ever using the internet.

Data analysis

Data were analyzed using Stata version 17. Data were cleaned and checked for completeness before analysis. Descriptive statistics, including frequencies and percentages, were computed to summarize the characteristics of study participants. Bivariate ordinal logistic regression was conducted to assess the association between socio-demographic and Information and Communication Technology (ICT) variables with maternal health care access. Variables with a p-value ≤ 0.25 in the bivariate analysis were included in the multivariable models. Multilevel ordinal logistic regression was employed to account for clustering within primary sampling units and to estimate the adjusted effects of both individual- and community-level factors on maternal health care access. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported, and statistical significance was set at $p < 0.05$. Model fit was assessed using likelihood-ratio tests, Akaike's Information Criterion (AIC), Bayesian Information Criterion (BIC), and intraclass correlation coefficients (ICCs) to evaluate the proportion of variance explained at the cluster level.

Results

Table 1 presents the bivariate ordinal logistic regression analysis assessing the association between demographic characteristics and Information and Communication Technology-related variables with maternal health care access among women in Somaliland, using SLDHS 2020 data. The results indicate significant differences in maternal health care access across various groups. Age was significantly associated with access ($p < 0.025$), with women aged 15–19 and 45–49 experiencing the highest levels of severe difficulties in obtaining care. Place of residence also showed a strong association ($p < 0.025$); nomadic and rural women were more likely to report severe access problems compared to women living in urban areas. A clear socioeconomic gradient was observed for wealth ($p < 0.025$), with women in the lowest and second wealth categories experiencing notably higher barriers to accessing maternal health services. Regional disparities were also apparent ($p < 0.025$), with regions such as Sanaag and Togdheer demonstrating higher levels of severe difficulty compared to Awdal, where challenges were comparatively lower. Employment status and partner's occupation were significantly associated with access ($p < 0.025$), as

unemployed women and those whose partners lacked formal employment reported more severe obstacles. Variables related to Information and Communication Technology exposure also showed important associations with maternal health care access. Women who watched television at least once a week reported fewer severe access problems compared to those who did not watch at all ($p < 0.025$). Similar patterns were observed for listening to the radio and reading newspapers or magazines, suggesting that regular access to information sources enhances awareness and reduces barriers to maternal healthcare. Internet use demonstrated one of the strongest associations ($p < 0.025$), with women who had ever used the internet reporting substantially fewer difficulties than those who had never used it. In contrast, literacy status and mobile phone ownership were not significantly associated with maternal health care access ($p > 0.025$). Overall, the results highlight that socioeconomic position, residential setting, and exposure to Information and Communication Technology play a crucial role in determining the level of access to maternal health care among women in Somaliland.

Table 1
Bivariate Ordinal Logistic Regression Analysis of ICT Variables and Their Association with Maternal Health Care Access, SLDHS 2020

Variables	Frequency (%)	Maternal Health Care Access			χ^2 *p-value
		No problem	Moderate problem	Severe Problem	
Age					
15–19	74(2.88)	22(29.73)	0(0.00)	52(70.27)	40.93 *
20–24	317(12.36)	107(33.75)	11(3.47)	199(62.78)	
25–29	592(23.08)	157(26.52)	9(1.52)	426(71.96)	
30–34	661(25.77)	181(27.38)	22(3.33)	458(69.29)	
35–39	481(18.75)	140(29.11)	0(0.00)	341(70.89)	
40–44	240(9.36)	66(27.50)	10(4.17)	164(68.33)	
45–49	200(7.80)	46(23.00)	0(0.00)	154(77.00)	
Residence					
Urban	1351(52.67)	465(34.42)	46(3.40)	840(62.18)	102.85 *
Rural	1032(40.23)	233(22.58)	6(0.58)	793(76.84)	
Nomadic	\182(7.10)	21(11.54)	0(0.00)	161(88.46)	
Wealth index					
Lowest	255(9.94)	39(15.29)	0(0.00)	216(84.71)	153.72 *
Second	220(8.58)	28(12.73)	0(0.00)	192(87.27)	
Middle	359(14.00)	79(22.01)	1(0.28)	279(77.72)	
Fourth	628(24.48)	151(24.04)	12(1.91)	465(74.04)	
Highest	1103(43.00)	422(38.26)	39(3.54)	642(58.20)	
Region					
Awdal	246(9.59)	125(50.81)	0(0.00)	121(49.19)	114.61*
Marodijeh	253(9.86)	73(28.85)	11(4.35)	169(66.80)	
Sahil	287(11.19)	65(22.65)	10(3.48)	212(73.87)	

Variables	Frequency (%)	Maternal Health Care Access			χ^2 *p-value
Togdheer	493(19.22)	119(24.14)	9(1.83)	365(74.04)	
Sool	543(21.17)	175(32.23)	0(0.00)	368(67.77)	
Sanaag	743(28.97)	162(21.80)	22(2.96)	559(75.24)	
Literacy					
Illiterate	2451(95.56)	689(28.11)	52(2.12)	1710(69.77)	2.78
Literate	114(4.44)	30(26.32)	0(0.00)	84(73.68)	
Occupation					
Employed	30(1.17)	0(0.00)	0(0.00)	30(100.00)	13.05 *
Unemployed	2535(98.83)	719(28.36)	52(2.05)	1764(69.59)	
Partner's occupation					
Yes	1693(66.00)	538(31.78)	38(2.24)	1117(65.98)	37.29 *
No	872(34.00)	181(20.76)	14(1.61)	677(77.64)	
Owns a mobile phone					
Yes	2354(91.77)	665(28.25)	48(2.04)	1641(69.71)	0.72
No	211(8.23)	54(25.59)	4(1.90)	153(72.51)	
Frequency of watching television					
At least once a week	501(19.53)	228(45.51)	34(6.79)	239(47.70)	188.55 *
Less than once a week	159(6.20)	52(32.70)	0(0.00)	107(67.30)	
Not at all	1905(74.27)	439(23.04)	18(0.94)	1448(76.01)	
Frequency of listening to the radio					
At least once a week	125(4.87)	25(20.00)	0(0.00)	100(80.00)	15.80 *
Less than once a	102(3.98)	19(18.63)	0(0.00)	83(81.37)	

Variables	Frequency (%)	Maternal Health Care Access			χ^2 *p-value
week					
Not at all	2338(91.15)	675(28.87)	52(2.22)	1611(68.91)	
Frequency of reading a newspaper or magazine					
At least once a week	82(3.20)	13(15.85)	0(0.00)	69(84.15)	12.97 *
Less than once a week	59(2.30)	23(38.98)	0(0.00)	36(61.02)	
Not at all	2424(94.50)	683(28.18)	52(2.15)	1689(69.68)	
Ever used the internet					
Yes	451(17.58)	229(50.78)	12(2.66)	210(46.56)	144.84 *
No	2114(82.42)	490(23.18)	40(1.89)	1584(74.93)	

*p-value less than 0.025

Table 2 presents the random effects analysis and model comparison results for the hierarchical models assessing determinants of maternal health care access in Somaliland. The null model, which contains no explanatory variables, shows a tau-squared (τ^2) value of 1.453 and an intraclass correlation coefficient (ICC) of 0.3064. This indicates that 30.6% of the total variation in maternal health care access is due to differences between clusters, highlighting the substantial influence of community- or cluster-level factors. When socio-demographic variables were introduced in Model I, the cluster-level variance slightly decreased ($\tau^2 = 1.388$; ICC = 0.2968), showing that individual socioeconomic and demographic characteristics explain part of the between-cluster variability. Model II, which included Information and Communication Technology variables, further reduced the variance ($\tau^2 = 1.1895$; ICC = 0.2656), suggesting that exposure to information sources contributes meaningfully to explaining disparities in maternal health care access. Model III, which combined both socio-demographic and Information and Communication Technology variables, showed an increased tau-squared value ($\tau^2 = 1.7546$) and ICC (0.3478). This rise suggests that although the model includes a wider range of predictors, substantial unexplained variation remains at the cluster level, possibly due to contextual or health system differences that were not captured. Model comparison statistics support

progressive improvement in model fit across the models. Log-likelihood values improved from −1660.4186 in the null model to −1495.9296 in the full model (Model III). Similarly, Akaike's Information Criterion (AIC) decreased from 3326.837 to 3051.859, and Bayesian Information Criterion (BIC) demonstrated consistent improvement, indicating better model performance. The Likelihood Ratio Tests were statistically significant for all models ($p < 0.0001$), confirming that each successive model provided a significantly better fit than the previous model. Overall, these results highlight that both socio-demographic and Information and Communication Technology variables significantly contribute to understanding maternal health care access, while notable cluster-level differences continue to influence outcomes.

Table 2
Random effect analysis and model comparison

Parameters	Null Model	Model I	Model II	Model III
Tau-squared (τ^2)	1.453	1.388	1.1895	1.7546
Inter-class correlation (ICC)	0.3064	.2968	.2655564	.3478265
Log-likelihood ratio (LLR)	-1660.4186	-1559.6154	-1564.5819	-1495.9296
Akaike's information criterion (AIC)	3326.837	3163.231	3151.164	3051.859
Bayesian information criterion (BIC)	3344.386	3291.924	3215.511	3227.351
Likelihood Ratio Test (LR test)	196.28	143.48	136.12	158.71
p-value	<0.0001	<0.0001	<0.0001	<0.0001

As Table 3 presents, a multilevel ordinal logistic regression analysis was conducted to examine the socio-demographic characteristics and Information and Communication Technology (ICT) factors that influence maternal healthcare access in Somaliland, using SLDHS 2020 data. Among the socio-demographic variables, wealth index, region, literacy status, and partner's occupation were found to be significantly associated with maternal health care access. In terms of regional disparities, women residing in Marodijeh, Sahil, Togdheer, Sool, and Sanaag exhibited substantially higher odds of reporting difficulties in accessing maternal health care compared with women from Awdal. For example, women in Sanaag demonstrated the highest likelihood of experiencing barriers (AOR = 8.783; CI: 4.84–15.94). Wealth status also emerged as an important determinant. Women in the highest wealth category were significantly less likely to face maternal health care access problems (AOR = 0.438; CI: 0.24–0.80), and similar protective effects were observed in the fourth wealth category in Model I. Literacy was another significant factor, where illiterate women showed increased odds of difficulty accessing maternal health care (AOR = 0.474; CI: 0.252–0.89). Partner's occupation also demonstrated a strong association, with women

whose partners were not employed having higher odds of experiencing barriers (AOR = 1.49; CI: 1.16–1.92). Meanwhile, age and ownership of a mobile phone did not show significant associations in the final model. Regarding Information and Communication Technology factors, several indicators exhibited strong and consistent associations with maternal health care access. Women who watched television less than once a week or not at all had significantly higher odds of encountering difficulties compared with those who watched at least once a week (AOR = 3.37; CI: 1.99–5.71 and AOR = 3.03; CI: 2.15–4.27, respectively). Similarly, women who did not listen to the radio showed increased odds of poor access (AOR = 0.379; CI: 0.199–0.721), while limited or no newspaper and magazine exposure was significantly associated with higher odds of facing challenges. For instance, women who did not read newspapers at all had higher odds of experiencing maternal health care access problems (AOR = 0.352; CI: 0.155–0.80). Furthermore, internet use emerged as one of the strongest predictors. Women who had never used the internet faced significantly higher odds of encountering maternal health care access barriers (AOR = 2.41; CI: 1.8–3.26). Overall, the findings highlight that socio-demographic conditions, particularly wealth, region, literacy, and partner's occupation along with several Information and Communication Technology exposure indicators, play a critical role in determining maternal health care access in Somaliland.

Table 3
Multivariate Ordinal Logistic Regression Examining the Role of Information and Communication Technology in Improving Maternal Health Care Access in Somaliland (SLDHS 2020)

Characteristics	Null model	Model I	Model II	Model III
Age		AOR with 95%CI	AOR with 95%CI	AOR with 95%CI
15–19		Ref	Ref	Ref
20–24		.65(.334,1.25)		.614 (.312,1.20)
25–29		1.32(.70, 2.48)		1.07(.557,2.07)
30–34		1.07(.573,2.01)		.971 (.505,1.87)
35–39		1.08(.566,2.05)		.763(.389,1.498)
40–44		1.51(.756,3.04)		.972(.467,2.02)
45–49		1.194(.587,2.43)		.787(.375,1.65)
Residence				
Urban	Ref	Ref	Ref	Ref
Rural		1.17 (.78,1.77)		1.13(.727,1.756)
Nomadic		3.08(1.07,8.85) *		2.58(.824,8.06)
Wealth index				
Lowest	Ref	Ref	Ref	Ref
Second		1.57(.83,2.973)		1.5(.78,2.88)
Middle		.8196(.467,1.44)		.913(.511,1.631)
Fourth		.546(.309,.964) *		.613 (.342,1.098)
Highest		.274(.154,.485) ***		.438(.24,.80) **
Region				
Awdal	Ref	Ref	Ref	Ref
Marodijeh		3.121(1.597,6.1) **		4.84 (2.38,9.84) ***
Sahil		5.798(3.09,10.89) ***		7.23 (3.71,14.1) ***
Togdheer		2.87(1.6,5.15) ***		3.53(1.92,6.49) ***

Characteristics	Null model	Model I	Model II	Model III
Sool		2.36(1.37,4.06) **		2.74 (1.56,4.82) ***
Sanaag		8.08(4.53,14.42) ***		8.783(4.84,15.94) ***
Literacy				
Illiterate	Ref	Ref	Ref	Ref
Literate		.565 (.316,1.008)		.474 (.252,.89) *
Partner's occupation				
Yes	Ref	Ref	Ref	Ref
No		1.28(1.02,1.62) *		1.49(1.155 1.92) **
Owns a mobile phone				
Yes	Ref	Ref	Ref	Ref
No			.923(.641,1.33)	1.03 (.692,1.54)
Frequency of watching television				
At least once a week	Ref	Ref	Ref	Ref
Less than once a week			3.29(2.01,5.39) ***	3.37(1.99,5.71) ***
Not at all			3.89(2.89,5.23) ***	3.03(2.15,4.27) ***
Frequency of listening to the radio				
At least once a week	Ref	Ref	Ref	Ref
Less than once a week			.88(.375,2.06)	.62 (.242,1.59)
Not at all			.46(.261,.812) **	.379(.199,.721) **
Frequency of reading a				

Characteristics	Null model	Model I	Model II	Model III
newspaper or magazine				
At least once a week	Ref	Ref	Ref	Ref
Less than once a week			.161 (.058,.452) **	.129(.043,.385) ***
Not at all			.31(.143,.671) **	.352(.155,.8) * **
Ever used the internet				
Yes	Ref	Ref	Ref	Ref
No			2.64(2,3.47) ***	2.41(1.8,3.26) ***

***** p<.01, ** p<.05, * p<.1 Ref, reference category; AOR, Adjusted Odds Ratio; CI, confidence interval.**

Discussion

This study examined the determinants of maternal health care access among women in Somaliland using data from the 2020 SLDHS. The findings reveal a complex interplay of socio-demographic characteristics, regional differences, and information and communication technology exposure in shaping women's ability to access essential maternal health services. These results underscore the need for context-specific strategies that address structural, social, and informational barriers to accessing maternal healthcare.

How is information and communication technology related to maternal health care access?

The study measured information and communication technology exposure through the frequency of watching television, listening to the radio, reading newspapers or magazines, mobile phone ownership, and internet use. Women who rarely or never watched television, listened to the radio, or read newspapers consistently reported higher odds of experiencing difficulties accessing care. This finding aligns with evidence from these studies(15–17) showing that mass media exposure enhances women's awareness of antenatal care schedules, danger signs, and available services. Internet use was one of the strongest predictors in this study, with women who never used the internet exhibiting

significantly higher barriers. This highlights the growing influence of digital information in shaping health-seeking behavior, particularly in settings with limited facility-based outreach. However, ownership of a mobile phone alone was not associated with improved access, suggesting that access to devices does not automatically translate into meaningful use of health information.

What other demographic factors have a significant effect on maternal healthcare access?

A central finding of this study is the strong role of socioeconomic conditions in determining maternal healthcare access. Women from the highest wealth group demonstrated significantly reduced odds of reporting difficulties accessing care compared with those in the poorest households. This aligns with previous research conducted in Ethiopia(18) and elsewhere(19–21). Access to maternal health services may be significantly hampered by household poverty. Women from low-income families could not have the necessary funds. should either pay for the services provided throughout the prenatal period or register at clinics. This may lead to a situation where such women would partially attend the clinics or not attend at all. Regional differences also emerged as a powerful determinant of maternal health care access. Women residing in Marodijeh, Sahil, Togdheer, Sool, and particularly Sanaag exhibited significantly higher odds of experiencing difficulties compared with women in Awdal. These findings reflect earlier studies documenting geographical inequalities in access to maternal health services due to variations in health facility distribution, transportation networks, and regional investment. (22, 23). The magnitude of disparities observed, especially in Sanaag, indicates systematic gaps in health infrastructure that disproportionately affect women in remote regions. This highlights the need for region-specific interventions addressing geographic isolation and service availability. Education plays an important role in shaping women’s ability to navigate the health system. Illiterate women had significantly higher odds of experiencing maternal health care access problems. These studies support this finding (24, 25). Lack of literacy limits women’s capacity to understand health information, recognize danger signs, and communicate effectively with health professionals. Interestingly, age was not significantly associated with maternal health care access in this study, suggesting that economic and contextual factors may exert stronger influences than age-related differences in health-seeking behavior. Additionally, women whose partners were not employed faced greater barriers, reflecting the importance of household economic security and male involvement in reproductive health decisions.

Conclusion

This study examined the role of information and communication technology alongside socio-demographic and contextual factors in shaping maternal health care access among

women in Somaliland, using data from the 2020 Somaliland Demographic and Health Survey. The findings demonstrate that maternal health care access remains unequally distributed and is strongly influenced by socioeconomic status, regional location, literacy, partner's employment, and exposure to information sources. Exposure to information and technology is a critical determinant of maternal health care access. Women who regularly watched television, listened to the radio, read newspapers or magazines, or had ever used the internet were significantly less likely to experience barriers to accessing maternal health services. In contrast, women with limited or no exposure to these information channels faced substantially higher odds of reporting moderate to severe access problems. These findings highlight the importance of information dissemination in improving awareness, health literacy, and timely utilization of maternal health services. Notably, ownership of a mobile phone alone was not sufficient to improve access, emphasizing that meaningful use of information, rather than mere access to technology, is essential. Socioeconomic and regional disparities also played a central role. Women from poorer households, those residing in remote regions, particularly Sanaag, and those with unemployed partners were more likely to face significant barriers. Illiteracy further compounded these challenges, limiting women's ability to navigate the health system and utilize available services effectively, of community and health system factors beyond individual characteristics.

Overall, the study underscores that improving maternal health care access in Somaliland requires a multifaceted approach. Strengthening information and communication technology-based health communication, expanding equitable access to mass media and internet services, and addressing underlying socioeconomic and regional inequalities are essential. Policymakers and health planners should prioritize targeted, region-specific interventions and integrate ICT strategies into maternal health programs to enhance information reach, reduce barriers, and promote equitable access to maternal health care services across Somaliland.

Abbreviations

BIC
Bayesian Information Criterion
CI
Confidence Interval
DHS
Demographic and Health Survey
EA
Enumeration Area
GIS
Geographic Information System

ICC
Intraclass Correlation Coefficient
ICT
Information and Communication Technology
LMICs
Low–and Middle–Income Countries
LLR
Log–Likelihood Ratio

Declarations

Ethical approval and consent to participate

This study was based on secondary analysis of publicly available data from the 2020 Somaliland Demographic and Health Survey (SLDHS). The SLDHS survey protocol was reviewed and approved by the relevant national ethics review authorities and the Institutional Review Board (IRB) of ICF International. The dataset used in this study was fully anonymized and obtained with permission from the DHS Program. No direct contact with human participants was involved in this analysis. Therefore, additional ethical approval was not required for this secondary analysis in accordance with national regulations. All methods were carried out in accordance with the principles of the Declaration of Helsinki.

Consent for publication

Not applicable

Competing interests

The authors declare no competing interests.

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Author Contribution

All authors contributed to the research, writing, and final approval of the manuscript and are accountable for its content. All authors were involved in the study's design, data analysis, and manuscript preparation.

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Data Availability

The data used in this study were obtained from the Somaliland Demographic and Health Survey (SLDHS) 2020, conducted by the National Bureau of Statistics (NBS), Somaliland. The dataset is available upon reasonable request from the National Bureau of Statistics.

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