MATERNAL HEALTH CARE SERVICES UTILIZATION AND ASSOCIATED FACTORS AMONG WOMEN IN ZOBA MAEKEL, ERITREA 2022: A COMMUNITY BASED STUDY

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Abstact

Introduction: Studies reveal that regular utilization of maternal health care services reduces maternal morbidity and mortality in which these services are affected by complex factors which may be similar across populations. **Methods:** A community based cross sectional study was conducted from February to May of 2022. A total of 607 women who gave birth in the last 2 years and residing in the area for at least 6 months were selected by two stage cluster sampling technique. A predesigned and pretested questionnaire was used to collect data via face to face interview technique. Chi-square test and multivariable logistic regression were used for data analysis using SPSS (Version 26). **Results:** Magnitude of maternal health care services utilization was found as; attending antenatal care 99.9%, institutional delivery 99.3% and postnatal care 91.4%. The majority (91.4%) were aware of postnatal care. The proportion (91.5%) of women who utilized postnatal care among those with awareness about it was significantly greater ($p<0.001$) than the proportion of women who utilized it and with no awareness (63.5%). The nationwide lockdown due to COVID- 19, sudden onset of labor, feeling well were barriers to attending antenatal care, institutional delivery and postnatal care services respectively. **Conclusion:** Prevalence of antenatal care, institutional delivery and postnatal care services was higher than the national estimate. Improving the quality of care around the time of pregnancy, birth and postpartum is recommended to continuously sensitize the community about the services and further increase the utilization.

Keywords: Maternal Health Care Service utilization, associated factors, women

INTRODUCTION

Pregnancy and delivery are essential events in human life; it is therefore important to pay special attention to women during those times [1]. Maternal health is the health of women during pregnancy, childbirth, and postpartum period [2, 3]. Maternal health care services (MHCS) are antenatal care (ANC), delivery care and postnatal care (PNC) services [4]. The prime concern of MHCS is to prioritize reproductive health of women along with the well-being of newborn [5, 6]. Timely access to skilled maternal health services is necessary to decrease the rates of adverse health outcomes among mothers and newborns [7, 8].

Utilization of recommended ANC during pregnancy improves maternal and child health outcomes [9, 10]. Evidence from demographic health survey data from 17 Sub-Saharan Africa (SSA) countries showed that having prenatal care provided

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by a skilled practitioner reduced the odds of neonatal mortality by 30% [11]. Findings from a systematic review in Ethiopia also showed that ANC utilization reduced neonatal mortality by 34% [12]. Previous studies have found an association between the deaths of children less than 1year old and skilled birth and health facility delivery. A systematic review from developing countries showed that delivery at health facilities reduced the risk of under-1 child mortality by 29% [13]. A systematic review conducted in developing countries also found that frequent postnatal visits reduced neonatal deaths; it also encouraged women to breastfeed exclusively [14-16]. All in all, maternal health has become a global concern because the lives of millions of women in reproductive age can be saved through proper utilization of MHCS [17].

Despite efforts that have been made to strengthen MHCS, maternal mortality is still high in most of the developing countries [3, 4, 13, 18-20]. The huge number of maternal death, specifically in low and middle income countries is because of low level of MHCS utilization, Eritrea is no exception. Eritrea is one of the countries with the highest burden of maternal and newborn deaths in Africa with maternal mortality ratio (MMR) of 486 deaths per 100,000 live births (or alternatively 5 deaths per 1,000 live births). It is true that there has been a declining trend in MMR since 1996. It declined from 656 deaths per 100,000 live births during the period 1996-2000 to 561 deaths during 2001-2005 and to 486 deaths per 100,000 live births between 2006 and 2010 [21]. Still the country stands at a number where there is a need for enhancement of nursing and midwifery services which can help achieve the Millennium Development Goals. To achieve the newly set Sustainable Development Goals3 (i.e. reducing the global MMR to less than 70 per 100,000 live births in 2030), Eritrea needs to increase the rate at which it reduces its annual maternal mortality and this can only be achieved through proper utilization of MHCS. In addition, different predictors have been found to be associated with the utilization of MHCS and can be grouped as sociodemographic, behavioral, institutional, and service quality-related factors [22, 23].

Thus this study is conducted with the aim at filling the gap of lack of studies on MHCS utilization and exploring the associated factors can assist health planners to prioritize promotion strategies which is a fundamental step for intervention. This research employed the

Health Belief Model which posits that an individual's health-care utilization choice is dependent on the perceived risk of becoming ill, severity of illness, perceived balance of benefits against costs of treatment, and source of information on treatment of illness [24-27].

METHOD

Design and study place

A community based cross-sectional study design was employed from February to May of 2022 in Maekel region, Eritrea. Administratively, the country is divided into six regions called zobas (districts). The six zobas are Semenawi Keih Bahri, Debubawi Keyh Bahri, Maekel, Anseba, Debub and Gash-Barka as shown in Map 1 (Supplemental material 3). According to the municipality of Asmara, Maekel region is home to a population of 608,637 people with 328, 469 of them being females.

Map 1: Eritrea and its subzones

Study Population

Maekel region is divided in to sixteen subzones namely Abashawel, Akria, Arbaete Asmara, Berik, Edaga Hamus, Gala Nefhi, Gejeret, Geza Banda, Godaif, Maekel Ketema, Maitemenay, Paradizo, Sembel, Serejeka, Tiravolo, Tsetserat as shown in Map 2 (Supplemental material 4). The selected subzobas for the study along with their respective mimhdar kebabis are shown in Table 1 (Supplemental Table 1). All women who gave birth in the last 2 years and residing in the areas for at least 6 months during the study period were the study population.

Map 2: Zoba Maekel and its subzones

Sample size

The sample size is determined by the single population formula considering the two stage sampling technique as shown below

$$n_1 = \frac{(Z\ \alpha/2)^2 P\ (1-P)\ *\text{Design Effect}}{d^2}$$

where

n = Sample size

Z1-α/2 = 1.96 critical value (confidence limit)

P = 0.5 (to guarantee the maximum sample size needed since no other similar studies was conducted before)

d = 5% precision (marginal error)

Design Effect = 1.5

The initial sample size was found to be 577 and further adjusted for potential non-response (5%) using:

$n_2=n_1/0.95=607$ mothers.

Sampling technique

Due to a wide area of the targeted study, two stage cluster sampling technique was used to select sample mothers from the study site.

First stage

The primary sampling units (PSU) were selected using probability proportionate to size. The sampling frame consists of all villages/administrative area in Zoba Maekel. A total of 15 cluster/villages were selected as PSU.

Second stage

Each selected subzone was subdivided into segments, whereby in this case were the mimhdar kebabi. Data from each mimhdar kebabi was reported to the sub zonal offices. The reports were used to select one mimhdar kebabi (segment). Then 40 mothers were selected from the sampled mimhdar kebabis using systematic sampling technique from the list obtained by the administrative office.

To identify the interval, the total number of women was divided by the total sample size. The first woman was selected by lottery method. The selected woman was visited at most three times during the field work and considered as non-response afterwards. The distribution and allocation of the mothers is shown in Table.

Table 1. Distribution of selected villages by sample size

Inclusion and Exclusion criteria

Distribution of selected villages by sample size

Subzone	Village	Number
ABASHAWL	ABASHAWL	40
AKRIA	AKRIA	41
ARBAETE ASMERA	ARBAETE ASMERA	41
EDAGAHAMUS	EDAGAHAMUS	41
GEJIRET	GEJIRET	41
GEZABANDA	GEZABANDA	41
GODAYF	GODAYF	41
MAEKEL KETEMA	MAEKEL KETEMA	41
PARADIZO	PARADIZO	40
SEMBEL	SEMBEL	40
TSETSERAT	TSETSERAT	40
BERIK	TSEAZEGA	40
GALA NEFHI	ADI QEYIH	40
GALA NEFHI	SELAEDAERO	40
SEREJEKA	EMBADERHO	40
Total		607

Women who gave birth within the last 2 years, women who resided in the area for at least 6 months and those willing to be part of the study were included in the study. Women who cannot communicate verbally and women sick at the time of study were excluded.

Data collection tools and techniques

A structured and pretested questionnaire adapted from a review of relevant studies done [4, 28] on MHCS utilization and associated factors was used to collect the quantitative data via face to face interview technique (Supplemental material 1). The questionnaire adapted was translated to the local language, Tigrigna, and then back to English by two different individuals to

check the consistency. The questionnaire has four sections. Section I addresses the Socio-demographic characteristics. Section II addresses ANC utilization, Section III addresses Institutional delivery utilization. Section IV deals with PNC utilization.

Data collection procedure

The data collection was carried out by five members of the research team who are fluent in speaking Tigrigna. Data collection took place at women's residences from February 1 to March 30. Pretest was done for 5% of sample size in unselected mimhdar kebabi. For households with more than one eligible women, the index woman was selected by simple random sampling using lottery method.

Definition of concepts and terms were made clear with a common language to the participants. The principal investigator did on-site supervision during the data collection period and review all filled questionnaires during the next morning of each data collection so as to identify incomplete and incoherent responses. The face and content validity of the questionnaire was addressed through panel of experts from Orotta College of medicine and health sciences (OCMHS) and Ministry of health (MOH).

Patient and Public involvement

No patient involved

Measurement of variables

The dependent variables were skilled maternal health care services utilization. These include the following three consecutive cares: Antenatal care service, skilled delivery care service and postnatal care service. Each variable is binary outcome. Each variable was labeled as '0' for non-utilization and '1' for utilization of the respective service.

- **ANC utilization:** If the woman received at least one ANC during her pregnancy
- **Skilled birth attendance**: If the women had delivered in a hospital or health care institution
- **PNC utilization:** Any visit herself or by a healthcare professional at least once

Independent variables were socio-demographic and reproductive health variables in this study. These explanatory variables were selected from various literatures.

Data Analysis Procedures

Data was directly entered to Statistical Package for Social Science (SPSS, Version 26). Then the data was cleaned before the analysis. After cleaning the data, weights were computed because two stage cluster sampling was used.

Descriptive summary for categorical variables was assessed using frequency and percentage, while quantitative variables are summarized using mean (SD) or median (IQR), as appropriate. Factors affecting the ANC and skilled birth attendant were not assessed because almost all were found to attend ANC and utilize skilled birth facility. However, factors affecting PNC were assessed using Pearson's (for contingency tables with sufficient frequencies of the cells) and Fisher's chi-square test (for contingency tables without sufficient frequencies of the cells). Tables and figures were used to present the results. *P*-values less than 0.05 were considered as significant throughout the analysis. Finally, the STROBE checklist was used to increase scientific rigor along with the research protocol.

RESULT

A total of 607 interviews were conducted at women's residence to assess MHCS utilization and its associated factors among those who gave birth in the last two years. All women approached to participate completed the study yielding a response rate of 100%.

Table 2. Demographic characteristics of the study participants (n=607)

Demographic variables	Frequency	Percentage
Age (Mean=30.65, SD=4.91, Min.=18, Max.=43)		
15 to 24	66	10.8
25 to 34	397	65.3
35 to 44	145	23.9
Mother's educational level		
Cannot read and write	8	1.3
Adult education	3	0.6
Elementary	44	7.2
Secondary	467	77.0
Higher education	85	14.0
Religion		
Muslim	43	7.1
Christian	564	92.9
Ethnicity		
Tigrigna	586	96.5
Others	21	3.5
Marital Status		
Single	41	6.7
Married	557	91.7
Divorced	7	1.1
Widowed	1	0.2
Separated	2	0.3
Mother's occupation		
Unemployed	491	80.9
Government employed	78	12.9
Self employed	38	6.3
Husband's occupation		
Unemployed	49	8.1
Government employed	371	61.1
Self employed	137	22.5
Head of household		
Myself	242	39.8
My husband	317	52.2
Others	47	8
Distance to health facility		
0-5km	589	96.9
6 or above	19	3.1

Demographic characteristics of study participants

Analysis of demographic characteristics as revealed in **Table 2** indicates that the mean age of the respondents was 30.65 (SD=4.91) and the age range was 18-43 with the majority (65.3%) belonging to the age group 25 to 34. The majority (77.0%) had attained secondary level of education. More than ninety percent (92.9%) were Christian followers and similar percentage (96.5%) belonged to the Tigrigna ethnic group.

Concerning study participants marital status, 91.7% were married and in regards to respondents occupational status; 80.9% of women were unemployed while only 8.1% of husbands were unemployed. When looking at women's autonomy, for the majority of the households husbands were the lead (52.2%) followed by women themselves (39.8%). Assessment of distance to nearest health facility showed that the majority (96.9%) lived less than 5 km away from the health facility.

Reproductive characteristics of study participants

Table 3 depicts the reproductive characteristics of respondents. Parity in terms of children born was assessed. The average parity expressed as median and IQR was 3 and 2 respectively. The majority (42.4%) had given birth two to three times. The average household size was 5.28 (SD=1.71) ranging from 1 to 12. The number of people living in the household was from 4 to 6 for more than half of study participants (58.2%). Women were questioned about the time of their last birth. The youngest child's age for more than a third (39.5%) of the participants ranged from 6 to 12 months, and at minimum respondents had a child less than 1 month of age and the maximum age was 24 months.

Table 3. Reproductive characteristics of the study participants (n=607)

Reproductive variables	Frequency	Percentage
Number of children born (Median=3.00, IQR=2, Min.=1, Max.=10)		
One	119	19.6
Two to three	257	42.4
4 or above	231	38.0
Household size (Mean=5.28, SD=1.71, Min.=1 Max.=12)		
Less or equal to 3	102	16.7
4 to 6	353	58.2
7 or above	152	25.1
Time of last birth (Median=8.00, IQR=9, Min.=0, Max.=24)		
< 6 months	209	34.3
6 to 12 months	240	39.5
13 months to 2 years	159	26.2

Utilization of maternal healthcare services (ANC, Institutional delivery, PNC)

Analysis of MHCS utilization as portrayed in **Table 4** revealed that almost all (99.9%) visited ANC for their last pregnancy. Among those who were available at ANC services, more than ninety percent (93.3%) had made four or above visits. The majority (99.3%) attended births at health facilities. Among

births not attended in the health facilities, three out of the five deliveries were at home of the parturient. Moreover, 91.4% women utilized PNC services. More than three fourth (65.7%) of participants made their first PNC contact within 24 hours but only 0.7% made four or more contacts. Respondents were further asked about what made them seek PNC. The majority (77.1%) said it was for a routine checkup while only 1% sought PNC during immunization of her child.

Table 4. Utilization of maternal healthcare services among study participants (n=607)

Utilization of MHCS	Frequency	Percentage
ANC utilization		
Yes	606	99.9
No	1	0.1
Frequency of ANC visits		
One	2	0.3
Two	7	1.2
Three	31	5.1
Four or above	567	93.3
Institutional delivery utilization		
Yes	602	99.3
No	5	0.7
Places of non-institutional delivery		
Own home	3	0.4
TBA home	1	0.1
On the way to a hospital	1	0.2
PNC utilization		
Yes	555	91.4
No	52	8.6
Timing of 1st PNC		
Within 24 hours	399	65.7
Within 3 days	45	7.3
7 to 14 days	81	13.3
6 weeks	17	2.7
Frequency of PNC		
One	374	69.1
Two	124	22.9
Three	40	7.3
Four or above	4	0.7
Reasons for seeking PNC		
Health problem	119	22.0
Routine check up	417	77.1
EPI service	5	0.9

Five deliveries which took place out of health facility were at own home, TBA home and on the way to a hospital

Barriers to maternal health care service utilization

Those who didn't utilize MHCS in their last childbirth were questioned about the factors that deterred them from utilizing MHCS and this is shown in **Table 5.** The national lockdown of COVID-19 pandemic made attending ANC impossible for only one woman. Only 5 (0.7%) did not deliver at the place they intended to of whom 9 wanted to deliver in health facility and one at her home.

Those who did not deliver in health facility were further questioned about what prevented them from delivering at a health facility. More than three quarter (79.7%) blamed sudden onset of labor for their non-institutional delivery. Only one had a poor belief to modern medicine and none of the respondents were ever concerned with long distance, lack of transport or the bad behavior of health workers. More than ninety percent (98.4%) of those who did not seek PNC was due to not facing a health problem. Distance to health facility and being alone at home were not reported as reasons.

Table 5. Barriers to maternal health care service utilization (n=1 for ANC, n=5 for institutional delivery, n=52 for PNC)

Barriers to MHCS utilization	Frequency	Percentage
Reasons for not attending ANC		
COVID-19 pandemic	1	100
The place you delivered, intended or not		
Yes	603	99.3
No	5	0.7
Intended place of delivery		
Own home	1	16.2
Health facility	4	83.8
Reasons for not delivering at a health facility		
Sudden onset of labor	4	79.7
Poor belief to modern medicine	1	16.2
Reasons for not seeking PNC		
Not faced with a health problem	54	98.4
Bad behavior of health workers	1	2.3

Information on PNC

Participants' information regarding PNC was assessed as shown in **Table 6.** The majority (91.4%) of respondents were aware of PNC. Participants were asked if they know the advantages of PNC and among those who have ever heard of the service, the majority (94.7%) answered that PNC is necessary to detect and treat maternal health problems followed by checking the condition of the newborn (62.8%). PNC services as the best avenue for family planning counseling and service was reported by only 5.5% of participants. PPH as a postpartum complication was reported by 91.4% of participants followed by sepsis (42.9%), hypertensive disorders (19.5%) and maternal death (13.7%).

Table 6. Information on PNC of study participants (n=607)

Information on PNC	Frequency	Percentage
Ever heard about PNC		
Yes	555	91.4
No	52	8.6
Advantages of PNC		
Opportunity for family planning	30	5.5
Check the condition of newborn	346	62.8
Get information about child feeding	53	9.6
Detect and treat maternal health problems	522	94.7
Get information about vaccine	79	14.3
Don't know	56	9.2
Knowledge of postpartum complications		
PPH	524	91.4
Maternal death	79	13.7
Sepsis	246	42.9
Hypertensive disorders	112	19.5
Delayed lactation	3	0.4
Obstetric fistula	5	0.8
After pain	14	2.3
Neonatal death	7	1.1
Neonatal illness	6	1.0
Postpartum psychosis	3	0.5
Umbilical bleeding	3	0.5

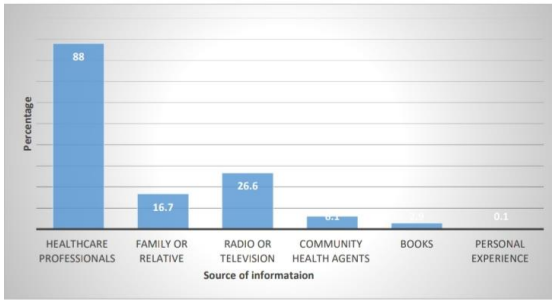

Figure 1. Source of information on PNC among women (n=555).

Those who have ever heard of PNC were further asked about their source of information regarding PNC. As shown in **Figure 1**, healthcare professionals (88%) were the source of information for the

majority of women followed by radio or television (26.6%), family or relative (16.7%). Only 2.9% and 0.1% obtained information regarding PNC from readings and their personal experience respectively.

Reasons for poor satisfaction to health care

More than eighty percent (86.8%) of women were satisfied with the services provided at health facilities while less than a quarter (13.2%) of the respondents were unsatisfied. **Table 7** indicates reasons given for poor satisfaction to health care. The main reasons for not being satisfied with the services at health facilities were; no drugs and supplies 49 (61.6%), bad behavior of health workers 41 (51.0) and poor service quality 17 (2.8%).

Table 7. Reasons for poor satisfaction to health care among study participants (n=527)

Reasons for poor satisfaction	Frequency	Percentage
No drugs and supplies	49	61.6
Bad behavior of health workers	41	51.0
Lack of privacy	2	2.9
Long distance to health facility	1	0.2
Poor service quality	17	2.8

Total percent might exceed 100 because of multiple responses

Reasons why women do not deliver at health facilities

Women were surveyed to explore why they do not deliver at health facilities as seen in **Table 8.** The commonly reported reasons were; sudden onset of labor (56.3%), lack of knowledge about the advantages (23.5%), long distance to health facility (23.1%). Lack of privacy, lack of transport, no previous ANC follow up, unqualified health workers, unaccompanied childbirth, unnecessary, unsupportive family, unwanted/unexpected pregnancy, wrong cultural belief were reported in lesser extent but in similar percentages.

Table 8. Reported reasons women do not deliver at health facilities (n=607)

Reasons women do not deliver at health facility	Frequency	Percentage
Sudden onset of labor	342	56.3
Bad behavior of health workers	25	4.2
Long distance to health facility	140	23.1
Lack of knowledge about the advantages	142	23.5

Total percent might exceed 100 because of multiple responses

Respondents were asked about the means of transport they use when they are referred to a health facility. As shown in **Figure 2**, the majority (60%) use a public transport, a little above a third (35.8%) turn to an ambulance when they need to and only 4.2% use their own means of transport to reach the desired health facility.

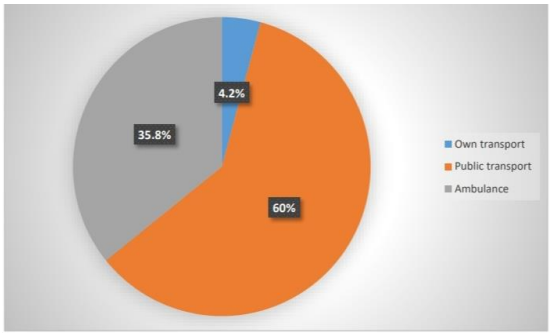

Figure 2. Means of transport when one is referred to another health facility (n=607).

Women were asked about what they usually do to cover the cost of transport when they are referred in the absence of an ambulance **(Figure 3).** The majority have to borrow from their neighbor/friends, and almost a third (30.2%) are able to use their savings and only 0.3% have to sell their property to cover the costs of transport.

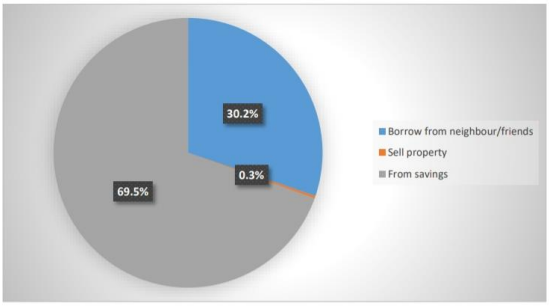

Figure 3. Means of covering transport when referred (n=607).

Recommendation for enhancement of the service

Study participants were asked to make recommendations about the current service as shown in **Table 9.** Almost half (50.7%) recommended the improvement in the availability of drugs and supplies. A third suggested that healthcare providers become more respectful (36.8%) and ambulances become available as necessary (34.8%). Less than a fifth (1.1%) desperately wanted the emergence of a new health facility specially a maternity hospital and increasing the number of health workers was demanded by 6.4% of respondents.

Adding cleaners to improve the sanitation status of the hospital, comfortable waiting rooms for care givers, avoiding discriminatory care, avoiding premature medical decisions (early decision for surgical interventions), provision of quality health education, better care and follow up in the delivery room, presence of labor companion, meticulous postpartum follow up, prioritized care, private care, addressing psychological process during labor, improve qualification of healthcare providers, painless labor were some of the suggestions recommended by women to a lesser extent but similar percentage.

Table 9. Reported recommendations from study participants (n=398)

Reported recommendations	Frequency	Percentage
Increase number of health workers	25	6.4
Improve availability of supplies and drugs	202	50.7
Respectful health workers	146	36.8
Presence of ambulance	115	29.0

Different cultures have different values, beliefs and practices. A woman's cultural background can affect her needs and expectations during pregnancy and childbirth, as well as how she and her family raise children. Respondents were openly asked if there were any traditional practices and preferences as shown in **Table 10.**

Almost half (52.3%) could not think of any traditional habit. Consumption of flax (known as common linseed to induce parturition), fume (smoke with application of butter on the hair and body) was reported by the majority (98.6%) of study participants who said there are traditional habits practiced before birth. Cultural values and food taboos due to health, cultural or spiritual reasons happen to exempt mothers from eating certain food items. Only 1 participant claimed avoiding eating banana for fear of fatty baby and difficulty during delivery as a common practice before birth.

Table 10. Traditional habits practiced before birth among study participants (n=290)

Traditional habits	Frequency	Percentage
Avoid eating banana	1	0.3
Drink Flax, fume and butter	286	98.6
Sleep on side	1	0.3
Ambulation (Taking a walk at evenings)	2	0.7

Factors affecting the utilization of PNC

Table 11 depicts the potential demographic and health related factors affecting the utilization of PNC which were assessed using chi-square test. The results revealed that age (p=0.828), parity (p=0.289), household size (p=0.239), time of last birth (p=0.348), distance of health facility (p=0.455), educational level (p=0.642), religion (p=0.801), marital status (p=0.069), mother's occupation (p=1.000), husband's occupation (p=0.817), head of household (p=0.268), and place of delivery (p=0.120) were not significantly related with utilization of PNC. However, awareness about PNC (p<0.001) was significantly related with the utilization of PNC.

The proportion of women who had utilized PNC among those who have heard about PNC (91.5%) was significantly greater (p<0.001) than the proportion of women who utilized PNC from those who have never heard of PNC (63.5%).

Table 11. Demographic and health related factors affecting the utilization of PNC among the women

Variable		PNC utilization		Chi-square	p-value
		Yes n (%)	No n (%)		
Age					
	15 to 24	59 (89.4)	7(10.6)	0.38	0.828
	25 to 34	355 (89.4)	42 (10.6)		
	35 to 44	127 (87.6)	18 (12.4)		
Parity					
	One	107 (89.2)	13 (10.8)	2.49	0.289
	Two to three	234 (91.1)	23 (8.9)		
	Four or above	200 (86.6)	31 (13.4)		
Household size					
	Less or equal to 3	88 (86.3%)	14 (13.7%)	2.87	0.239
	4 to 6	321 (90.9%)	32 (9.1%)		
	7 or above	132 (86.8)	20 (13.2%)		
Time of last birth					
	< 6 months	191 (91.4%)	18 (8.6%)	2.11	0.348
	6 to 12 months	212 (88.3%)	28 (11.7%)		
	13 months to 2 years	138 (86.8%)	21 (13.2%)		
Distance to health facility					
	0 to 5km	525 (89.1%)	64 (10.9%)		0.455§
	6 or above	16 (84.2%)	3 (15.8%)		
Educational level					
	Adult education	3 (100)	0		0.642§
	Elementary	37 (84.1%)	7 (15.9%)		
	Secondary	419 (89.5%)	49 (10.5%)		
	Higher education	76 (89.4%)	9 (10.6%)		
Religion					
	Muslim	38 (88.4%)	5 (11.6%)		0.801§
	Christian	503 (89.2%)	61 (10.8%)		
Marital status					
	Single	39 (97.5%)	1 (2.5%)		0.069§
	Married	493 (88.5%)	64 (11.5%)		
	Divorced	7 (100)	0		
	Widowed	0	1 (100)		
	Separated	2 (100)	0		
Mother's occupation					
	Unemployed	437 (89.0)	54 (11.0)		1.000§
	Government employed	67 (89.3%)	8 (10.7%)		
	Self employed	34 (89.5%)	4 (10.5%)		
Husband's occupation					

Unemployed	44 (89.8%)	5 (10.2%)	0.93	0.817
Government employed	212 (89.8%)	24 (10.2%)		
Self employed	121 (88.3%)	16 (11.7%)		
Head of household				
Myself	215 (89.2%)	26 (10.8%)	2.63	0.268
My husband	279 (88.0%)	38 (12.0%)		
Other	46 (95.8%)	2 (4.2%)		
Ever heard about PNC				
Yes	508 (91.5%)	47 (8.5%)	38.66	<0.001
No	33 (63.5%)	19 (36.5)		
Place of delivery				
Own home	2 (100.0)	0		0.120[§]
TBA home	0	1 (100.0)		
Health facility	538 (89.2%)	65 (10.8%)		

[§]*Fisher's exact test was used because the expected count for more than 20% of the cells was less than 5.*

DISCUSSION

This is a study, a first in its kind in the study area which tried to assess the utilization of MHCS and associated factors among women. Leaving the conflicts of extent of utilization and its determinants unsolved at individual level can lead to miss the target point of intervention during policy making and program design [28]. This study thus tried to provide adequate picture of the uptake of continuum of care from pregnancy to postpartum period in the Eritrean context. This study anticipated good MHCS utilization since it was conducted in an urban area.

As to the findings of the study, the proportion of women who attended ANC for their last pregnancy was 99.9% and the majority (93.3%) had 4 or more ANC visits. This is higher than that of national estimate. It is also higher when compared to all of the comparative studies taken inconsideration for this study. Berhan Tsegaye and his colleagues in their study found 69.1% of women who were utilizing ANC [28]. Any ANC was made by only 58.3% in a study by Pooja Singh and their associates [29]. Almost half women in India, west Bengal fully utilized ANC services [30]. The majority (87%) postpartum mothers attended ANC in a study conducted in Ghana [31]. A study from Pakistan came up with 57% of women who were utilizing ANC [32]. An analytical cross-sectional study in 2012 found a close percentage (98.6%) of ANC utilization to what is reported in this study [33]. A 2019 community based study found 69.1% of women who sought ANC [34].

Another Ethiopian community based study by Dereje Kifle and his associates found ANC utilization to be 74.3% [4]. A 2014 study in south Ethiopia also found 87.6% of women who made a visit to ANC clinic [35].

Results pertaining to skilled birth attendant delivery from this study was also high (99.3%). Similar to ANC utilization, the study's result is incomparably higher than the value reported in the majority of the studies. Pooja Singh and their associates reported 59.9% utilization of skilled delivery [29]. Prevalence of skilled delivery service from Berhan Tsegaye and his colleagues study was 52.1% [28]. A cross-sectional study in south Ethiopia found an overall skilled delivery utilization of 52.1% [34]. Less than one third (28.7%) of women attended institutional delivery in an Ethiopian study [4]. In a study by Gwamka Samson in 2012, only 44.0% delivered in health facilities [33].

Across the continuum of care, PNC is an important element of MHCS. PNC utilization from this study was 91.4%. More than sixty percent (65.7%) of this contact was made within 24 hours. The WHO recommendation is to provide PNC in the first 24 hours to all mothers and babies regardless of where the birth occurs. A full clinical examination should be done around 1 hour after birth, when the baby has had his/her first breastfeed. The baby should be checked again before discharge. For home births, the first postnatal contact should be as early as possible within 24 hours of birth and, if possible, an extra contact for home births at 24–48 hours is desirable [36]. With the majority of births occurring in a health facility in this study, the result appears to be low as all those who were delivered in the health facility should have been guaranteed PNC. To compare this studies result with other studies, it is remarkably high. For example, any PNC visits herself and any PNC visit by healthcare workers was 45.4% and 26.3% respectively in a study by Pooja Singh and their associates [29].

The prevalence of PNC utilization among women of reproductive age group was 32.7% and 22% in a study by Tsegaye et al. (2021) and Kifle et al. (2017) respectively. An overall utilization of PNC of 32.7% was reported in a community based study [34]. Only 7.3% and 13.3% utilized PNC services within 3 days and 7 to 14 days. The presence of cultural belief by community members who perceive movement outside of home could expose women for evil spirit probably decreased the postnatal care use by restricting

movement of women after delivery in the current study area.

PNC uptake was associated with having prior information, the only determinant for PNC utilization proved in this study. This was comparable to an Ethiopian study where the odds of utilizing PNC were 3.66 times higher (among those who had information about PNC) [34]. This might be because informed women are more likely to have a good awareness, increased level of the knowledge and skill of MHCS, and increased access to MHCS. This further led the researchers to ascribe the high utilization of PNC to women's place of domicile. Women living in urban areas are probably more knowledgeable about obstetric services because of their connectivity to social media, the influx of radio and television in urban areas that serve as a powerful tool to broadcast information on mother and baby's health and hence facilitates the uptake of these essential obstetric services as reported elsewhere [37, 38]. Though the study failed to find a positive or negative association between PNC utilization and the other maternal demographic and obstetric characteristics, maternal education status and autonomy of women to make decision on health issues were positively associated with utilization of PNC in an Ethiopian study [34].

Gap of information on PNC was evidenced in the current study as only 5.5% and 9.6% respectively stated that PNC is a moment of service for family planning and to get information about child feeding. Figure 1 from results section showed that healthcare professionals were the source of information for the majority (88%) of women. This was similar to a recent Ethiopian study where health professional were the source of information for 54.2% of women. These results in terms of source of information appear to be in favor of healthcare professionals so versing them with knowledge regarding MHCS through training may be of benefit to women as they can get appropriate counseling.

From the above discussions it is clear that the overall utilization of MHCS is much higher when compared to all of the researches taken into consideration for this study. The high result of this study as per the belief of the researchers is due to the study being conducted in an urban area where the level of infrastructural development as well as adequacy of health personnel is high compared to rural areas despite the fact that rural population have poor health outcomes compared to their counterparts in the towns and cities. For

instance in many studies, distance between home and the health facilities contributed to women utilizing MHCS to a lesser extent [33] but this was not a factor in this study as the majority (96.9%) lived less than 5km away from the nearest health facility. It is true that there are some studies conducted in urban areas only and yet the current study shows improved results. The researchers to their best knowledge have tried to justify this by highlighting the differences in cultural practices and extent of urbanization among study settings.

The uneven distribution of resources across geopolitical zones, rural/urban areas is supported by many literatures [39, 40]. It is also believed that there is widespread availability of private clinics/hospitals in urban areas and hence easier access to obstetric services in urban communities. The good living condition in urban areas could also have made recruiting training health professionals easier. Urban communities also tend to be more diverse with people from different cultural and socioeconomic backgrounds which promote sharing of ideas and practices that can influence the uptake of obstetric care services including PNC services [38].

Moreover, it has been reported from almost all studies that ANC utilization affects skilled birth delivery and the skilled birth delivery affects uptake of PNC. In this study, the high ANC utilization increased the chances of utilizing institutional delivery and likewise for PNC utilization. An argument for this is that during ANC visits, especially if booked early, women are provided with health education and information about the benefits of delivering in health facility.

Another argument forwarded for this is the difference in the operational definition or measurement used in the different studies. For example, ANC utilization was calculated as per percentage of women who have at least four ANC visits, including a visit in the first three months of pregnancy for their most recent pregnancy and PNC utilization was calculated as percentage of women who receive a PNC checkup within 48 hours of delivering their most recent birth [41]. Full ANC indicator was measured as those women who had four or more antenatal check-ups, had at least one tetanus toxoid injection and consumed iron and folic acid tablets or syrup for the last live birth during the 3 years preceding the survey period in a study by Pooja Singh and their associates [29]. A similar operational definition was employed in an Indian study [30]. It can be understood from this that a low threshold

for calculation of utilization was used and that probably brought high levels of MHCS utilization in this study.

Barriers to utilization of MHCS was assessed in this study. The main descriptive reason a study participant did not attend ANC was the nationwide lockdown associated with the current pandemic during her time of pregnancy. This of course was not reported in many studies as some were conducted long before evolution of the disease and some didn't struggle with providing MHCS to their pregnant population. As the COVID-19 pandemic unfolded, pregnant women were advised to take additional precautions. To reduce transmission risks for both pregnant women and health care workers, the International Federation of Gynecology and Obstetrics recommended the suspension of much routine ANC and replacement with video or telephone consultations whenever possible so a lot of countries did find a way to provide ANC or PNC services.

Several studies have been conducted worldwide on the factors affecting delivery in health facilities and the following was observed in addition to what was reported in this study. The issues of risk and vulnerability, short labor, geographical location, tradition, cultures and the pattern of decision-making power within the household were perceived as key determinants of place of delivery [42, 43].

The prevailing model of intrapartum care which gives a health care provider full control over the birthing process is believed to be exposing apparently healthy pregnant women to unnecessary medical interventions that interfere with the physiological process of childbirth. Similarly little attention to non-clinical intrapartum practices such as provision of emotional support through labor companionship, effective communication and respectful care, which may be fairly inexpensive to implement, are not regarded as priorities in many settings thus health provider behavior and attitudes are an important determinant factors for the choice of place of delivery for pregnant mother. Inadequate knowledge and skills for health workers on management of obstetric cases can be a barrier for delivery in health facilities. Several study found that health workers tend to unnecessary refer pregnant mother to higher level and this woman never tend to come back to the facility [44]. Some health workers are very rude, use abusive language and refuse to assist mothers [45, 46].

Lack of privacy is also documented as a barrier for delivery in health facilities because some older women don't want to be attended by younger midwives at health facilities who they think they are like their daughter or younger women would want to be attended by male health workers during delivery [42]. In this study 36.8% of women called for a respectful maternity care. Study participants during the time of their delivery noted students coming in and out of rooms during physical examination and those who delivered in the teaching hospitals reported that that this practice is common where multiple staff or students perform vaginal examinations for learning purposes.

Findings from this study may be useful for both integrating and rethinking constructs that would allow for an improvement in the quality of MHCS further increasing the utilization. Early booking of ANC clinic and completion of more than four visits, conducting a qualitative study approach using in depth interview or focus group discussions and perceptions of the users on it and influences of cultural factors on the utilization have to be studied very well. Non-governmental organizations with community communication have to be strengthened for a wider role of making utilization of services available to women in all areas. Disregarding the concept of MHCS utilization in rural areas may be a serious handicap in achieving the objective and so should be addressed by a similar study.

The potential limitations of the study include recall and social desirability bias. Cross sectional study by nature only derives association but not causation. Since the questions on utilization of maternity services were focused on the most recent pregnancy/labor experiences, it was not possible to explain behavioral consistency in the use of these services between successive births for the same woman.

CONCLUSION

Overall, MHCS utilization was found high in the study setting. The proportion of women who utilized PNC among those who have heard about PNC was significantly greater than the proportion of women who utilized PNC and never heard of it. The nationwide lockdown due to COVID- 19, sudden onset of labor, feeling well were barriers to attending ANC, institutional delivery and PNC services respectively. More than eighty percent of women were happy with the services provided at health facilities. Almost half recommended the

improvement in the availability of drugs and supplies. MHCS provided by well trained and equipped health workers is widely recognized as an important protective factor against maternal and new borne morbidity and mortality and the results from the current study look very promising.

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