



# Delay in receiving emergency obstetric care and associated factors among mothers who gave birth in public hospitals of Bale and East Bale zones, Oromia region, South East Ethiopia: Facility based cross-sectional study

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## ABSTRACT

**Introduction:** Delays in timely seeking care, failure to reach health institutions and receiving ineffective health care cause maternal mortality in developing countries. The three maternal delay was used to identify contributing factors to maternal death. There was limited data on the maternal delay in receiving emergency obstetric care services in the study area. Therefore, the aim of this study was to assess the magnitude of delay in receiving emergency obstetric care and associated factors among postnatal mothers in the Bale and east Bale zones.

**Methods:** A facility-based cross-sectional study was conducted among 407 postnatal women from April 6 to May 6, 2022. A systematic random sampling technique was used to select study participants. The data were collected electronically using an Open Data Kit and exported to SPSS window version 25 for cleaning and analysis. Both bivariate and multivariable analyses were done by using a binary logistic regression model to identify factors associated with delay in receiving emergency obstetric care services. Statistical significance was declared at P-value < 0.05.

**Results:** In this study, the magnitude of delay in receiving institutional delivery service utilization was 34.6% with [95% CI (30.0-39.5)]. Delay one was found to be statistically associated with maternal delay in receiving institutional delivery services (AOR = 2.07; 95% CI: 1.21, 3.53). Mothers with low monthly income had shown higher odds of delay (AOR = 1.79; 95% CI: 1.03, 3.10). Moreover, the delay in receiving emergency obstetric care was 89% less likely among mothers who had not been referred multiple times than among those who had been referred many times (AOR = 0.10; 95% CI: 0.06, 0.18).

**Conclusion:** This study showed that the magnitude of the delay in receiving the utilization of emergency obstetric care services in the study area was high. Factors such as delay one, average monthly income and multiple referrals of mothers were found significant factors for delay in

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receiving care. Therefore, it is important to reduce delay in receiving institutional delivery by working on promoting road accessibility, transport mechanisms and building health education on key danger signs.

## 1. Background

Delay for receiving emergency institutional delivery refers to the period between the decision to seek emergency obstetric care and the commencement of early health care service [1]. Three Delays is a model that was created in the 1990s as a tool to analyze the circumstances underlying maternal death. It has since been applied in nations all over the world to comprehend and reduce maternal mortality [2].

Maternal delays were described as having three levels which have been named first, second and third maternal delays respectively. The first delay is in deciding to seek care during pregnancy related complications. It occurs because of family and community associated factors [3]. The second delay is in reaching health care facility and due to road conditions, lack of transport or locations. The third delay occurs at health care facility [4,5].

Maternal delay is one of burden for high maternal mortality in developing countries. Globally, more than 800 women die each day from complications related to pregnancy and childbirth. Every year, 295,000 women die, with low-income countries accounting for 95% of maternal deaths [6]. Of these, more than two-thirds (68%) of all maternal mortality occurs in Sub-Saharan Africa (SSA) [7]. According to the Ethiopian ministry of health on maternal health report, the maternal mortality rate (MMR) in Ethiopia is 401 deaths per 100,000 live births [8]. Approximately 15% of pregnant women develop a life-threatening complication that requires trained delivery care, and some were need a major obstetrical intervention to survive [9].

Maternal delay could be fatal to a women with obstetric complications [10]. Obstetric complications during pregnancy and delivery are often the cause of maternal death. Majority of maternal death caused by direct obstetric causes in 85% of cases. Hence, obstetric hemorrhage accounts for 41%–51% of maternal deaths, hypertensive disorders of pregnancy accounts for more than 18%, and anemia accounts for 18%–20% of maternal deaths. Three delays are the major indirect contributing factors for maternal mortality. Most maternal deaths were preventable with timely access to intrapartum and postpartum care [11].

By 2030, the UN Sustainable Development Goals (SDGs) for ending preventable maternal deaths aimed to reduce global maternal mortality to less than 70 per 100,000 live births, with no country having an MMR of more than 140 [12]. The Ethiopian Federal Ministry of Health (FMOH) has made reducing maternal mortality and improving maternal health a top priority. For the past five years, the national Maternal Death Surveillance and Response (MDSR) system had been in place to identify and capture maternal deaths in both facilities and the community [13]. In the last two decades, Ethiopia has made significant progress in improving the health of women. Maternal mortality has decreased slightly, from 871 deaths per 100,000 live births in 2000 to 401 in 2017. However, Maternal and neonatal mortality rates remain high [14]. Decreasing maternal mortality cannot be achieved unless the government works on issues such as maternal delay in receiving emergency obstetric care [15].

Despite the fact that the majority of maternal deaths can be avoided by early detection and treatment, a variety of factors can obstruct women's access to emergency obstetric care. Several factors had been discovered to delay women's access to and utilization of emergency obstetric care in SSA. These barriers were interconnected and can be found at multiple levels, including at home, on the way to health care facility, and at the health care facility itself [4,16].

Because of the difficulty of accessing health-care facility in rural areas, home deliveries by untrained birth attendants are common. Due to long travel times to a health facility, poor road construction, misunderstandings about the value of health care services, and disrespectful behavior by health care providers, nearly half of all mothers were unable to access delivery services [17].

The use of delivery services at the time of birth has an impact on maternal health outcomes. As a result, maternal delay was the factor. Low utilization of modern health care services by mothers was a result of poor health outcomes [18]. In our country, few people use delivery services. According to the Ethiopia Mini Demographic Health Survey (EMDHS) 2019, skilled-based delivery accounts for 48% of total deliveries [19].

According to available evidence, illiteracy, poor knowledge on danger signs at labor and childbirth, inadequate birth preparedness and its complication readiness, decision-making powers of women, long distance, lack of transport, lack of obstetric drugs were factors that contribute to three maternal delays [20,21].

Maternal and neonatal morbidity and mortality have been shown to be reduced by both timely arrival and high-quality delivery services including prenatal care, skilled delivery, postnatal care, and respectful maternal care [13].

Previous studies conducted in the country were identified factors associated with maternal delay in receiving emergency obstetric care. However, most of the former studies done before the occurrence of coronavirus disease 2019 (COVID-19) which was a great challenge for health care delivery system. There is still information gap as well as minimal evidence on maternal delay in receiving emergency obstetric care in the study area.

Therefore, the aim of this study was to determine the magnitude of delay in receiving emergency obstetric care and associated factors among mothers who gave birth in public hospitals of Bale and East Bale zones, Oromia region, Ethiopia.

## 2. Material and methods

### 2.1. Study settings and period

The study was conducted in the six public hospitals found in the Bale and East Bale zones, Oromia region, Ethiopia from April 6th to May 6th, 2022. The Bale and East Bale zones were located in the Oromia regional state in Southeast Ethiopia. Currently the bale zone had 18 districts, of which three were town administrations, and of the rural districts, nine were agrarian and nine were agro-pastoralist. The zone had a total population of 1,888,366 of which 936,630 were female and the expected deliveries in the year accounts were 65,526. A total of six public hospitals were found in the zones, namely: Madda Walabu University Goba Referral Hospital (MWUGRH), Robe General Hospital, Goro primary hospital, Ginir General Hospital, Delo Mena General Hospital, and Madda Walabu Primary Hospital.

There are also 90 functional health centers in the zone. Concerning comprehensive maternal service delivery, all the hospitals deliver comprehensive emergency, obstetric, and neonatal care service and 80 health centers deliver basic emergency, obstetric and neonatal care services.

### 2.2. Study design

An institutional based cross sectional quantitative study was conducted.

### 2.3. Population

All women who gave birth in public hospitals of Bale and East Bale zones were a source of population whereas all women who gave birth during data collection period in public hospitals of Bale and east Bale zones were study population and the study unit were women who gave birth in public hospitals of Bale and East Bale zones.

### 2.4. Eligibility criteria

All women who gave birth in the Bale and East Bale zones public hospitals were included in the study area whereas all women who are severely sick during data collection period were excluded.

### 2.5. Sample size and Sampling Procedure

The minimal sample size required for this study was calculated using the Epi-info version 7.2.5 statistical software package with the assumptions of 95% confidence level ( $Z_{\alpha/2} = 1.96$ ) 5% margin of error ( $d = 0.05$ ). The magnitude of the mothers who experienced delays during emergency obstetric care were 59.7% [21]. Considering a 10% non-response rate, the maximum sample size requires for this study was found to be 407 postnatal mothers.

In this study, the six hospitals found in the Bale and East Bale zones were included in the study. The average source population of each hospital was taken by reviewing the previous year's similar-month delivery report in a data collection period. The proportional allocation were done for six hospitals to collect 407 sample. The study participants was systematically selected with an interval of K every three persons from each hospital. Finally, the total sample size required was collected within the given period.

### 2.6. Data collection tools and procedures

An interviewer administered structured questionnaire was adapted from the survey tools developed by Johns Hopkins Program for International Education in Gynecology and Obstetrics (JHPIEGO) maternal and neonatal health program [22] and from previous literature review with careful modification [1,21,23,24,25,26]. The questionnaire contains three dimensions: socio-demographic and economic factors, Health facility related factor and Delay in receiving emergency obstetric care related variables. Finally, the questionnaire was collected by ODK (Open Data Kit) collect.

A pre testing was conducted on 21 respondents (5% of sample size) in Dodola general hospital that had similar characteristics with the study population, which was one of unselected health facility (Outside of Bale zones) to check clarity, wordings, logical sequence, skip patterns and culturally sensitive issues of the questions. Six bachelor degree nurses were recruited for data collection and three health officers with bachelor's degree were employed as supervisor. The objective of the study was explained and training was given on how to use the ODK application, connect with the server, save, and send files for the data collectors and supervisors for two days.

ODK collect version 1.17.2 application was installed on the data collector's smart mobile phone and the blank form was downloaded from the server. Then, the tool was pre-tested a week before the actual data collection. Supervisors were kept in touch with the data collectors to regularly check the data collection procedure. The data was collected through face-to-face interview with postpartum mothers in private place while discharge.

## 2.7. Study variables

### 2.7.1. Dependent variable

Delay in receiving emergency obstetric care.

### 2.7.2. Independent variables

Socio-demographic characteristics: Maternal age, residence, marital status, education of the mother, education of husband, occupation of the mother, occupation of husband, household monthly income.

Health facility related factors: available health facility, multiple referrals, the distance to health care facility, means of transportation, road availability and obstetric drug. Information about benefit of delivery at health facility, public transport available, health care provider timely available, transportation problem, and referred from other health facility.

## 2.8. Operational definitions and measurement

Third maternal delay: was the time interval between reaching the facility and the delivery care service received. Time taken  $\geq 1$  h to receive delivery service considered as delay and less than an hour considered no delay [27].

Emergency obstetric care: Emergency medical or surgical attention given to a woman who was, in labour or had recently given birth [24].

**Table 1**  
Socio-demographic and economic characteristics of participants in the public hospitals of Bale and East Bale zones, Oromia, Ethiopia, 2022 (N = 407).

Variables	Frequency	Percentage (%)
Age (in completed years)		
15–20	74	18.2
21–34	255	62.6
$\geq 35$	78	19.2
Residence		
Rural	190	46.7
Urban	217	53.3
Mother's Education		
Cannot read and write	144	35.4
Can read and write	57	14
Primary (Grade 1–8)	97	23.8
Secondary (Grade 9–12)	64	15.7
Tertiary and above	45	11.1
Mother's Occupation		
House wife	281	69
Merchant	48	11.8
Government Employee	41	10.1
Private	25	6.1
Other <sup>a</sup>	12	3
Marital status		
Married	397	97.5
Others <sup>b</sup>	10	2.5
Husband's Education		
Cannot read and write	101	24.8
Can read and write	71	17.4
primary (grade 1–8)	81	19.9
Secondary (grade 9–12)	80	19.7
Tertiary and Above	74	18.2
Husband's Occupation		
Farmer	169	41.5
Merchant	91	22.4
Government employee	72	17.7
Private	75	18.4
Head of house hold		
Husband	293	72
Joint	73	18
Woman	38	9.3
Father	3	0.7
House hold average monthly Income (ETB)		
$\leq 1000$	114	28
1001–1999	36	9
$\geq 2000$	257	63

<sup>a</sup>Farmer, Students, ETB-Ethiopia Birr.

<sup>b</sup>Single, divorced, widowed.

Institutional delivery service: when a mother gave birth in a health facility and was assisted by a skilled birth attendant [27].

Non-referred mothers: a mother who gave birth among selected hospitals and had not been referred from another health care facility to the selected hospital for advanced care [21].

## 2.9. Data quality control

A structured interviewer-administered questionnaire was first developed in English and translated into Afan Oromo and Amharic versions by language experts and back to English for consistency. The training was given to data collectors and supervisors about how to collect data using ODK and briefed on each question included in the tool. Moreover, a pretest was done to ensure the clarity of the tool.

Supervisors were checked and review the questionnaires to ensure completeness of the forms. Each woman was interviewed in a separate private place to avoid social desirability bias. Furthermore, the investigators were kept in touch with the server to regularly check the sent files from each data collector.

## 2.10. Data processing and analysis

Each data files sent from the data collector's smart mobile phone were downloaded from the server and saved as an excel file. Finally, the data set were imported to SPSS 25.0 versions for cleaning, coding and analysis. Descriptive statistics such as frequency, percentage, mean and standard deviation were computed to describe the characteristics of participants.

Bivariate and multivariable analysis were done in binary logistic regression model to identify factors. The assumptions of the binary logistic regression model was checked. A P-value < 0.25 in the bi-variate analysis was considered to take a candidate variables for the final model.

The Hosmer-Lemeshow goodness fitness was done to check model fitness. Multicollinearity among independent variables were checked by variance inflation factor (VIF). Adjusted odds ratio (AOR) with 95% confidence interval (CI) was computed to determine the level of significance. A statistical significance was declared at P-value < 0.05. The result was presented by using tables and figures.

## 3. Results

### 3.1. Socio-demographic and economic characteristics

A total of 407 postnatal mothers were voluntarily involved in the current study. The mean ( $\pm$ SD) age of the respondents were 27.34

**Table 2**  
Health facility characteristics of participants in the public hospitals of Bale and East Bale zones, Oromia, Ethiopia, 2022, (N = 407).

Variables	Frequency	Percentage (%)
Health facility available in your kebele		
Yes	364	89.4
No	43	10.6
Availability of road		
Yes	215	52.8
No	192	47.2
Public transport available to go health facility		
Yes	303	74.4
No	104	25.6
Means of transportation to this hospital		
Ambulance	109	26.8
Walking	67	16.4
Public transport	231	56.8
Distance to reaching to nearby health facility		
Less than or equal to 5 km	245	60.2
Greater than 5 km	162	39.8
Transportation problem		
Yes	155	38.1
No	252	61.9
Referred multiple times		
Yes	269	66.1
No	138	33.9
Absence of skilled health provider		
Yes	28	6.9
No	379	93.1
Obstetric drugs available		
Yes	264	64.9
No	143	35.1

(±6) years. Of the study participants, 255 (62.6%) were within the age group of 21–34 years; 144 (35.4%) had no formal education; 397 (97.5%) were married, and 281 (69%) were housewives. In this study, 190 (46.7%) mothers were rural residents (Table 1).

### 3.2. Health facility related characteristics of study participants

Of the study respondents, 358 (88%) had information about the benefits of delivery in a health facility. Three hundreds sixty four (89.4%) of the participants had access to health facilities in their kebele. Among respondents, 245 (60.2%) of mothers live within a physical distance of at least 5 km from nearby health care facilities. Of the participants, 196 (48.2%) mothers were referred from other health facilities to the hospitals. One hundred forty five (35.6%) inaccessible to car, and 24 (5.6%) mothers were complained about the cost of transportation as expensive to reach health facility (Table 2).

## 4. Magnitude of delay in receiving emergency obstetric care

The magnitude of delay in receiving emergency obstetric care of mothers in the study area was 34.6% (Fig. 1).

### 4.1. Factors for maternal delay in receiving emergency obstetric care

Out of seven variables entered into the multivariable analysis, three variables, monthly income, multiple referrals, and delay one were statistically significant with the third delay at  $P < 0.05$ .

The delay in receiving care at a health facility was 1.8 times higher among mothers whose monthly income was below or equal to 1000.00ETB (AOR = 1.79; 95% CI: 1.03, 3.10) than those whose monthly income was above 1000.00ETB.

The findings of this study showed that mothers who experienced delay one were twice too late in receiving emergency obstetric care (AOR = 2.07; 95% CI: 1.21, 3.53) than their counterparts.

The delay in receiving emergency obstetric care was 89% (AOR = 0.10; 95% CI: 0.06, 0.18) less likely among mothers who had not been referred multiple times than among those who had been referred many times (Table 3).

## 5. Discussions

The maternal delays were an unspeakable problem faced by women that lead to potentially life-threatening conditions. The occurrence of these delays with obstetric complications were the major contributing factor to maternal mortality. There was, however, limited data on the delays during emergency obstetric care services in the study area. Therefore, the aim of this study was to assess the magnitude of delays during emergency obstetric care and associated factors among postnatal mothers in the Bale and east Bale zones.

This study investigation showed that the magnitude of the maternal delay in receiving the utilization of emergency obstetric care was 34.6% with [95% CI (30.0, 39.5)], which was in line with the findings in Ethiopia 34.7% [28] and 33.3% [29]. But lower than the studies in Nepal 55% [30], Tanzania 93% [31] and Egypt 88.9% [32]. However, it was higher than studies in the Southern Ethiopia 31.7% [27], and 32.6% [1] respectively. This might be the difference in a health service delivery system, study setting, medical supply difference, and professional staff in skilled delivery.

Multiple referral levels were significantly associated with the delay in receiving emergency obstetric care services, the third maternal delay. This was consistent with a study conducted in the Ethiopia [1]. This could be a non-functioning health facility in EmOC, a lack of basic medical equipment for care, a lack of skilled delivery service providers, or a level beyond the primary health unit level that needs further investigation. This was evidenced by 47% mothers were reside of rurals and 48% mothers were referred from other health facilities to the hospitals.

The finding of this study showed that an average monthly income was significantly associated with the third delay. The possible reasons were high-cost medical services like medications and gloves, and the impact of COVID-19 on household income. In this study the head of house hold 72% were husbands. This implies that the economically majority of women depends on their husbands which follows logic of the families.

Maternal delay three during emergency obstetric care services was influenced by delay one. This was supported by the study done

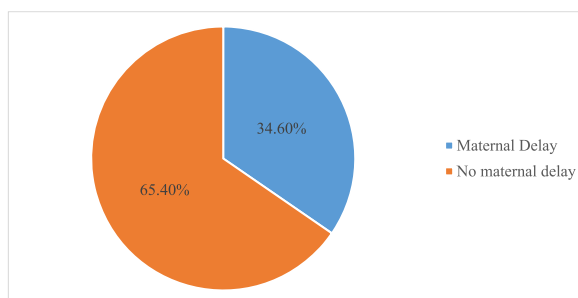


Fig. 1. Magnitude third maternal delay in the public hospitals of Bale and East Bale zones, Oromia, Ethiopia, 2022 (N = 407).

**Table 3**

Factors associated with third delay among postnatal mothers in the public hospitals of Bale and East bale zones, Oromia, Ethiopia,2022 (n = 407).

Variables	Category	Maternal delay three		COR [95% CI]	AOR [95% CI]	P value
		Delayed	Not delayed			
Mother's occupation	House wife	99 (35.2%)	182 (64.8%)	0.64 (0.32,1.28)	0.48 (0.22,1.08)	0.077
	Merchant	13 (27.1%)	35 (72.9%)	0.44 (0.18,1.08)	0.41 (0.14,1.19)	0.100
	Gov't employee	12 (29.3)	29 (70.7%)	0.49 (0.19,1.24)	0.59 (0.20,1.74)	0.342
	Others <sup>β</sup>	17 (45.9)	20 (54.1%)	1	1	
Monthly income	≤1000	48 (42.1%)	66 (57.9%)	1.50 (0.95,2.36)	1.79 (1.03,3.09)*	0.039
	1001–1999	9 (25%)	27 (75%)	0.69 (0.31,1.53)	0.79 (0.30,2.08)	0.637
	≥2000	84 (32.7%)	173 (67.3%)	1	1	
Current mode of delivery	NSVD	65 (39.2%)	101 (60.8%)	1.40 (0.92,2.11)	1.43 (0.88,2.34)	0.149
	SVD	76 (31.5%)	165 (68.5%)	1	1	
Referred multiple times	Yes	48 (17.8%)	221 (82.2%)	0.11 (0.07,0.17)	0.10 (0.06,0.17)*	<0.001
	No	93 (67.4%)	45 (32.6%)	1	1	
Lengthy admission process	Yes	73 (36.3%)	128 (63.7%)	1.16 (0.77,1.74)	1.14 (0.69,1.87)	0.601
	No	68 (33%)	138 (67%)	1	1	
Maternal delay One	Yes	59 (49.6%)	60 (50.4%)	2.47 (1.59,3.84)	2.18 (1.27,3.76)*	0.005
	No	82 (28.5%)	206 (71.5%)	1	1	
Maternal delay Two	Yes	68 (43.9%)	87 (56.1%)	1.92 (1.26,2.91)	1.07 (0.63,1.83)	0.791
	No	73 (29%)	179 (71%)	1	1	

(\* = a statistically significant variable at  $p < 0.05$ ), <sup>β</sup>-students, farmer, tailor).

in southern Ethiopia [24]. This could be as a result of women becoming more assured and experiencing delays in their first pregnancy, which went smoothly. This was supported by 9% of mothers had fear of childbirth at health facility. It implies that they delayed to made decision early to go health facilities.

## 6. Strengths and limitations of the study

### 6.1. Strengths of the study

Data was collected using the ODK Collect application, which increased the completeness, accuracy, and quality of the data. For maternal delay three, each variable was managed independently to control the effect of confounders and prevent bias from being introduced at the analysis stage.

### 6.2. Limitations of the study

Since delays were measured by time based on client responses' estimations, they can be overestimated or underestimated. Besides, since an interviewer-administered questionnaire was used to collect data that may be subject to recall bias. Furthermore, this study employed a cross-sectional design that failed to differentiate between cause and effect relationships.

## 7. Conclusions and recommendations

### 7.1. Conclusions

This study showed that the magnitude of third maternal delay in the utilization of emergency obstetric care services in the study area was high. Factors associated with the third maternal delay in the utilization of emergency obstetric care services were monthly income, multiple referrals, and delay one.

### 7.2. Recommendations

Maternal delays were a long and complex chain that led to maternal mortality. The magnitude of delay three in the study areas was high. This was due to contributing factors. Overcoming the solution to those factors needs the action of all, from single individual (the mother) to the institutions. Therefore, the recommendation was made for the following bodies:

The hospital would strengthen collaboration with primary health care sub-facilities to improve the maternal referral system, such as the liaison office. The government would promote road availability, quality, closeness, and transportation mechanisms to health facilities and the community. Lastly, further research is needed on the community-based study.

## Ethical approval and consent to participate

Ethical clearance was obtained from Institutional Research Ethics Review Board with the reference number of (IRB/1222/2022) of Arba Minch University, College of Medicine and Health Science. Permission letter were gained from Health offices of Bale and East Bale

zones and finally from study Hospitals before data collection began. At the beginning of data collection, informed written consent was obtained from each study participant after the explanation of the purpose and procedures of the study. Any information obtained from respondents would be kept confidential and anonymous. To maintain confidentiality, respondents' names were replaced with code numbers. During data collection, the possible COVID-19 prevention measures were implemented. All necessary methods were carried out in accordance with the guidelines of institutional and declaration of Helsinki.

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## Author contribution statement

Derese Eshetu; Zeleke Aschalew; Agegnehu Bante; Genet Fikedu; Mesfin Abebe; Degefa Gomora; Eden Silesh; Rediet Belay; Tewodros Getachew; Aregash Acha; Abera Mersha: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

## Data availability statement

Data will be made available on request.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## List of abbreviations

ANC	Antenatal Care
COVID19	Coronavirus Disease 2019
EDHS	Ethiopia Demographic Health Survey
EMDHS	Ethiopia Mini Demographic Health Survey
EmOC	Emergency Obstetric Care
ETB	Ethiopian Birr
FMOH	Federal Ministry Of Health
MDSR	Maternal Death Surveillance Response
MMR	Maternal Mortality Ratio
MWUGR	Madda Walabu University Goba Referral Hospital
ODK	Open Data Kit
SDG	Sustainable Development Goal
SNNP	Southern Nation, Nationalities and Peoples Region
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
UN	United Nations
WHO	World Health Organization

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