

# Process Evaluation of Facility Delivery Services in Northwest Ethiopia: In the Case of Public Health Centers

Tesfahun Zemene Tafere, Andualem Yalew Aschalew, Chalie Tadie Tsehay , Tsegaye Gebremedhin 

Department of Health Systems and Policy, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia

Correspondence: Tesfahun Zemene Tafere, Department of Health Systems and Policy, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, P.O. Box: 196, Gondar, Ethiopia, Email [tesfahunzemene4@gmail.com](mailto:tesfahunzemene4@gmail.com)

**Background:** Even if giving birth at health facility is vital for both the mothers and their newborns, the coverage of institutional delivery in Ethiopia is very low (50%). In that regard, several studies have shown the possible factors of low delivery service uptake from the patients' side, but evidences on delivery services at the health centers are meagre. This study aimed to evaluate the process of delivery services in public health centers of northwest Ethiopia.

**Methods:** A case study evaluation design with an embedded mixed-method was used to evaluate institutional delivery in public health centers of Gondar city. Dimensions from the access (availability, accommodation, and acceptability) and implementation fidelity (compliance) frameworks were used. A total of 363 mothers, 32 document reviews, 32 direct observations, and 17 key informants were included. The qualitative data were transcribed, translated, coded, and analysed using a thematic analysis approach. The overall process of institutional delivery services was measured based on pre-determined judgmental criteria.

**Results:** The overall facility delivery process was 75.1%, judged by availability (78.5%), compliance (70.6%), accommodation (68.8%), and acceptability (80.2%) of services. Essential medicines in some of the health centers were stockout, insufficient delivery rooms and inadequate training of health workers on obstetric and newborn care were observed. Using partograph and examining vulval-perineal region for possible laceration during intrapartum period were less practiced. Residence (AOR: 0.13, 95% CI: 0.06–0.30), ANC 1 to 3 visits (AOR: 2.65, 95% CI: 1.05–6.74) and ANC4<sup>+</sup> (AOR: 5.57, 95% CI: 2.09, 14.84) were factors affected acceptability of delivery services.

**Conclusion:** Major constraints were in the accommodation of delivery services which needs a holistic effort from all stakeholders. Therefore, implementors with other stakeholders shall improve delivery rooms, facilitate training, and provide parenteral drugs as part of the obstetric and newborn care to improve the facility delivery services in Ethiopia.

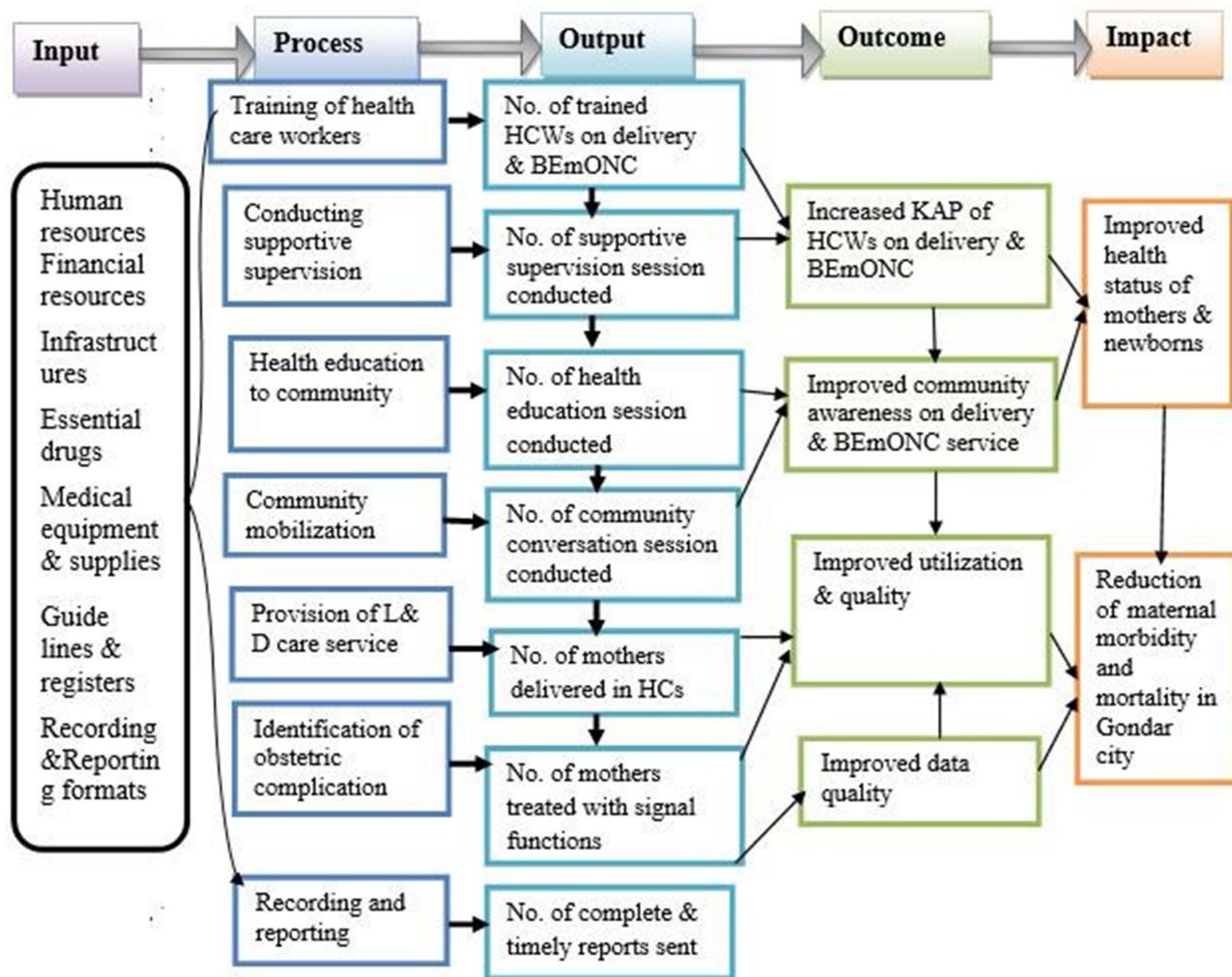
**Keywords:** acceptability, accommodation, availability, compliance, institutional delivery, evaluation

## Background

Women comprise a large proportion of any society, and many of them live having increased preventable risk of morbidity and mortality substantially during childbirth.<sup>1</sup> One of the interventions that is believed to reduce this excess risk is institutional delivery which means giving births in health institutions under the supervision of trained health professionals.<sup>2</sup>

The World Health Organization (WHO) promotes institutional delivery at every birth.<sup>3</sup> As a result, 63.1% of births were attended by skilled health-care workers across the globe. Its respective coverage among the high-income countries was 100%, whereas the corresponding figure in developing countries is 59.1%.<sup>4</sup> According to the 2019 mini Ethiopian Demographic and Health Survey (mEDHS) report, skilled birth attendance in Ethiopia was 50%.<sup>5</sup>

Socio-cultural factors, inadequate availability of resources such as drugs, human resources, medical equipment, low compliance of health-care providers, and mothers' attitudes towards the service are delivery process-related attributes reported to impact the utilisation of institutional delivery service.<sup>6,13</sup>



**Figure 1** Logic model of delivery services.

To overcome the gap, the Ethiopian Ministry of Health has adopted various public health policy initiatives to strengthen the institutional delivery care services such as community mobilization for behavioral and cultural barriers, establishing maternity waiting homes for distance barriers, and exemption of maternal health services for financial or cost barriers.<sup>7</sup> Regardless of the efforts, the quality of labor and delivery service process falls below WHO's standards<sup>8</sup> that could prevent 44% of stillbirths, 73% newborn deaths, and 61% of maternal deaths.<sup>9</sup> The linkage of the program components of the delivery services in the health centers can be explained by the program logic model in (Figure 1). Health center is a health facility within the primary health-care system that provides promotive, preventive, curative and rehabilitative outpatient care including basic laboratory and pharmacy services through health-care professionals.<sup>10,11</sup>

Previous studies in Ethiopia focused on the magnitude of institutional delivery. However, the implementation of the program organized by its components-inputs, activities and outputs<sup>12</sup> and the barriers and facilitators for the process are not well addressed yet. Therefore, this evaluation will generate a comprehensive evidence on the program process and the barriers and facilitators of the process for decision-making.<sup>13–17</sup> Moreover, the findings of the evaluation are expected to produce valuable information for policymakers and program managers in improving the implementation of this vital area of maternal health-care service.

## Methods

### Evaluation Design and Settings

A case-study design with an embedded mixed-method evaluation was used in this evaluation. The evaluation was conducted in Gondar city. The city has six sub-cities and an estimated population of 344,046.<sup>18</sup> According to the information obtained from city administration's health department office, there is one comprehensive specialised teaching hospital, eight health centers (HCs), and 14 health posts in the city. Maternal, newborn and child health service provisions are integrated with other health services at the health center level. An estimated number of 11,594 pregnant women were served in the HCs in the year 2020.<sup>18</sup> The study participants were (a) mothers who received labour and delivery services, (b) health-care providers working in the labour and delivery units, (c) heads of HCs, (d) maternal reproductive health officer of Gondar administrative city, and (e) delivery services documents (partograph, and delivering mothers registration book).

### Evaluation Approach and Dimensions

A formative evaluation approach was used that focused on the process theory of institutional delivery. The program process theory consists of the program organisational and services utilization plan.<sup>19</sup> Accordingly, the program's organisational plan was articulated from the perspective of program management that encompasses both the functions and activities the program is expected to perform and the resources required for that performance. Whereas the service utilization plan focused on the critical assumptions about how and why the intended recipients of delivery service were become engaged with the program and follow through to the point of receiving sufficient services to initiate the change process represented in the program impact theory.

This evaluation used a total of four dimensions – three (availability, accommodation and acceptability) from the access framework<sup>20</sup> and one (compliance) from the implementation fidelity framework.<sup>21</sup>

### Variables and Measurements

Evaluation dimensions are measurable aspects of program performance that an evaluation intends to examine.<sup>19</sup> The compliance domain was assessed using 12 items which measured the health-care providers' adherence level with the national obstetrics management protocol. Availability refers to the physical presence of services, the supply of drugs, equipment, skilled health professionals, and guidelines, registers, and infrastructures.<sup>20</sup> The availability of resources was measured using 12 indicators to determine whether essential drugs, medical equipment, and infrastructures required for the services were available or not. Compliance is the practice of delivery service activities based on the national obstetrics management protocol guideline.<sup>21</sup> Accommodation refers to the setup of the organization to accept clients, the clients' convenience of its appropriateness, and the ability to accommodate organizational factors.<sup>20</sup> Likewise, the accommodation of delivery services was measured using eight indicators, each with a 5-point Likert scale (1 = highly dissatisfied to 5 = highly satisfied). Then, highly dissatisfied, dissatisfied, and neutrals were classified as dissatisfied, else as satisfied with the delivery service's accommodation. Acceptability is the relationship of clients' attitudes about the personal and practice of providers to the actual characteristics of existing providers.<sup>20</sup> Moreover, delivery services acceptability was assessed using 10 indicators with 5-point Likert scales (0 = strongly disagree to 5 = strongly agree). Then the acceptability was dichotomised based on a threshold score. The threshold score for acceptability was determined using the demarcation threshold formula.<sup>22</sup>

$$\left( \frac{\text{Total highest score} - \text{Total lowest score}}{2} \right) + \text{Total lowest score}$$

Accordingly, respondents who scored above 60 on the acceptability questions were considered as accepted otherwise not accepted. The indicators were adapted after reviewing different literatures.<sup>13,23–25</sup> Stakeholders determined indicators' weights during the evaluability assessment stage which were calculated using the formula:

Indicator weight =  $\left(\frac{\text{Observed number} \times \text{Indicator weight}}{\text{Expected number}}\right)^{26}$  (Table 1). Then, judgment parameter was seated; >85, 70–85, 50–69.9, and <50% as very good, good, fair, and poor, respectively, for each dimension and also for the overall program process.

## Sample Size and Sampling Procedures

Eight health centers were inventoried for the measurements of availability. A total of 32 non-participatory direct observation sessions were conducted, and all mothers' medical records were reviewed for measuring the compliance of health-care providers with the national guideline. Further, purposefully selected 17 health workers were involved in the key informant interviews. Accordingly, the head of the delivery room from each health center and coordinator of maternal reproductive health at the health office were selected purposively.

The sample size for the accommodation and acceptability was calculated using a single population proportion formula:  $n = \frac{z^2 \left(\frac{q}{2}\right)^2 \times p(1-p)}{d^2}$  with the assumption of 5% margin of error (d), 95% confidence level,  $p = 31.3\%$ ,<sup>27</sup> and 10% non-response rate which yields the final sample size of 363.

The proportional sample size allocation was done to each health center based on the prior two months of delivery. Then, participants were selected using a systematic sampling technique. Mothers who gave birth at Gondar city HCs during the data collection period, heads of the delivery room, heads of the health center, and health-care providers who were worked at the facilities at least for six months were included in this evaluation. Mothers who were severely ill and unable to communicate were excluded from the exit interview.

**Table 1** Stakeholders' Identification and Analysis Matrix for Delivery Service in Gondar City Health Centers, Northwest Ethiopia, 2020

S. No.	Stakeholder	Role in the Program	Perspective in the Evaluation	Role in the Evaluation	Means of Communication
1	Regional Health Bureau	Training of health care providers, supplies and supervision	Use of the findings to improve services and experience sharing	Giving support letter	Reading guidelines, Telephone
2	Zonal health department	Supervision, Budgeting and providing logistics	Use of the findings to improve services	Technical support, Facilitation of evaluation process	Report Telephone
3	City administrative health office	Implementer, supportive supervision	Learning from experience, use of the findings for improvement	Data source Technical support	Key informant interview, Report Telephone
4	Health centers	Provider of delivery services/program implementer	Service gap identification	Data source	Meeting Telephone Interview
5	City administrative	Budgeting, facilitation of services, and community mobilization	Service gap identification	Data source, facilitating evaluation process	Telephone Meeting
6	Health care providers	Provision of delivery service	Use the evaluation finding and recommendations for program improvement	Data source, technical support	Meeting Telephone Key informant Interview
7	Clients	Recipients of services	Beneficiary from the evaluation findings	Data source	Exit interview

## Data Collection Tools and Procedures

Resource inventory checklists, direct observation checklists, document review, structured and semi-structured questionnaires were used for data collection. The resource inventory checklists used for measuring the availability of resources were adapted from the Ethiopian national standard health center requirement guideline and other literature.<sup>24,25</sup> The observation checklists and document review used for measuring the compliance of health-care providers to labour and delivery guideline were adapted from the Ethiopian national obstetrics management protocol<sup>23</sup> which is similar to WHO guideline (Pregnancy, Childbirth, Postpartum, and Newborn Care: A guide for essential practice).<sup>28</sup> A structured questionnaire for exit interviews was adapted from transforming health-care quality in Ethiopia guides and other related literature.<sup>29–31</sup> A semi-structured questionnaire for key informant interviews was also adapted from the WHO quality of care for mothers and newborn babies assessment tool and other literature.<sup>29,30</sup> These tools were first developed in English and translated to the local language (Amharic), and back to English to ensure consistency. Eight female diploma midwives and two male BSC degree graduate midwives were recruited for data collection and supervision, respectively. A day of training was given on basic data collection and client handling techniques.

Moreover, a pre-test was done on 18 mothers before the actual data collection and the internal consistency of the questionnaires was demonstrated through the reliability analysis of Cronbach alpha value of 0.93. Daily supervision was done throughout the evaluation process. Furthermore, the first three observations were dropped to minimize the possible Hawthorn effects. The qualitative data quality was controlled by taking daily notes on the in-depth information gained from the key informants.

## Data Management and Analysis

The quantitative data were checked for completeness, edited, coded, and entered into Epi-data version 4.6 and exported to STATA version 14 software for analysis. Descriptive statistics were computed and results were presented using tables and narrations. A binary logistic regression model was fitted to identify factors associated with the acceptability of services, and in the final model, a p-value of <0.05 and adjusted odds ratio (AOR) with 95% confidence intervals (CI) were used. Qualitative data were gathered, audio records of key informant interviews were transcribed into the text format of the local language, translated into English, and then coded and categorized by using a thematic analysis approach under the dimensions that supplemented the quantitative findings. Weight for the dimensions and the respective indicators were given depending on their level of relevance to the program. Finally, the dimensions were judged based on the pre-determined judgmental criteria.

## Results

A total of 363 women who had their newborns recently for the survey, eight health centers for resource inventory, 32 direct observation sessions and document reviews, and 17 health-care providers for key informant interviews were involved in this evaluation.

### Availability of Resources

There were a total of 133 skilled birth attendants in the health centers, of whom 63.2% were nurses, 21.0% were midwives, and 15.8% were health officers. Five health centers have recommended (3 and more) midwives.

The key informant interview results indicated that there was a shortage and an unequal deployment of midwives in the HCs; some HCs have more than the minimum required standards, whereas some have less than the standards.

There is a shortage of midwives in this HC. There are only two midwives currently working in the HC whom both of them are diploma midwives. During training or day off work, when either of them is absent in the HC, we always operate the delivery unit by one midwife only. This makes providing the necessary care to labour and delivery clients difficult. [mid forty years old male HC head]

There was a high turnover of midwives. Midwives who were trained on different kinds of training regarding delivery care services were turned over to other HCs, and fresh midwives filled the vacant position. Giving training about the delivery care



activities and socialisation of them are challenges that results interruption of the implementation of delivery service activities and contribute for the poor quality of the service. [male delivery service coordinator midwife nurse]

Regarding the availability of basic infrastructure, one-fourth of the HCs had three separate rooms per national guideline (labouring, delivering, and postnatal units), and 87.5% of HCs had curtains and functional autoclave. Moreover, 62.5% HCs had a clean toilet with hand washing basin.

There is only one room with one bed for labour, delivery, and postpartum. One day, I remember that the situation that we were forced to give delivery services in the dressing room. As a result, we face problems when more than one labouring mother come to the HC. [male HC head]

Since there is only one room with one delivery couch for maternal health activities (labor, delivery, and postpartum), I was forced many times to transfer laboring clients to University of Gondar hospital when more than one laboring mothers come at the same time. Consequently, there is an unnecessary referral, which is one reason for low coverage of delivery service [female midwife-nurse delivery service coordinator].

The availability of continuous electric and water supply was limited in the majority of HCs. However, the Ethiopian national guideline of health center requirement recommends that adequate water and power supply should be secured 24 hours a day in the HC.

There is an interruption of electric power supply for the last five months, including this month. We are facing a problem to make delivery kits sterilized. We tried to overcome this problem by sterilizing in the nearby HC. We also provide delivery care service by using movable solar light while interruption of electric power supply. [Female delivery service coordinator midwife nurse]

The limitation in the availability of continuous water supply in this HC has affected our routine delivery care service activity. We do not find the required water supply as the desired amount. During the interruption, the water is provided by jerrican outside the HC. [mid-twenty-five-year-old female delivery service coordinator midwife nurse]

In all HCs, there was drug stockout like adrenaline, lidocaine, TTC eye ointment, and parenteral IV infusion (ringer lactate and normal saline). Around 37.5% of HCs were with stockout of magnesium sulfate and hydralazine for the last three months. Additionally, metronidazole parenteral antibiotic was stockout at 50% of HCs for the last three months. Furthermore, parenteral oxytocin was stockout in an HC and vitamin K was stockout for one-fourth of HCs since February 2020 (Table 2).

**Table 2** Availability of Drugs for Delivery Service in Gondar City HCs, Northwest Ethiopia, 2020 (n = 8)

Drugs	Available at the Time of Observation n (%)	Available in the Last Three Months n (%)
Adrenaline	8 (100.0)	8 (100.0)
Vitamin K	6 (75.0)	6 (75.0)
Lidocaine	8 (100.0)	8 (100.0)
TTC eye ointment	8 (100.0)	8 (100.0)
Ringer lactate	8 (100.0)	8 (100.0)
Normal saline	8 (100.0)	8 (100.0)
Metronidazole	4 (50.0)	4 (50.0)
Gentamycin	5 (62.5)	5 (62.5)
Oxytocin	7 (87.5)	7 (87.5)
Ergometrine	2 (25.0)	2 (25.0)
Magnesium sulphate	5 (62.5)	5 (62.5)
Diazepam	3 (37.5)	3 (37.5)
Hydralazine	5 (62.5)	5 (62.5)
Methyldopa	1 (12.5)	1 (12.5)

We have requested magnesium sulfate, hydralazine, oxytocin, and vitamin K but they would not be available from pharmaceutical fund and supply agency, especially vitamin k and magnesium sulfate were stockout many times in the market [mid thirty years old male HC head].

Regarding medical equipment and supplies, all HCs had medical equipment used for delivery services like delivery couches, stethoscope, sphygmomanometer, fetoscope, baby weighing scale, episiotomy set, newborn resuscitation set, and delivery forceps.

Moreover, personal protective equipment (surgical glove, goggle, apron) and national delivery care guidelines were available in all HCs (Table 3). According to the results indicated by key informant interviews, the personal protective equipment was not being utilised well despite their presence in the HCs.

No shortage of PPE in this HC. But midwives are reluctant the utilization of these PPE for every labor and delivery care service.

They usually use them when more than one delivery clients come at a time. This is because of the negligence that midwives have towards using these PP". [late twenty years old male HC head]

The overall availability score of the delivery service was 78.5%. Medical equipment items, parenteral IV infusions, and delivery care guidelines were 100.0% available in all HCs, whereas the availability of rooms for laboring, delivery, and postpartum per national standard was only in one-fourths of HCs (Table 4).

## Compliance of Delivery Service to the Guideline

In the client's medical record review, a history of present pregnancy like gravida, parity, and ANC visits was recorded for 87.5% of mothers. About abdominal examinations such as fundal height, fetal position, fetal descent, and fetal heartbeat were recorded for 62.5%, 46.9%, 56.3%, and 65.6% of mothers, respectively. Furthermore, vaginal examination at the initial assessment; status of the membrane (68.8%), cervical dilation (81.3%), and fetal presentations (78.1%) were documented. Additionally, some recording files were not safely kept to be easily accessed whenever necessary; they were not also stapled together and had no folders. During the direct observation, monitoring of labor using partograph such as plotting cervical dilation and maternal blood pressure every four hours were observed to be practised for 72.0% and 65.6% of mothers, respectively.

**Table 3** Availability of Medical Equipment and Supplies of Delivery Service in Gondar City HCs, Northwest Ethiopia, 2020 (n = 8)

Medical Equipment and Supplies	Available at the Time of Observation n (%)	Available in the Last Three Months n (%)
Delivery couch	8 (100.0)	8 (100.0)
Sphygmomanometer	8 (100.0)	8 (100.0)
Fetoscope	8 (100.0)	8 (100.0)
Thermometer	7 (87.5)	7 (87.5)
Stethoscope	8 (100.0)	8 (100.0)
Episiotomy set	8 (100.0)	8 (100.0)
Delivery forceps	8 (100.0)	8 (100.0)
Infant meter scale	7 (87.5)	7 (87.5)
Delivery set	8 (100.0)	8 (100.0)
Baby towel	5 (62.5)	5 (62.5)
Vacuum extractor	7 (87.5)	7 (87.5)
Delivery care guide line	8 (100.0)	8 (100.0)
Surgical glove	8 (100.0)	8 (100.0)
Boots	8 (100.0)	8 (100.0)
Goggles	8 (100.0)	8 (100.0)
Apron	8 (100.0)	8 (100.0)

**Table 4** Judgment Analysis Matrix of Availability Dimension for Evaluation of the Process of Delivery Service in Gondar City Health Centers, Northwest Ethiopia, 2020

Indicators	E	O	W	R	R (%)	JP
Proportion health centers with 3 midwives per national guide line	8	6	10	7.5	75.0	Good
The proportion of midwives in current staff trained on BEmONC	28	19	8	5.4	67.5	Fair
Proportion HCs with 3 separate room number (laboring, delivering and post-natal) per national guideline	8	2	10	2.5	25.0	Poor
The proportion of HCs with vitamin K in stock in the last three months	8	6	6	4.5	75.0	Good
Proportion of HCs with national labor and delivery guidelines	8	8	8	8.0	100	Vgood
The proportion of HCs with parenteral IV infusion (ringer lactate and normal saline) in stock in the last three months	8	8	8	8.0	100	Vgood
The proportion of HCs with parenteral metronidazole in stock in the last three months	8	4	8	4.0	50.0	Fair
The proportion of HCs with parenteral oxytocin in stock in the last three months	8	7	10	8.8	88.0	Vgood
The proportion of HCs with parenteral (magnesium sulphate, hydralazine) in stock in the last three months	8	5	6	3.8	62.5	Fair
The proportion of HCs with medical equipment (delivery couch, sphygmomanometer, fetoscope, episiotomy set) on the day of assessment	8	8	10	10.0	100	Vgood
The proportion of HCs with PPE (surgical glove, boots, google, apron) on the day of assessment	8	8	8	8.0	100	Vgood
Proportion of HCs providing BEmONC	8	8	8	8.0	100	Vgood
<b>Overall availability score 100</b>				<b>78.5</b>	<b>78.5</b>	<b>Good</b>

**Abbreviations:** E, Expected; O, Observed; W, Weight; R, Result= (Observed X Weight)/Expected; R (%), Result in % = (Result/Weight) X100; JP, Judgement Parameter.

The use of partograph for all mothers admitted in labor is recommended. But midwives do not plot findings on the partograph throughout the labor process. This is because of both the negligence and lack of refreshment training of health workers on partograph utilisation. [male HC head]

Furthermore, the health-care providers had washed hands during delivery preparation and used sterile gloves for 50% and 96.9% of births, respectively.

Washing before and after every L&D care procedure is essential for the mothers and ourselves to prevent infections. But we sometimes attain delivery care without washing hands, simply by wearing gloves. Because we do not have access to water near to the delivery room since there is no hand washing basin in the delivery room [female midwife-nurse delivery service coordinator].

Likewise, health-care providers were observed to be adhered to checking the completeness of the placenta and contraction of the uterus after the delivery of the placenta for 81.3% and 65.6% of delivering mothers, respectively. On the other hand, 71.9% of births were recorded in the medical record and 75.0% of newborn babies have started breastfeeding within an hour. Moreover, 53.0% of delivering mothers were checked for blood pressure every 15 minutes after the complete delivery of the placenta (Table 5).

The overall score of the compliance dimension was found to be 70.6%. Moreover, the proportion of clients who were checked for completeness of placenta was 81.3% which was the highest score and the proportion of delivering clients checked for vaginal bleeding every 15 minutes in the first hour after delivery of the placenta were 59.0% rated as the lowest score under the compliance dimension (Table 6).

## Accommodation and Acceptability of Delivery Service Socio-Demographic Characteristics of Participants

A total of 363 mothers participated in this study. One hundred thirty-two (36.4%) of mothers were aged 25–29 years; the mean age was 26.6 (SD:  $\pm 4.8$ ) years. Religious preference for 80.4% was Orthodox; 80.4% were urban dwellers. About 88.2% of them were married; 32.2% went to secondary school (Table 7).



**Table 5** Chart Reviews and Direct Observation Results of Labor and Delivery Care in Gondar City HCs, Northwest Ethiopia, 2020 (n = 32)

Tasks for Delivering Mothers and Newborns During Labor and Delivery Care	Performed by HCWs n (%)
History of the present pregnancy recorded	
Gravida	28 (87.5)
Parity	28 (87.5)
Number of ANC visit	28 (87.5)
Abdominal examination at initial assessment recorded	
Fundal height	20 (62.5)
Fetal position	15 (46.9)
Fetal descent	18 (56.3)
Fetal Heart Beat (FHB)	21 (65.6)
Vaginal examination at initial assessment recorded	
Status of membrane	22 (68.8)
Cervical dilation	26 (81.3)
Fetal presentation	25 (78.0)
Observation of care during labor and delivery: Progress of labor monitored by using partograph	
Plotted cervical dilatation at least every 4 hours	23 (72.0)
Plotted descent of head at least every 4 hours	18 (56.3)
Maternal blood pressure plotted at least every 4 hours	21 (65.6)
Maternal pulse plotted at least every half hour	21 (65.6)
Time of birth recorded in the clinical chart	23 (71.9)
Explained what is going to be done to woman or support person	24 (75.0)
Family member allowed to remain with her constantly during L& D	21 (65.6)
Washed hands thoroughly in preparation for birth	16 (50.0)
Sterile gloves used for delivery	31 (96.9)
Give oxytocin 10 IU IM within 1 minute after birth of a baby	23 (71.9)
Placed the baby on the mother's abdomen	26 (81.3)
Examined vulval-perineal region for possible lacerations	22 (68.8)
Cut the cord 2 fingers from the abdomen of the baby and another 2 fingers from the first clamping	28 (87.5)
Controlled cord traction applied to deliver the placenta	26 (81.3)
Checked completeness of placenta	26 (81.3)
Checked contraction of the uterus after the placenta is delivered	21 (65.6)
Gave vitamin K 1mg IM for the baby	23 (71.9)

(Continued)

**Table 5** (Continued).

Tasks for Delivering Mothers and Newborns During Labor and Delivery Care	Performed by HCWs n (%)
Weighed the baby	28 (87.5)
Baby start breastfeeding within 1 hour	24 (75.0)
Checked vaginal bleeding every 15 minutes in the first hour after complete delivery of the placenta	19 (59.4)
Blood pressure checked every 15 minutes after complete delivery of the placenta	17 (53.0)
Disposed contaminated materials leak-proof container	25 (78.1)
Washed hands thoroughly after delivery	29 (90.6)

**Table 6** Judgment Analysis Matrix of Compliance Dimension for Evaluation of the Process of Delivery Service in Gondar City Health Centers, Northwest Ethiopia, 2020

Indicators	E	O	W	R	R (%)	JP
The proportion of clients whom fetal heartbeat (FHB) at initial assessment recorded	32	21	8	5.3	65.6	Fair
The proportion of clients whom fetal presentation at initial assessment recorded	32	25	8	6.3	78.1	Good
The proportion of clients whom cervical dilation is plotted at least every 4 hours on partograph	32	23	10	7.2	72.0	Good
The proportion of clients whom maternal blood pressure is plotted at least every 4 hours on partograph	32	21	8	5.3	65.6	Fair
The proportion of time of birth recorded in the clinical chart	32	23	6	4.3	71.9	Good
The proportion of clients who have given oxytocin 10 IU IM within 1 minute after birth	32	23	10	7.2	72.0	Good
The proportion of clients checked for the contraction of the uterus after the placenta is delivered	32	21	8	5.3	65.6	Good
The proportion of clients who are checked for completeness of placenta and membranes	32	26	8	6.5	81.3	Good
Proportion of clients examined vulval -perineal region for possible lacerations	32	22	8	5.5	68.8	Fair
Proportion of newborns given Vitamin K 1mg IM	32	23	8	5.8	72.5	Good
The proportion of newborns started breastfeeding within 1 hour	32	24	8	6.0	75.0	Good
The proportion of client checked for vaginal bleeding every 15 minutes in the first hour after complete delivery of the placenta	32	19	10	5.9	59.0	Fair
<b>Overall compliance score</b>			<b>100</b>	<b>70.6</b>	<b>70.6</b>	<b>Good</b>

**Abbreviations:** E, Expected; O, Observed; W, Weight; R, Result= (Observed X weight)/Expected; R (%), Result in % = (Result/weight) X100; JP, Judgement Parameter.

## Obstetric Characteristics of Participants

Nearly 12% of mothers' recent pregnancy was unplanned. Fifty-eight percent of mothers had ANC visit four times and above, 59.0% of mothers were multigravida and 56.7% had two or more deliveries. Seven percent of the mothers ever had a history of abortion. On the other hand, 3% of mothers ever had a history of stillbirth. Moreover, 96.4% of mother had spontaneous vaginal delivery (SVD) which was the predominant mode of delivery and 2 (0.6%) of delivery ended with newborn death (Table 8).

## Accommodation of Delivery Service

Out of the respondents, 65.6% were perceived that the waiting area was convenient. Nearly two-thirds of mothers were satisfied with the cleanliness of the delivery room. The majority (93.3%) of delivering mothers were satisfied with the delivery room's light and air condition. About 72.5% of delivering mothers were satisfied with the waiting time; 85.0%

**Table 7** Socio-Demographic Characteristics of Participants in Gondar City Health Centers, Northwest Ethiopia, 2020 (n = 363)

Socio-Demographic Variables	Frequency	Percent (%)
<b>Age in years</b>		
<20	41	11.3
20–24	92	25.3
25–29	132	36.4
≥30	98	27.0
<b>Residence</b>		
Urban	292	80.4
Rural	71	19.6
<b>Marital status</b>		
Married	320	88.2
Single	21	5.8
Divorced	15	4.1
Widowed	7	1.9
<b>Religion status</b>		
Orthodox	296	81.5
Muslim	62	17
Protestant	5	1.4
<b>Educational status</b>		
Unable to read and write	36	9.9
Primary (1–8)	110	30.3
Secondary (9–10)	117	32.2
Preparatory(11–12)	24	6.6
College and above	76	20.9
<b>Occupation status</b>		
Privately employed	37	10.2
Government employed	64	17.6
Housewife	188	51.8
Merchant	49	13.5
Student	25	6.9
<b>Monthly household Income (ETB)</b>		
<1000	47	13.0
1000–2000	88	24.2
>2000	228	62.8

were satisfied with the delivery room's silence and 48.6% were satisfied with the appropriateness of proximity of the toilet.

There is only one toilet in the HC. The toilet has no hand washing basin and it doesn't get clean regularly because of shortage of water accessibility in the HC. We have informed the head of the HC to discuss different stake holders on the possibilities of building additional toilets and water accessing full days. [female midwife-nurse]

Further, the level of mothers' satisfaction regarding the accommodation of delivery service structure was 68.8% (Table 9).

### Acceptability of Delivery Service

The finding of the evaluation showed that the overall acceptability level of delivery service was 80.2%. Of this, 80.4% of mothers responded that health-care providers answered their questions and concerns during delivery care service, and

**Table 8** Obstetrics Characteristics of Participants in Gondar City HCs, Northwest Ethiopia, 2020 (n = 363)

Obstetrics Variables	Frequency	Percent (%)
Planned pregnancy		
Yes	321	88.4
No	42	11.6
Number of ANC visit		
None	45	12.4
1–3	108	29.8
4+	210	57.8
Gravida		
Primi-gravidae (I)	149	41.0
Multi-gravidae (>I)	214	59.0
Parity		
Primi-para (I)	157	43.3
Multi-para (>I)	206	56.7
Ever had abortion		
Yes	27	7.4
No	336	92.6
Ever had stillbirth		
Yes	11	3.0
No	352	97.0
Mode of delivery of current child		
Spontaneous	350	96.4
Instrumental	13	3.6
Newborn outcome		
Alive	361	99.4
Died	2	0.6

**Table 9** Judgment Matrix Analysis of Accommodation Dimension for the Evaluation of Delivery Service in Gondar City HCs, Northwest Ethiopia, 2020

Indicators	E	O	W	R	R (%)	JP
The proportion of clients who perceived that the waiting area is convenient	363	238	12	7.9	65.8	Fair
Percentage of clients who perceived that cleanliness of the room is appropriate	363	230	12	7.6	63.3	Fair
The proportion of clients who perceived that waiting time is appropriate	363	264	12	8.7	72.5	Good
The proportion of clients who perceived that proximity to service delivery points is appropriate	363	237	14	9.1	65.0	Fair
The proportion of clients who perceived that the number of patients in a room is appropriate	363	233	14	9.0	64.3	Fair
The proportion of clients who perceived that the silence of the delivery room is appropriate	363	308	10	8.5	85.0	Good
The proportion of clients who perceived that light, air condition of the delivery room is appropriate	363	338	12	11.2	93.3	V. good
The proportion of clients who perceived that proximity to a toilet is appropriate	363	177	14	6.8	48.6	Poor
<b>Overall accommodation score</b>			<b>100</b>	<b>68.8</b>	<b>68.8</b>	<b>Fair</b>

**Abbreviations:** E, Expected; O, Observed; W, Weight; R, Result= (Observed X weight)/Expected; R (%), Result in % = (Result/weight) X 100; JP, Judgement Parameter.

**Table 10** Judgment Analysis Matrix of Acceptability Dimension for the Evaluation of Delivery Service in Gondar City HCs, Northwest Ethiopia, 2020

Indicators	E	O	W	R	R (%)	JP
The proportion of clients who perceived that health care providers clearly answered their questions and concerns during delivery care service	363	292	12	9.7	80.8	Good
The proportion of clients who perceived that health care providers explained about benefits and side effects of medical treatments and procedures	363	243	10	6.7	67.0	Fair
The proportion of clients who perceived that health care providers treated them with courtesy	363	282	8	6.2	77.5	Good
The proportion of clients who perceived that health care providers informed me about each procedure of L&D care process	363	306	8	6.7	83.8	Good
The proportion of clients who perceived that they are seen by health workers immediately at arrival to the HC	363	292	12	9.7	80.8	Good
The proportion of clients who perceived that health professionals encouraged (reassured) them when they were in pain during L&D	363	275	10	7.5	75.0	Good
The proportion of clients who perceived that their privacy was secured during delivery	363	309	10	8.5	85.0	Good
The proportion of clients who perceived that health professionals treated them well without depending on some personal attribute	363	281	10	7.7	77.0	Good
The proportion of clients who perceived that health care providers' greeting was acceptable	363	277	8	6.1	76.3	Good
The proportion of clients who responded that they will recommend the delivery service of the health center for friends and families	363	343	12	11.3	94.2	Very Good
<b>Overall acceptability score</b>			<b>100</b>	<b>80.2</b>	<b>80.2</b>	<b>Good</b>

**Abbreviations:** E, Expected; O, Observed; W, Weight; R, Result= (Observed X weight)/Expected; R (%), Result in % = (Result/weight) X100; JP, Judgement Parameter.

67.0% accepted the information given by health-care providers about the benefit and side effects of medical treatments and procedures. About 77.7% of mothers accepted the courtesy of health-care providers. The evaluation also showed that 83.8% of mothers were informed about the procedures of the L&D care. Moreover, 94.2% of mothers were responded to recommend the HC's delivery service for friends and families (Table 10).

### Factors Associated with the Acceptance of Delivery Service

In our analysis, residence and having ANC during the recent pregnancy were the factors that affect the delivery services. Accordingly, the odds of acceptance of delivery services by rural dweller mothers is significantly lower compared to mothers from urban areas (AOR: 0.13; 95% CI: 0.06–0.30). Mothers who had ANC visits of 1 to 3 compared to mothers who never had any ANC visit (AOR: 2.65; 95% CI: 1.05–6.74) and mothers who had ANC4 or more visits compared to who never had any ANC visit (AOR: 5.57; 95% CI: 2.09–14.84) had significantly higher odds to acceptance delivery services (Table 11).

## Discussion

We used an indicator-driven evaluation to evaluate the process of institutional delivery services, and we found the process was judged as good. Moreover, availability, accommodation, and acceptability dimensions were judged as good whereas the compliance was judged as fair based on a predetermined judgement parameter. Pertinent parenteral IV infusions like ringer lactate and normal saline were fully available in the HCs. Likewise, essential drugs such as adrenaline, lidocaine, and TTC eye ointment were in stock in the last 3 months. This finding is in line with the Ethiopian national guideline of health sector transformation in quality.<sup>31</sup>

The availability of parenteral antibiotic drugs like metronidazole and gentamycin were stockout, in the 40.0% of HCs in the last three months. This finding is lower than a study in Pakistan which reported that more than 90.0% of health facilities were stocked for these drugs.<sup>32</sup> This great difference might be because of the existence of differences in the health system and service delivery.

**Table 11** Bivariable and Multivariable Logistic Regression Analysis for the Factors Associated with Acceptability of Delivery Services in Gondar City, Northwest Ethiopia, 2020 (n = 363)

Variables	Delivery Services		COR (95% CI)	AOR (95% CI)
	Accepted	Not-Accepted		
	n (%)	n (%)		
<b>Age in years</b>				
<20	24 (6.6)	17 (4.9)	1	1
20–24	77 (21.2)	15 (4.0)	3.64 (1.58, 8.35)	2.61 (0.94, 7.29)
25–29	98 (27.0)	34 (9.3)	2.04 (0.98, 4.25)	0.95 (0.34, 2.62)
≥30	75 (20.7)	23 (6.3)	2.31 (1.06, 5.03)	0.70 (0.23, 2.13)
<b>Residence</b>				
Urban	239 (65.8)	53 (14.6)	1	1
Rural	35 (9.6)	36 (10)	0.22 (0.12, 0.37)	0.13 (0.06, 0.30)*
<b>Educational status</b>				
Unable to read and write	24 (6.6)	12 (3.3)	1	1
Primary (1–8)	77 (21.2)	33 (9.0)	1.17 (0.52, 2.61)	0.83 (0.30, 2.31)
Secondary (9–10)	103 (28.4)	14 (3.8)	3.68 (1.51, 8.96)	1.57 (0.49, 5.07)
Preparatory (11–12)	14 (3.8)	10 (2.7)	0.70 (0.24, 2.03)	0.28 (0.06, 1.23)
College and above	56 (15.4)	20 (5.5)	1.40 (0.59, 3.31)	0.67 (0.16, 2.89)
<b>Occupational status</b>				
Privately employed	24 (6.6)	13 (3.6)	1	1
Government employed	45 (12.4)	19 (5.2)	1.28 (0.54, 3.04)	0.61 (0.17, 2.21)
Housewife	148 (40.8)	40 (11.0)	2.00 (0.94, 4.29)	2.16 (0.74, 6.24)
Merchant	38 (10.47)	11 (3.0)	1.87 (0.72, 4.85)	0.75 (0.22, 2.53)
Student	19 (5.23)	6 (1.7)	1.72 (0.55, 5.36)	3.12 (0.63, 15.4)
<b>Planned pregnancy</b>				
Yes	249 (68.6)	72 (19.8)	1	1
No	25 (6.9)	17 (4.7)	0.43 (0.22, 0.83)	0.10 (0.36, 2.76)
<b>Number of ANC visit</b>				
None	17 (4.7)	28 (7.7)	1	
1–3	80 (22.0)	28 (7.7)	4.71 (2.24, 9.87)	2.65 (1.05, 6.74)*
4+	177 (48.8)	33 (9.1)	8.83 (4.35, 17.93)	5.57 (2.09, 14.84)*
<b>Gravida</b>				
Primi-gravidae (1)	103 (28.4)	46 (12.7)	1	1
Multi-gravidae (>1)	171 (47.1)	43 (11.8)	1.78 (1.10, 2.88)	0.92 (0.18, 4.66)
<b>Parity</b>				
Primi-para (1)	108 (29.8)	49 (13.5)	1	1
Multi-para (>1)	166 (45.7)	40 (11.0)	1.88 (1.16, 3.05)	3.78 (0.72, 19.83)

Note: \*Statistically significant at p-value <0.05.

Health centers had parenteral anticonvulsants; magnesium sulfate was 62.5% and diazepam was 37.5%. This finding was relatively consistent with the other study done in Guinea where 57.0% of health facilities were with parenteral anticonvulsants.<sup>33</sup> This consistency might be due to the similarity of the health-care delivery system.

In a significant number of HCs, there was a stockout of parenteral antihypertensive drugs such as hydralazine and methyldopa for the last three months. The key informant interview showed that the reason was the shortage of drugs in the pharmaceutical center. This implies that the quality of delivery services in these HCs is likely to be compromised for delivering mothers with obstetric complications.



Medical equipment; baby towel and vacuum extractor were available in 62.5%, and 87.5% of health centers, respectively, which are below the expected standard in the evaluation. The finding is incongruent with the recommended standard of HC requirements guidelines<sup>24</sup> and the recommendation of WHO guidelines.<sup>28</sup> The possible reason might be the insufficient allocation of finances for the health centers to buy these equipments. The availability of midwives in 40% of HCs was below the national guideline recommendation (3 midwives per HC) which affects the skill birth attendance coverage in the city. The finding from key informants also indicated the insufficient number of midwives has made the necessary care for delivering mothers difficult. The finding is consistent with a study in northern Ethiopia where half of the health facilities had fulfilled three midwives per HC. The shortage of midwives might be explained by either the limited availability in the market or a high turnover. Thus, emphasis needs to be given to increasing the number of midwives.

The proportion of HCs having separate rooms to accommodate delivering mothers was observed to be 25.0%. This finding is far from the Ethiopian standard health center requirements guideline (3 separate rooms).<sup>24</sup> This implies limited health-care managers involved in building rooms and ensuring the safety of delivering mothers.

This evaluation showed that 70.6% of the delivery care services were implemented according to the national standards. This finding was higher than an evaluation conducted in southern Ethiopia, which showed that the compliance dimension's average result was 46.9%.<sup>13</sup> This may be due to the existence of differences in the availability of delivery care guidelines and differences in health-care providers' tendency towards using labour and delivery care guidelines. For the majority (96.9%) of the mothers, health-care providers were wearing a surgical glove during labour and delivery care procedures. This encouraging finding reflected that health-care providers in Gondar city HCs have relatively adhered to the recommended infection prevention practice during childbirth care.

As an initial assessment task, fetal heartbeat was assessed for 65.6% and fetal presentation for 78.1% as per the guideline. Conducting a complete initial assessment of the laboring mother informs the decision about whether she needs extra care or referral. This finding is relatively better than the finding of the study conducted in Bishoftu town, Ethiopia.<sup>8</sup> The difference may be explained by differences that health-care providers adhere to the documentation of initial assessment task done and attention given for timely identification of the mothers.

The finding of this evaluation also showed that partograph used for 72.0% of mothers to monitor the progress of labor for cervical dilation and maternal blood pressure plotting was done for 65.6% of mothers. This finding contrasts the Ethiopian national obstetrics management protocol guideline, which recommends that all mothers in labour be monitored by partograph.<sup>23</sup> This inconsistency might be due to a lack of refreshment training on partograph utilisation, which implies relatively poor compliance of health-care providers to the recommended protocol.

Seventy-five percent of the newborn were started breastfeeding within an hour of delivery. This finding was comparable with the study conducted in Northern Ethiopia where 70.4% of newborn babies were early initiated for breastfeeding within an hour<sup>34</sup> and was higher than the study conducted in Cotedivoire, in which less than 10% of babies have started breastfeeding within an hour.<sup>35</sup> This difference shown during immediate newborn care practice might be due to the difference of knowledge and attitude of the two countries' health-care providers towards the importance of early initiation of breastfeeding in the prevention of newborn infections.

In this evaluation, 71.9% of mothers were administered with oxytocin 10 IU IM within 1 minute after the birth of the baby. This finding was lower than a study conducted in the Oromia region, Ethiopia, which revealed that 100% of delivering mothers were administered oxytocin.<sup>8</sup> The result might be due to the limitation of oxytocin from the pharmaceutical fund and supply agency that supplies the HCs and the inability of health-care providers to adhere to the recommended protocol.

In this evaluation, the satisfaction of delivering mothers with the convenience of waiting area, clean lines of the room, and waiting time was 65.8%, 63.3%, and 72.5%, respectively. These findings were lower than that of a study conducted in northwest Ethiopia, which reported that 95.9%, 88.7% and 95.6% of mothers were satisfied with the waiting area, cleanliness of the room, and waiting for time, respectively.<sup>2</sup> This variation might be due to the availability of different structural set up to accommodate delivering mothers. This evaluation demonstrated that 48.6% of mothers were satisfied by the proximity of the toilet. This finding was higher than that of study findings in Gamo Gofa, southwest Ethiopia resulted in 35.5% of mothers were satisfied with the clean lines and access of the toilet<sup>36</sup> but lower than the study

conducted in Debre Markose, northwest Ethiopia where 83.3% of mothers were satisfied.<sup>2</sup> This discrepancy might be due to differences in the accessibility of the toilet for delivering mothers near to the delivery room.

Moreover, mothers' satisfaction with the accommodation of delivery service structural set up in Gondar city HCs was 68.8%. This finding has briefed that more than 30% of mothers were not satisfied with the delivery service structure's accommodation. This might be due to the delivery service structure's accommodation that might not be well structured to be convenient for delivering mothers.

The finding of the evaluation showed that 80.2% of mothers were accepted the delivery service which was judged as good. Furthermore, about 94.0% of delivering mothers had accepted the delivery service and will recommend the HCs to their families and friends for the future. This indicates that the mothers' knowledge, attitude, and personal character of health-care providers caring for delivering mothers might be as desired.

In this evaluation, mothers' acceptance of delivery service was associated with the residence and having ANC follow up. Those delivering mothers from rural communities were more likely to be associated with non-acceptance compared to urban residents. This finding is consistent with another study conducted in Gondar, Ethiopia<sup>27</sup> but contrasts with the study conducted in Addis Ababa, Ethiopia.<sup>37</sup> This might be because most rural mothers live in relatively different socio-cultural circumstances, and most of them are in a low level of educational status and they are new to the HCs environment which makes communication and understanding with health-care providers difficult and causes poor acceptance.

Moreover, mothers who had ANC1 to 3 visits had accepted the delivery service two times higher than those mothers who never had any ANC visits. Likewise, mothers who had ANC4 or more visits were five times more likely to accept delivery service than mothers who had no ANC follow-up. This finding supports the study conducted in Oromia, Ethiopia.<sup>38</sup>

## Strengths and Limitations of the Evaluation

The strength of this evaluation was that the evaluation used four dimensions to evaluate the process of delivery service to address a wide area of performance aspects. Moreover, the evaluation employed both qualitative and quantitative methods to get more accurate and detailed results and covered all HCs in Gondar city to make them representative of the findings.

The limitations of this evaluation were that since the evaluation was facility-based and conducted in the health institutions, there might be a social desirability bias like showing gratitude to the health-care providers who saved their lives. This might result in relatively high levels of satisfaction and acceptance towards the service. To minimize it, intensive training of the data collectors on proper interview techniques and interviewing clients in a separate room were the strategies taken. Hawthorn's effect during the direct observation was the other possible limitation of the evaluation, which might have contributed to the relatively high-performance scores of observant on delivering care process practices. Dropping the first three observations is recommended to minimize it.<sup>39</sup> Because after the third session, the observant will return to his/her actual behavior. So, in this evaluation, the first 3 observations were dropped from each observant per facility.

## Conclusions

The evaluation findings revealed that the overall process of the delivery service in the evaluation area was good. The availability of resources was also good. But there was insufficient manpower for delivery service; the number of midwives was sub-standard. The training status of health-care workers on BEmONC was relatively insufficient. Parenteral IV Infusions, HIV test kit, surgical gloves, and medical equipment were stock-in. However, the majority of basic parenteral signal functions were not found to be adequately provided to the HCs. Parenteral signal functions were stockout.

The delivery service's compliance to the guideline was relatively good; however, clinical practices were not found to be adequately practised.

The accommodation of the delivery service structure was judged as poor. Moreover, the acceptability of the delivery service provided in Gondar city HCs was good.

Therefore, it is recommended that the city administrative health office should recruit midwives to the HCs as per national requirements. The HCs should act on providing BEmONC parenteral signal functions. Moreover, health workers should also comply with the standard of care for delivery service.

## Abbreviations

ANC, Antenatal Care; BEmONC, Basic Emergency Management of Obstetric and Newborn Care; EDHS, Ethiopian Demography Health Survey; ETB, Ethiopian Birr; HC, Health Center; L&D, Labour and Delivery; MCH, Maternal and Child Health; MOH, Ministry of Health; MMR, Maternal Mortality Ratio; NGO, Non-Governmental Organisation; MRHO, Maternal Reproductive Health Office; UNICEF, United Nations International Children's Emergency Fund; WHO, World Health Organization.

## Data Sharing Statement

Data will be available upon reasonable request from the corresponding author.

## Ethics Approval and Consent to Participate

All the ethical procedures were followed in accordance with the declaration of Helsinki. Ethical clearance was obtained from the ethical review committee of the Institute of Public Health, University of Gondar (Ref. No. IPH/837/6/2012). A permission letter was obtained from the Gondar city administration health office, and permission was assured from the heads of the HCs. Informed written consent was obtained from each participant after a brief explanation of the research objectives and data collection process of the study. Participants were also informed about their right to withdraw at any time or to skip a single question or number of questions. After ensuring their volunteerism, those participants who could read and write signed on the space provided. Whereas, for those who were unable to read and write, a fingermark (finger thumb) was taken. Finally, the confidentiality of the participants was anonymized with no any personal identifiers.

## Consent for Publication

All participants provided permission to use their anonymised responses in the manuscript.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

## Disclosure

The authors declared that they have no competing interests.

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