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# Armed conflict and maternal health service utilization in Ethiopia's Tigray Region: a community-based survey

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## Abstract

**Background** Evidence generated on utilization of maternal health services during times of conflict can inform the development of targeted interventions. The deadly war in Tigray caused the health system to collapse. However, utilization of maternal health services is not well documented that might help in design effective interventions applicable during armed conflict. Thus, this study aimed to assess maternal health service utilization and bridge the gap in healthcare provision and support during conflict.

**Methods** A community-based cross-sectional survey was conducted among mothers of children under the age of 1 year in six accessible zones of Tigray from August 4–20, 2021. The study participants were selected through a random sampling method. The study was conducted during the armed conflict where the access to health services was limited due to the damaged and looted health facilities. A descriptive study was used to characterize the study population and data were presented using proportions and percentages. A Chi-square test was used for categorical variables and a  $P$ -value of 0.05 was considered significant.

**Results** A total of 4,381 participants were included in the study. Modern contraceptives were used by 1002 (22.9%) of women, and injectable contraceptives were the most common method used by 472 (47.1%) women. Likewise, only 830 (36.5%), 1956 (47.1%), and 623 (15.0%) respondents reported the use of optimal antenatal care (ANC), skilled delivery, and postnatal care (PNC) in the first 24 h by mothers, respectively. About 34% of women received comprehensive abortion care services. Most delivery services took place in hospitals. Residence has shown a significant difference in using maternal health services at  $p$ -value  $< 0.001$ .

**Conclusion** The conflict in Tigray has had a profound impact on maternal health services, resulting in a significant disruption that is disproportionately high in rural areas. Immediate action is required to provide access to lifesaving interventions for basic maternal health services. The timely initiation of these services is crucial in addressing the pressing needs of pregnant women and their infants. By implementing comprehensive and targeted interventions,

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we can mitigate the potential long-term consequences and ensure that maternal health services are effectively reinstated.

**Keywords** Armed conflict, Tigray, Maternal health, Service use

## Background

According to the Universal Declaration of Human Rights, everyone is entitled to all rights and freedoms without distinction of any kind, while mothers and children are entitled to special care and assistance [1]. Despite this, all human rights agreed upon by the global community are violated across the globe, particularly in war zones. One particular human right most significantly violated in a conflict setting is the right to health. Conflict disrupts health systems. Armed conflicts impede the delivery and use of health services because of reduced accessibility to health facilities, distrust, a lack of medical supplies, and abandoned health facilities due to intentional damage or looting [2–4]. Insecurity, impaired functionality of health facilities, and ill distribution of supplies limit the availability and quality of service [5].

Women and their newborns are a particular group of populations that are most significantly affected in conflict settings. Reports from various armed conflict zones have shown a remarkable decline in maternal health indicators, which is related to inadequate care-seeking [6]. Women and their newborns particularly suffer during labor and delivery, during which most deaths occur [7, 8]. Similarly, in armed conflicts where there are security issues and non- or partially functional health facilities, essential services such as abortion care and family planning are rarely available [9]. This was evidenced in Northern Uganda, where the use of contraceptives during and post-conflict was lower than that in the non-conflict zones [10, 11]. In such conflict settings, sexual violence is commonly reported, leaving many women unprotected from unwanted pregnancy and STIs, including HIV [12]. This highlights the increase in maternal morbidity and mortality due to limited access to maternal health services such as abortion and follow-up care. Overall, a decline in early antenatal care (ANC) use and the number of ANC visits have been reported during conflicts [13, 14], while the proportion of all obstetric complications treated declined from 58.9 to 43.9% [10]. Notably, the proportion of skill-attended deliveries in studies conducted in Cameroon and Uganda has shown a significant decline [15, 16]. Studies from conflict settings also reported a decline in postnatal care (PNC) because women preferred to informally consult community health workers when they had any perceived risk [17, 18]. Consequently, these challenges reduce access to maternal healthcare services and expose women to the risk of maternal complications and preventable deaths [19–21].

Tigray's health system has improved over the last three decades. The Tigray Health System served as a benchmark for Ethiopia's flagship health extension program. The Ethiopian demographic health survey 2019 revealed skilled ANC, delivery, and PNC services were 94%, 73.3%, and 62.9% in Tigray, respectively, compared with 73.6%, 49.8%, and 33.8% of the national report, respectively [22]. A report from the Tigray Statistical Agency (TSA) also showed an improvement in the proportion of maternity care services such as ANC (90%), skilled birth (81%), and PNC (81%) before the break out of the war [23]. Since the war breakout on November 4, 2020, however, these decades of progress in the health system have been destroyed in a moment [24]. In Tigray, 70% of the health facilities were damaged or destroyed due to the war [25].

Currently, mothers use a few partly functioning health institutions. However, the capacity of the Tigray health system to provide care to women and their newborns remained largely unknown after the war. Thus, the aim of this study was to investigate the use of maternal health services during the war, where the option for healthcare was limited across Tigray. This might help design interventions to access alternative lifesaving services while rebuilding the health system.

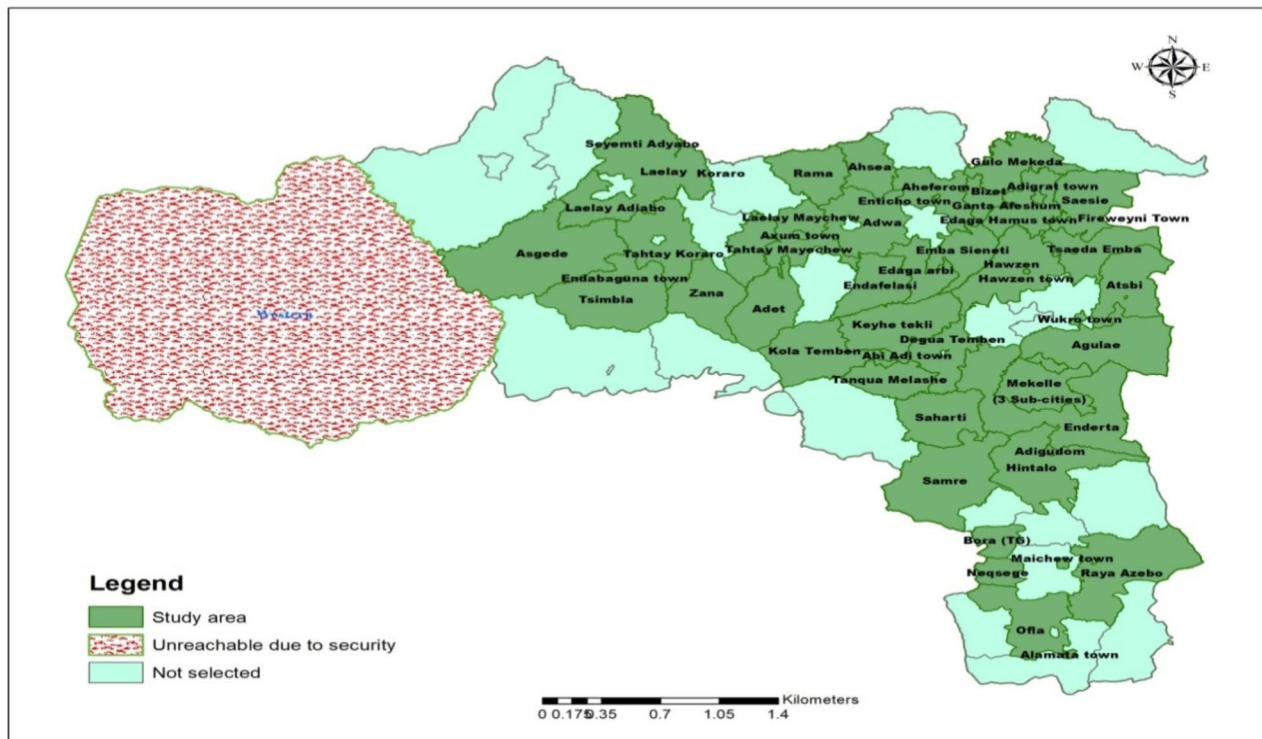
## Methods

### Study design and setting

A community-based cross-sectional study was conducted in six zones of Tigray except the western zone, which was excluded for security reasons, to assess maternal health service utilization during the war (from November 2020 to June 2021). Administratively, the region is divided into seven zones and 93 districts, and the districts are further divided into Kebeles or Tabias (the smallest administrative unit). The data was collected from August 4–20, 2021, on selected key performance indicators for health (Fig. 1)

### Study population, sample size and sampling procedure

This study was part of a large-scale survey on Key Performance Indicators for Health survey including maternal health, child health, nutritional status, WASH, and civilian injuries. The study was based on the Ethiopian Demographic and Health Survey (EDHS), which served as the enumeration area. Accordingly, four enumeration areas (Kebeles or Tabias) for each district were considered for the study. A total of 208 enumeration areas in 52 districts were used, and twenty households in each enumeration area were considered for data collection, resulting in a



**Fig. 1** Map of study area

total sample of 4160 households (52 districts \* 4 Tabias/district \* 20 households/Tabia), and 5% of the sampled population was considered, giving a total sample size of 4368 as shown in Fig. 2. A multi stage sampling technique was employed. The households were selected randomly from each Kebele or Tabia using the household list. The study units were households with children under one year of age. Mothers, and in the absence of a mother, any household member aged 18 years and older were the study participants. All households with children under the age of one year were included in the study. In case of more than one eligible study participants in the selected household, a ransom sample was used to select one. The next household was taken when the household had no eligible study participant.

#### Data collection and quality control

The data were collected using an interviewer-administered structured questionnaire. The tool included information on socio-demographics, maternal and child health service indicators, water, hygiene, and sanitation conditions, and household food insecurity. A three-day intensive training was given to data collectors and supervisors about the purpose of the study, privacy and confidentiality issues, techniques of data collection, and ethical issues. Health extension workers and experts from Mekelle University, the Tigray Health Research Institute and the Tigray Health Bureau were used as data

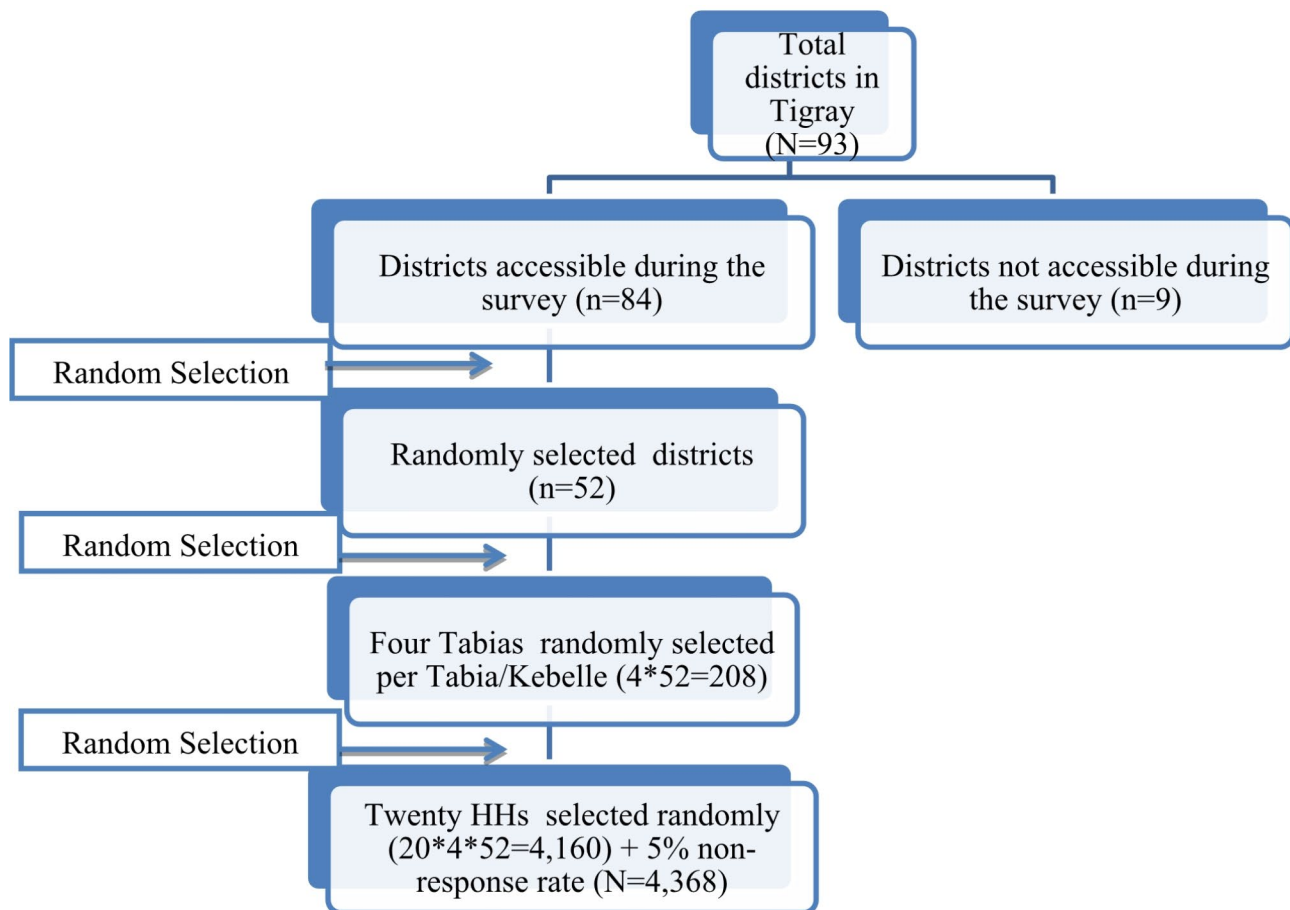
collectors and supervisors. The supervisors were responsible for verifying, monitoring, and evaluating the quality of the data and validating the instrument for accuracy and consistency throughout the data collection period. The instrument was translated into the local language (Tigrigna) and then back to English to check for consistency. In addition, the tool was pretested, and a modification was made to the wording and timing of the PNC visit. To ensure a high response rate, any household (HH) member aged 18 years and older had been planned to participate in the absence of a mother. Moreover, three attempts were also considered to address closed HHs; otherwise, the next HH must be taken for an interview.

#### Variables and measurements

The variables used to measure the key performance indicators of maternal health service use in this study included contraceptive use (both traditional and modern), ANC service, skilled delivery service, PNC service in the first 24 h and comprehensive abortion care services.

#### Description of the maternal health services in the context of this study

**Use of contraceptive** A woman in the reproductive age group reported using any method of contraceptive including lactational method, injectables, regular pills, emergency pills, implants, IUCD, condom, surgical method.



**Fig. 2** Schematic presentation of the sampling procedure

This can be measured by the percentage of women who received at least one contraceptive method in the specified period.

**Antenatal care service use** A service obtained during pregnancy to ensure the pregnant woman and her unborn child is in the best possible health before delivery. This can be measured by the percentage of mothers who received at least one ANC during the first trimester and visited at least 4 ANC during her pregnancy for optimal ANC.

**Skilled delivery service utilization** A pregnant woman who receive assistance from skilled birth attendants either at home or at health facilities. It can be measured by the percentage of mothers received any skilled delivery regardless of the place of delivery.

**Postnatal care service utilization** A service provided to the mother and newborn after birth by a skilled provider during the first 24 h of birth. This was measured by the percentage of mothers attending for PNC during the first 24 h of birth.

**Comprehensive abortion care (CAC) services use** is use of an intervention proven to prevent maternal death or injury. The percentage of mothers who received the comprehensive abortion care was used to measure CAC service use.

#### Data analysis

The data were entered into Epi Data software version 3.1 and then exported to SPSS version 25 for analysis. Coding, reclassification, and merging of variables were thoroughly performed, and then the data were cleaned to minimize errors. Descriptive statistics, such as frequencies and percentages, were used to describe the study participants in relation to the relevant variables, and the processed data were presented using tables and figures. Healthcare service use for each indicator was presented using a proportion with a 95% confidence interval (CI). The data were weighted according to the number of eligible women who had children under one year of age in the HH. Using cross-tabulation, a Chi-square (categorical variables) test was performed to determine an association between the variables and compare them across

**Table 1** Methods of contraceptives used during the war in Tigray (Nov.4/2020 to June 28/2021) ( $n=1,002$ )

| Method used            | Number | Percentage | CI           |
|------------------------|--------|------------|--------------|
| Injectables            | 472    | 47.1       | (44.1, 50.4) |
| Lactational Amenorrhea | 184    | 18.2       | (16.5, 20.8) |
| Implants/Norplant      | 165    | 16.5       | (14.2, 18.8) |
| Pills                  | 99     | 9.9        | (7.9, 11.7)  |
| Others*                | 82     | 8.2        | (6.6, 10.1)  |

\*IUD, Male condom, Emergency contraception, Periodic abstinence, Standard days method

**Table 2** Frequency of ANC visits during the war in Tigray (Nov.4/2020 to June 28/2021) ( $N=2273$ )

| Frequency of ANC visits | Number | Percentage | CI           |
|-------------------------|--------|------------|--------------|
| One time                | 1249   | 54.9       | (52.7, 56.8) |
| Two times               | 1028   | 45.2       | (43.1, 47.2) |
| Three times             | 755    | 33.2       | (31.3, 35.2) |
| Four times and above    | 456    | 20.1       | (18.5, 21.8) |

the study participants. A  $P$ -value of 0.05 was considered significant.

## Results

A total of 4368 household respondents were included in the study. Approximately two-thirds ( $n=2892$ ) of the study participants were rural residents. Women who were pregnant and gave birth to a child before the war ( $n=217$ ) were excluded from the analysis of ANC service, skilled delivery, and postnatal care. An analysis was conducted among women who were pregnant and in their postpartum period during the war ( $n=4,151$ ). Eight months into the war, health extension workers (HEWs) visited approximately 14% of HHs.

### Utilization of contraceptive methods

Among the study participants ( $n=4,368$ ), the use of any contraceptive method (traditional and modern) was 22.9% (95% CI: 21.7, 24.2). Of these, 472 (47.1%) women used injectable during the war, followed by lactational amenorrhea (Table 1).

### Use of antenatal care services

Of the women who were pregnant during the war ( $n=4,151$ ), the proportion of women who received optimal ANC was 36.5% (95% CI: 18.9, 21.4). 55% of women had at least one visit to the ANC during the war (Table 2).

### Skilled delivery attendance

The use of skilled delivery during the war was 47.1% (95% CI: 45.5, 48.5). Seventy (1.7%) women gave birth either on the way to a health facility, roadsides, bushes, caves, or camps of an internally displaced person (IDP). The majority, 1743(82%) women in rural areas had unattended births by skilled health providers.

**Table 3** Delivery services by type of health facility during the war in Tigray (Nov.4/2020 to June 28/2021) ( $N=2026$ )

| Facility used for delivery | Number | Percentage | CI           |
|----------------------------|--------|------------|--------------|
| Hospital                   | 1169   | 57.6       | (55.5, 59.9) |
| Health center              | 660    | 32.5       | (30.4, 34.5) |
| Other health facilities*   | 135    | 6.6        | (5.6, 7.8)   |
| Health post                | 62     | 3.1        | (2.5, 4.1)   |

\* Private health facilities and NGOs

**Table 4** Use of PNC during the war in Tigray (Nov.4/2020 to June 28/2021) ( $N=4151$ )

| Frequency of PNC visits     | Number | Percentage | CI           |
|-----------------------------|--------|------------|--------------|
| No PNC checkup              | 2923   | 70.4       | (68.7, 71.5) |
| First visit(6–24 h)         | 623    | 15.0       | (14.0, 16.2) |
| The second visit (3rd day)  | 190    | 4.6        | (3.9, 5.3)   |
| The third visit (7th day)   | 167    | 4.0        | (3.4, 4.6)   |
| The fourth visit (6th Week) | 130    | 3.1        | (2.6, 3.7)   |
| All the four event          | 118    | 2.8        | (2.3, 3.3)   |

PNC=Postnatal care

### Delivery service by the type of health facility

In this study, most of the 57.6% (95% CI: 55.5, 59.9) delivery services occurred in hospitals, followed by health centers 32.5% (95% CI: 30.4, 34.5), during the war, as shown in Table 3. These health facilities were relatively functioning in some towns, including the regional capital, Mekelle. Most health posts were not working because the health workers assigned to the facilities were displaced to safer places following the war. The other health facilities, such as private health facilities and NGOs, were not accessible and perhaps costly to access.

### Postnatal care service

The use of PNC in the first 24-hour period was 15.0% (95% CI: 14.3, 16.5), and seventy% of women did not check for postnatal care during the war period. Nearly 30% of women had PNC visits at least once; of these, 15.0% had only one visit, and 2.8% reported all four PNC visits (Table 4).

### Comprehensive abortion care service

Among the study participants, 32 (0.8%) women had a history of abortion during the war; of these, only 11(34.4%) received comprehensive abortion care services.

### Use of maternal health services by residence

A disparity in the use of maternal health services was observed between urban and rural settings during the war. Women residing in rural settings were less likely to utilize maternal health services, particularly for family planning, optimal ANC, and postnatal care, as seen in Table 5. Residence has shown a significant difference ( $P$ -value<0.001) in the utilization of maternal health services, which is attributable to a factor other than chance.

**Table 5** Use of maternal health services by place of residence during the war in Tigray (Nov.4/2020 to June 28/2021)

| Variable                                | Response | Residence   |             | Chi-square test (p-value) |
|---|----------|-------------|-------------|---------------------------|
|   |          | Rural n (%) | Urban n (%) |                           |
| Family planning service<br>(n = 4,368)  | No       | 2446(84.6)  | 920(62.3)   | < 0.001                   |
|   | Yes      | 446(15.4)   | 556(37.5)   |                           |
| Antenatal care service<br>(n = 4,151)   | No       | 1570(56.8)  | 308(22.2)   | < 0.001                   |
|   | Yes      | 1196(43.2)  | 1077(77.8)  |                           |
| Skilled delivery service<br>(n = 4,151) | No       | 1743(63.0)  | 382(27.6)   | < 0.001                   |
|   | Yes      | 1023(37.0)  | 1003(72.4)  |                           |
| PNC service<br>(n = 4,368)              | No       | 2305(79.7)  | 835(56.6)   | < 0.001                   |
|   | Yes      | 587(20.3)   | 641(43.4)   |                           |

## Discussion

This study aimed to assess the use of maternal health services during the war in the Tigray region. The findings of this study demonstrated a significant decline in the use of maternal health services in the first eight months since the outbreak of the war on November 4, 2020. The challenges in service use were disproportionately high in rural settings compared with urban ones. Of the maternity health services, optimal ANC and PNC were the least achieved. Although the health extension workers had contributed a lot in improving the utilization of maternal health services by creating awareness and linkage to the health facilities, only 14 HH visits were made for every 100 HHs by HEWs during the war. This indicates the extent of damage to the health posts, where it is a center for HEWs to discharge their responsibility at the community level, mainly through behavioral interventions in ensuring maternal health services.

The trend in the use of contraceptive services declined during the Tigray War compared with pre-war [22]. The decline in the trend of contraceptive service use might be due to barriers in accessing health services, insecurity, an inadequate number of healthcare staff, and a lack of supplies due to the damaged health system [24]. This is supported by a study conducted in Syria where health care workers and health facilities were targeted during the war, which has a direct effect on declining the provision of health services [26]. This implies that many women are left behind without any contraceptive access that protects them from unwanted pregnancy, sexually transmitted infections, including HIV, and their consequences, such as life-threatening unsafe abortions, particularly in Tigray, where war-related sexual violence is more prevalent. The uptake of injectable was higher during the war compared to the pre-war period [22]. This requires careful interpretation that the increment in the use of injectable is not linked to service access and availability. In a sphere of limited service access, the women's prior preference might be the long-acting methods to secure their contraceptive demand during armed conflict [27]. Using short-acting methods such as pills and barrier methods (Condoms) are not effective in conflict zones with

massive sexual violence like what has happened in Tigray [27]. The use of the lactational amenorrhea method has increased from 0.7% before the war [22] to 18.3% during the war. This implies that a significant number of women lack access to modern contraceptive methods because of war-related service inaccessibility.

During the war, the use of any skilled ANC and optimal ANC care has significantly declined when compared with the EDHS 2019 report [22]. Similarly, the finding is lower than the optimal ANC reported by the Tigray statistical agency in 2020, which is 59% [28]. The use of ANC has declined in reference to the prewar period, despite its critical importance. As pregnancy is an entry in to maternal death, attending ANC is a key factor in avoiding preventable death, and it is also a good time to counsel women about the availability of maternal health services and the subsequent health benefits [29]. However, armed conflicts often disrupt routine skilled services, and the fate of women will fall in the hands of community health workers and traditional birth attendants who have neither adequate skill nor resources to provide standard care. This implies the possibility of excessive maternal mortality because of the failure to receive skilled care and referral linkage for life-saving interventions [30].

Although skilled delivery is one of the best-proven interventions to prevent maternal death, a significant number of women in this study gave birth at home without the assistance of qualified healthcare providers. Findings from this study have shown that more than half of the deliveries were unattended during the war compared to the prewar report [22, 28]. Rural women contributed more than 80% of deliveries without a skilled attendant in this study, which is threefold the prewar report, making an absolute reduction of 55% [28]. Skilled delivery is relatively higher during the war compared to the other maternal health services because of the availability of displaced health workers in the community who provide assisted delivery services that take place at home. A skilled delivery can significantly avert the magnitude of death. A significant number of women gave birth neither at home nor in health facilities, where most births occurred on roads, roadsides, camps for internally

displaced people, in bushes, and caves while trying to run away from the invading forces.

Majority of the mothers received delivery services in hospitals, followed by health centers during the war. Despite the curfew and blockade, some hospitals and health centers located in zonal towns were partially functioning. Women using delivery services might be the inhabitants of these towns. However, even in the case of active war, family members made long trips to access delivery services due to fear of undesired outcomes. Shelling and killing were common while families were making a trip in search of health facilities for delivery service, regardless of the inconveniences due to the war. However, delivery in health facilities does not indicate the quality of care. Many women who give birth at health facilities rarely receive satisfactory healthcare services because of a lack of medical equipment and drugs. During the war, the occurrence of life-threatening complications that may end up with permanent damage and death is a common experience due to the inaccessibility of health services [31]. This might imply that the war has impacted the health of women, perhaps explained by increased morbidity and mortality due to the collapsed health system.

Compared with the pre-war period, there was a significant decline in the postnatal care visits (30% versus 63% [22] and 81% [28]). This is evidence of a cultural change in service use for PNC and a notable improvement. Services were readily accessible, affordable, and suitable for users. Conversely, the war has made the PNC service inaccessible for several reasons.

Overall, maternal health service usage in the Tigray region has significantly declined during the armed conflict, with lower coverage in rural households [30, 32–34]. However, the mechanism of the effect varies from one setting to another. This was quite unique in Tigray, where all possible mechanisms such as the destruction of health facilities, the killing of healthcare providers, impaired ambulance services, disruption of health services, massive sexual violence, and looting of medical supplies and equipment were observed during the war, unlike other conflict zones where only a few of the mentioned factors are at play [35–37]. All these mechanisms led to poor access to healthcare and its negative consequences such as death, as indicated elsewhere [38]. Conversely, armed conflict could also be an opportunity to improve access to maternal healthcare in a well-organized humanitarian setting [39, 40].

This study has several strengths that cover a broader geographic area (52 districts), and to the best of our knowledge, it is the first community-based study with a large sample size and high response rate to analyze maternal health services as far as the Tigray conflict is concerned. Evidence generated from this study helps

inform decision-makers to prioritize lifesaving interventions and plan during and after the war. However, this study has some limitations. Although mothers made up most of the study respondents, any household member 18 years of age or older was also eligible to participate, which raised the possibility of bias since these respondents might not have the same knowledge and experience of the maternal health service as the mother herself.

The use of maternal health services reported in this study might be underestimated because of the exclusion of the western zone and some districts occupied by Ethiopian defense forces, Amhara militia, and Eritrean forces. Real experience has shown that areas occupied by the coalition forces for a longer period suffered severe damage that disrupted health services. This study did not address the quality of service where the majority of healthcare facilities are partially or not functioning.

#### **Strengths and limitations of this study**

Regarding war-torn Tigray, this study is the first and largest with a high response rate, which is important to document maternal health services and inform humanitarian efforts and health system rehabilitation. As the study was conducted during the conflict, it may inform other conflict areas as the evidence is scanty because of the disruptive nature of war and conflict and the need to plan response measures. However, there are also some limitations of the study including the possibility of a potential recall bias because study participants other than the mothers themselves were interviewed to respond to questions about the frequency of service use in the last 8 months. The use of HEW as interviewers could also introduce a social desirability bias though the HEWs were well oriented about it. In addition, weighting was not done despite the difference in population size across the district and tabias which may affect the magnitude of maternal health services. There might be under reporting due to the social issues related to abortion particularly among single, and early pregnancy abortions may not be recognized. Moreover, geographic exclusion of unsecured areas in the Tigray region might result in an underestimation of maternal health service use. Furthermore, the study did not address the quality of service, mainly because the service itself is not available.

#### **Conclusion**

The deadly war in Tigray has had a significant effect in disrupting the use of maternal health services. Service use was disproportionately lower among women living in rural settings. Maternal morbidity and mortality following disruption of health services are expected to be high in a collapsed health system. Initiating maternal health services, particularly in rural setting, is critical to saving the lives of women and their offspring, and measuring the

## outcome of disrupted maternal health services requires further study.

### Abbreviations

|      |                                    |
|------|------------------------------------|
| ANC  | Antenatal care                     |
| EDHS | Ethiopia demographic health survey |
| PNC  | Postnatal care                     |
| STI  | Sexually transmitted infections    |
| TSA  | Tigray statistical agency          |

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### Author contributions

MT designed the method and drafted the manuscript. HT, MW, HG, AY, GB, GF, and TG developed the data collection tool, supervised the data collection, and participated in data analysis and write-up. FG, MT, GK, MM, BT, YA, FT, and HG were involved in data processing and write-up of the manuscript. All authors have approved the final version of the manuscript.

### Funding

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### Data availability

No datasets were generated or analysed during the current study.

### Declarations

#### Ethics approval and consent to participate

Ethical clearance was obtained from Mekelle University, College of Health Science Ethical Review Board on August 2, 2021, with IRB Ref: MU-IRB 1906/2021. An additional support letter from the Tigray Health Bureau, district health offices, and verbal consent from the participants themselves were assured before data collection. The household (HH) heads and other eligible study participants were communicated, and verbal informed consent from the participants themselves were assured before data collection. To protect the participants, no individual identifying information was collected.

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare no competing interests.

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