Introduction

Maternal mortality rate (MMR) remains a global public health concern especially in developing countries [1]. Worldwide, nearly 275,288 maternal deaths occurred due to pregnancy and related complications [2]. In 2000, millennium development goal (MDG) targeted for World Health Organization [1] member countries reducing MMR by 75% [3]. But still MMR was remains unacceptably high in developing countries particularly in sub-Saharan African countries [4, 5] which is 920 per 100,000 live births, and the lifetime risk of maternal death is 1 in 16 compared to 1 in 2400 in Europe [5]. Ethiopia is a country that experience high MMR rate [1]. It is the most sensitive indicator of the health disparities between poorer and richer nations, and for general growth. The effects of MM also have influences on other families like children [4, 6–9]. The survival status of all under-five children has significant association with child nutrition and other vital child health care practices seeking maternal involvement [10].

Low institutional deliveries, shortage of birth preparedness, the poor competence of health care providers, shortage of emergency obstetric services at facilities and week referral systems for obstetric emergencies were the common factors [11–14]. In Ethiopia, there is a minimal utilization of necessary maternal health services by pregnant women [12, 14–16]. This can be related to many factors identified by different studies are socio-demographic, cultural, communal, limited access to health facilities and poor quality of care in health facilities [12, 14–16]. The cause of maternal death was recognized as the three delays model [17] which is a delay in deciding to seek care (delay 1), delay in reaching the health facility (delay 2), and delay in receiving quality care once at the health facility (delay 3). And therefore, to reduce maternal death different strategies were initiated at the
country wide. Of these, birth preparedness and complication readiness (BPCR) is one [12, 14–16]. In Ethiopia evidences show that the status of birth BPCR was low; Aleta Wondo district (17%) [18], Jimma Zone (23.3%) [19] and Basoliben District (26.9%) [20].

Main text
Method

Study area and period, study design and populations
A community-based cross-sectional study was conducted at Southern Ethiopia on August 2016. The setting is located 470 km away from the capital city of Ethiopia, Addis Ababa. According to the projected population estimate of 2016 the district has a total of 282,912 populations of these 42,707 women’s were expected to give birth [21]. All pregnant women who were permanently resided in the semi-pastoral of Bule Hora District were the study population.

Sample size and sampling procedure
Sample size was determined using single population proportion formula. We considered 17% level of compliance from the previous study [12]. We also considered a 5% level of significance (α) and 5% margin of error. Using these assumptions the sample size was calculated to be 339. After considering non-response rate (10%) and design effect (2), the final sample size obtained was 746. Participants were selected by multi-stage systematic random sampling from the population who were pregnant during the study period. The total number of pregnant women who lives in the study area was 3731 and we divided 3731 (sampling frame) by 746 (sample), so that a sampling fraction of 1/5 was obtained. To determine the order of the first respondent, we employed simple random sampling technique among the first five participants, and it was found to be the 3rd pregnant women. Thus, every 3rd participant starting from the first respondent was then included and interviewed until we get the required sample size.

Operational definition
Well prepared BPCR mother If she reported at least three of five variables that she identified place of delivery, saved money, identify skilled provider at birth, identified a means of transport and identification of compatible blood donors in case of emergency.

Birth preparation An arrangement, plan, or time preparing for delivery.

Complication readiness It is a state of being prepared or willing for something that makes the situation difficult or the act of doing this (source JHPIEGO).

Data collection and quality management
Structured and pretested questionnaire were used for data collection. To maintain the data quality; pretest, training and supervision was done. Ten diploma nurse as data collectors and 2 BSc holder nurses as a supervisor were participated.

Data-analysis
The data were collected by interview on variables like, dependent variable: birth preparedness and complication readiness. Independent variables: maternal-factors (age, marital status, occupation, ethnicity, education, income, family size), reproductive factors (parity and history of still birth), paternal factors (occupation, education), health service factors (ANC use), obstetrics factors (gravidity) and knowledge factors (key danger sign, transportation, delivery cost and ANC) characteristics using structured and pretested questionnaire. The collected data were entered to Epidata version 3.1 and analyzed using SPSS version 22. Data were checked for consistency and completeness, and then descriptive and analytic computations were carried out. Bivariable (P value < 0.2 considered as a candidate variable multivariable binary logistic regression model was fitted to the data to identify variables associated with the dependent variable. Variables with P < 0.05 were considered statistically significant. SPSS version 20 was used to perform the analysis.

Result
Socio-demographic characteristics of respondents
A total of 746 pregnant women were interviewed. Almost half, 384 (51.5%) of them were found between 25 and 34 years of age. Majority, 535 (71.7%) of the participants were protestant and, reflecting the ethnic composition of study setting which is Oromo (93.4%). Slightly less than half 347 (46.5%) of the pregnant women were illiterate, the majority of the respondents, 724 (97%), were married, 651 (87.3) of respondents parent were farmer and while 332 (44.5%) attended elementary education (Table 1).

Knowledge of danger signs
Regarding about knowledge on key danger signs during pregnancy showed that 198 (26.5%) and 158 (21.2%) of the study participants were aware of vaginal bleeding and severe fatigue respectively. During labor and delivery knowledge on severe vaginal bleeding, prolonged labor and retained placenta were 242 (32.4%), 337 (45.29%) and 298 (39.9%) respectively. Knowledge during post-natal period sever bleeding foul-smelling vaginal discharge and high fever was reported 265 (35.5%), 158 (21.2%) and 88 (11.8%) respectively. Of the total respondents, 304
(40.8%), 280 (37.5%) and 254 (34%) of them mentioned at least two key danger signs during pregnancy, delivery and after delivery respectively (Table 2).

**Birth preparedness and complication readiness**

Two hundred sixteen (29%) and 14 (1.9%) of the respondents had good knowledge on identifying place of delivery and blood donor respectively. In this study three and more steps from five where considered as a cutoff points to categorize whether pregnant women prepare for birth or not and that 202 (27.1%) of the study participants were found to be prepared for BPCR. One hundred seventy-two (23.1%) of the respondents were planned to identified a skilled birth attendant while 200 (26.8%) of the respondents were plan saving money in case of emergency. Similarly, 186 (24.9%) of the respondents arranged transport service for labor service (Additional file 1).

**Role of husband during ANC and labour**

Half, 366 (50.5%) and 404 (55.8) of the respondents Husband accompanied them to the Health facility visit. While, 108 (14.9%) and 102 (14.9%) of the husbands were cares children at homes and looked after the cattle at respectively (Additional file 2).

**Factors associated with BPCR**

Binary logistic regression showed that BPCR practice has a significant association with education status of pregnant women, educational and occupational status of their spouse, the frequency of the ANC is visiting as well as, knowledge of danger signs during pregnancy, labour and post-partum. The Multivariate logistic regression showed that BPCR was a significant association with variable like to attend formal education (AOR = 4.65, 95% CI 2.49–8.63), employment (AOR = 2.76 95% CI 1.10–5.54), merchant husbands (AOR = 3.83, 95% CI 1.52–9.64), the spouse with formal education (AOR = 3.35, 95% CI 1.83–6.14), ANC Visit more (Table 3).

**Discussion**

This study found that birth preparedness and complication readiness at western Oromia was accounted for 27.1% [22] of the pregnant women which is similar with studies done in Basobilben District, Goba district and Jima town of Ethiopia were 26.9, 29.9, and 23.3% respectively [15, 19, 23]. The finding is higher than findings at Aleta wondo 18.1% and Adigrat town, Tigray 21.2% [17, 24]. The discrepancy might have resulted from the difference between the residential areas in which the current incorporate mostly the rural kebeles than the previous one.
This discrepancy might be due to the study area different. Debrebirhan is a zonal were most of the residents are educated compared with the current study area. In another case, the socio-economic status of Nigeria was better than Ethiopia.

This study also showed that women who had Knowledge about at least two danger signs during pregnancy, delivery and after delivering were 40.8, 37.5 and 34% respectively which is comparable to finding of Goba district danger signs during delivery and after delivery were 26 and 27% respectively but knowledge during pregnancy higher 66% [15]. The current finding has variation when compared with a study finding in Nepal knowledge on Obstetric danger signs during pregnancy, childbirth and postpartum were 34.8, 59.0 and 39.7% respectively [5, 19]. However it compared slightly higher to other studies done in Jimma town, the difference may be due to the fact that unlike the current study the former study considers woman is knowledgeable if only mention there and more danger signs which could decrease the number of respondents [19].

Another encouraging finding were identifying the place of delivery and saving money 29 and 26.8% respectively which are the most common practice of BPCR. Lower than the finding in Jimma town 73.5 and 60.2% of the respondents planned to save money and arrange transport [19]. And a study in Uganda, Mbarara, and majority of the respondents identified the place of delivery and saved money [13]. However, planned to arrange blood donor and planned to be attended by skilled were 1.9 and 23.1% respectively, which was still low. These low levels of preparations were also reported in other prior studies in Ethiopia and other abroad countries. In the study conducted in Jima town west Ethiopia, 19.9% planned to arrange blood donor and 21.9% identify skilled attendant [19]. Similarly, in the study conducted in Sidama Zone, South Ethiopia in 2007, plan to arrange blood donor and identify skilled attendant was 2.3, 8.1% respectively [22]. Being BPCR is a new strategy which is yet to expand, low education level of women and the population as a whole may explain this low practice of the indication of PBCR among the study population.

Women education and Husband occupation were determinant factors for BPCR. Attending formal education among woman was 5 times more likelihood to increase BPCR than the counterpart (OR = 4.65 95% CI 2.49–8.63). Moreover, having spouse who is a merchant formally educated increased the likelihood of BPCR by 1.5 and 3.88 respectively which is comparable with previous findings in Ethiopia and abroad; where education, occupation, and income were among the factors affecting birth preparedness and complication readiness [15, 17, 22]. The possible reason for this could be due to the fact that being educated, being a merchant and employed increases access to information and are able to prepare for birth and complication readiness respectively.

Women who have more than three ANC visit were 17.78 times more likely to prepare for BPCR than the counterpart (P < 0.001, AOR = 17.78, 95% 95% CI 7.11–44.4) which was supported by a study conducted in Nepal [5]. Moreover, this study found that pregnant women knowledge towards at least two danger signs during, pregnancy (AOR = 3.32, CI 1.64–6.69), labor (AOR = 3.13 95% CI 1.58–6.20) and after delivery (AOR = 3.75, CI 1.93–7.28) were predictor for BPCR and this was supported by study findings done at Ethiopian country and abroad knowledge of danger signs was the

### Table 2 Knowledge of danger signs during pregnancy, labor and immediate postpartum period among semi pastoral pregnant women, Bule Hora woreda, Oromia region, Ethiopia, August 2016

| Variables                           | Frequency |        |        |
|-------------------------------------|-----------|--------|--------|
|                                     | Yes (%)   | No (%) |        |
| Danger signs during pregnancy       |           |        |        |
| Severe fatigue                      | 158       | 21.2   | 588    | 78.8   |
| Severe abdominal pain               | 142       | 19     | 604    | 81     |
| Bleeding from the vagina            | 198       | 26.5   | 548    | 73.5   |
| Fever                               | 32        | 4.3    | 714    | 95.7   |
| Unusual swelling of face/finger/legs| 76        | 10.2   | 670    | 89.8   |
| Severe and continued headache       | 151       | 20.2   | 595    | 79.8   |
| Rapid or difficult breathing        | 61        | 8.2    | 685    | 91.8   |
| Foul smelling vaginal discharge     | 68        | 9.1    | 678    | 90.9   |
| Convulsions/fits                   | 27        | 3.6    | 719    | 96.4   |
| Loss of consciousness              | 58        | 7.8    | 688    | 92.2   |
| Blurred vision                      | 127       | 17     | 619    | 83     |
| Danger signs in labor and delivery  |           |        |        |
| Heavy bleeding                      | 242       | 32.4   | 504    | 67.6   |
| Prolonged (> 12 h) labor            | 337       | 45.2   | 409    | 54.8   |
| Vaginal tearing                     | 75        | 10.7   | 671    | 89.3   |
| Green or brown water coming from the vaginal | 65 | 8.7 | 681 | 91.3 |
| Water break and labor not induced within 6 h | 67 | 9 | 679 | 91 |
| Placenta not expelled within 1 h    | 298       | 39.9   | 448    | 60.1   |
| Danger signs in postpartum          |           |        |        |
| Heavy bleeding                      | 265       | 35.5   | 481    | 64.5   |
| Bad smelling vaginal discharge      | 158       | 21.2   | 588    | 78.8   |
| High fever                          | 88        | 11.8   | 658    | 88.2   |
| Painful urination                   | 148       | 19.9   | 598    | 80.1   |
| Hot swollen, painful breasts        | 186       | 24.9   | 560    | 75.1   |
strongest predictors of BPCR practice [3, 17, 22, 23]. This might be due to that knowledge of obstetric danger signs is essential to motivate women to seek skilled attendance at birth and prompt practices of another component of BPCR.

Conclusions and recommendations
This study found that birth preparedness and complication readiness among pregnant women at southern Ethiopia was lower. Women education, husband-education, occupation, knowledge on danger-sign, and ANC visits were identified as factors affecting BPCR.

Limitation
The limitation of this study was failing to consider temporal residence.

Additional files

**Additional file 1.** Describe Birth preparedness and complication readiness status of pastoral women at southern Ethiopia 2016.

**Additional file 2.** Describe the role of Husband during ANC and Labour of their partners in southern Ethiopia 2016.

Abbreviations
BPCR: birth preparedness and complication readiness; ANC: antenatal care; MMR: maternal mortality rate, MDGs: millennium development goal, WHO: World Health Organization, LB: live births, CI: confidence interval, EDHS: Ethiopian Demographic and Health Survey.

Authors’ contributions
AI, MA, conceived and designed the study, performed analysis and interpretation of data. HZ and CTL supervised the design conception, analysis, interpretation of data and made critical comments at each step of research. CTL drafted the manuscript. All authors read and approved the final manuscript.

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Acknowledgements
The authors would like to thank College of Health Science, Debre Markos University for approving the research topics. We would like to express our gratitude to data collectors and supervisors for their timely submission of completed questionnaires and to respondents for their willingness to participate in this study.

Competing interests
The authors declare that they have no competing interests.

Availability of data and materials
The dataset will not be shared in order to protect the participants’ identities.

Consent for publication
Not applicable.

Ethics approval and consent to participate
Ethical letter was obtained from the Ethical review committee of Debre Markos University, College of Medicine and Health Science. Moreover, by mentioning the low harm of the study, the ethics committee also approved the possibility of interviewing the respondents with age < 18 years old. Permission was taken from the local administrative. Informed verbal consent was taken from each individual. Their full right to withdraw or refuse to participate before their verbal consent was obtained.

Funding
Not applicable.

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Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 7 May 2018 Accepted: 26 June 2018 Published online: 04 July 2018

### Table 3 Bivariate and multivariate logistic regression of the likelihood to be prepared for birth and complications among semi pastoral pregnant women, Bule Hora, Oromia, Ethiopia, 2016

| Variables                         | BPCR  | OR (95% CI) | AOR (95% CI) | P value |
|----------------------------------|-------|-------------|--------------|---------|
|                                   | Yes   | No          |              |         |
| Age of respondents                |       |             |              |         |
| 16–24                            | 49    | 147         | 1            |         |
| 25–34                            | 109   | 275         | 1.18 (0.88–1.59) | 0.38 (0.24–0.57) | 0.004 |
| 35–49                            | 44    | 122         | 1.08 (0.64–1.73) | 0.71 (0.36–1.38) |
| Education of woman                |       |             |              |         |
| Formal                           | 157   | 166         | 7.95 (5.44–11.59) | 4.65 (2.49–8.63) |
| Not formal                       | 45    | 378         | 1            |         |
| Education of husband             |       |             |              |         |
| Formal                           | 165   | 293         | 3.97 (2.65–5.94) | 3.35 (1.83–6.14) |
| Not formal                       | 37    | 247         | 1            |         |
| Occupation of husband            |       |             |              |         |
| Farmer                           | 151   | 500         | 1            |         |
| Merchant                         | 27    | 19          | 4.65 (2.52–8.61) | 3.83 (1.52–9.64) |
| Employed                         | 23    | 1           | 9.17 (3.25–25.89) | 2.76 (1.10–5.54) |
| Parity                           |       |             |              |         |
| ≤ 2                              | 61    | 189         | 1            |         |
| > 3                              | 132   | 344         | 1.28 (1.07–1.69) | 1.39 (0.72–2.67) |
| Knowledge at least two sign during pregnancy | Yes   | 162  | 142  | 11.4 (7.72–17.02) | 3.32 (1.64–6.69) |
|                                      | No    | 40    | 402  | 1            |         |
| Knowledge at two danger signs during labor | Yes   | 161  | 119  | 9.36 (6.37–13.76) | 3.13 (1.58–6.20) |
|                                      | No    | 41    | 425  | 1            |         |
| Knowledge of at least two danger signs after delivery | Yes   | 153  | 101  | 13.69 (9.29–20.18) | 3.75 (1.93–7.28) |
|                                      | No    | 49    | 443  | 1            |         |
| ANC visit                         |       |             |              |         |
| < 4                              | 89    | 456         | 1            |         |
| ≥ 4                              | 113   | 14          | 19.9 (9.67–38.87) | 17.78 (7.11–44.47) |
|                                    |       |             |              | P < 0.001 |
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