

Determinants of practice of birth preparedness and complication readiness among pregnant women in Sodo Zuria District, Southern Ethiopia: Content analysis using Poisson's regression

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Abstract

Objectives: Every pregnancy can face risk. One of the World Health Organization recommendations for health promotion interventions for maternal and newborn health was to increase birth preparedness and complication readiness. The main objective of this recommendation was to increase the use of skilled care at birth and to increase the timely use of facility care for obstetric and newborn complications. However, to the best of our knowledge, there is a dearth of documented evidence on the magnitude of birth preparedness and complication readiness and factors associated with it in our study area. Thus, the aim of this study was to identify factors affecting the practice of birth preparedness and complication readiness.

Methods: A community-based cross-sectional study was carried out from 15 February to 15 March 2020. A total of 698 pregnant women were randomly selected and interviewed using a pretested semi-structured questionnaire. A multivariate generalized linear regression with Poisson link was carried out to see the effect of each independent variable on the dependent variable.

Result: Of the sampled 710 participants, 698 participated, which made a response rate of 98.3%. The mean score of practice of birth preparedness and complication readiness was 3.3 (standard deviation = 1.8). Mothers who used pre-pregnancy contraception methods (adjusted odds ratio = 1.22 (95% confidence interval = 1.09, 1.37)), used bare feet as a mode of transportation (adjusted odds ratio = 1.11 (95% confidence interval = 1.01, 1.21)), used more antenatal care content (adjusted odds ratio = 1.09 (95% confidence interval = 1.06, 1.13)), and whose husbands were educated at the primary level of education (adjusted odds ratio = 1.19 (95% confidence interval = 1.03, 1.37)) were predictors in multivariable general.

Conclusion: The mean score and overall practice of birth preparedness and complication readiness were low. This study revealed a low level of birth preparedness and complication readiness. In order to improve access to lifesaving care for women and neonates, there is a pressing need for implementation of existing strategies to increase practice of birth preparedness and complication readiness.

Keywords

Antenatal care, birth preparedness and complication readiness, practice

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Introduction

Maternal mortality is a major public health issue in which there is a significant disparity between high- and low-income nations.^{1,2} Around two-thirds of maternal deaths occurred in Sub-Saharan Africa, which accounts for 99% of maternal deaths worldwide.¹ When compared to developed countries, the maternal mortality ratio (MMR) and life-time risk of maternal mortality were one-fifth and more than a quarter

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times higher in developing countries, respectively. Similarly, despite a gradual growth in maternal, neonatal, and child health (MNCH) coverage over the last 25 years in Ethiopia, the 2016 Ethiopian Demographic and Health Survey (EDHS) report found a high MMR (412 maternal deaths per 1000 live births).³

Preventable direct obstetric causes accounted for more than three-fourths of maternal mortality.⁴ A number of strategies have been implemented to reduce these maternal deaths.^{5,6} To mentioned safe motherhood initiatives which were focused on antenatal care, clean delivery, and postnatal care, and Making Pregnancy safer.⁵ Recently, a global strategy for every woman and every child has mainly focused on improving maternal health status through increasing antenatal care, skilled birth attendants (SBAs), and postnatal care for mothers.⁷ However, there was a great discrepancy between developing and developed countries regarding these interventions. According to a 2015 World Health Organization (WHO) report, nearly all pregnant women in high-income countries receive at least four antenatal care visits, skilled delivery, and postnatal care, but only 40% of all pregnant women in low-income countries receive the recommended antenatal care appointments. According to a 2016 EDHS survey, just 32% of pregnant women in Ethiopia received the necessary prenatal care, 26% had a skilled birth, and only 17% received postnatal care.^{1,3}

Moreover, birth preparedness and complication readiness (BPCR) was one of the WHO recommendations on health promotion interventions for maternal and newborn health which is provided and implemented through a focused antenatal care program. The main objective of this recommendation was to increase the use of skilled care at birth and to increase the timely use of facility care for obstetric and newborn complications through identified place for birth, identified birth attendants, saved money, identified emergency transportation, identified labor and birth companion, identified nearby health facility, identified blood donors if needed, and identified caregiver to children's at home when the mother was away.⁸

However, to our knowledge, there is a paucity of published evidence in our study area on the scale of BPCR, as well as factors linked with it. As a result, our study intends to discover factors related to it among the target women in order to react to these study demands and to fill this gap in the scientific literature.

Methods

Study setting and design

The study was conducted in Sodo Zuria Woreda which is one of 16 Woredas and 6 town administrations of Wolaita Zone. Wolaita Sodo is a capital city of the Woreda (Woreda: an administrative unit corresponding to district in other parts of the world and Kebele: the smallest administrative

unit in the current Ethiopian government structure under Woreda), which is 327 km away from Addis Ababa through Butajira, and 160 km from Hawassa, the capital city of southern nation, nationalities and peoples region. The Woreda has 20 Kebeles and 5 town administrations. According to Central Statistical Agency report, projected total population of Woreda is 117,884. Expected pregnancy of the district was 4078 (3.6% from a total population of the district). A community-based cross-sectional study was conducted from 15 February 2020 to 15 March 2020.

Population of the study

The source population for this study was all pregnant women attending antenatal care (ANC) clinic during study period.

Eligibility criteria

Inclusion criteria. To measure the practice of BPCR accurately, women who had late gestational age (women whose gestational age >28 weeks ($n=710$) were considered and included in the study.

Exclusion criteria. All women who were critically ill and who reside less than 6 months in the study area during data collection period were excluded from this study.

Sample size determination

The sample size for this study was calculated using stat-calc menu of Epi-info software version 7 initially using the assumptions for single population proportion with estimated prevalence of 30% of practice of BPCR,⁹ confidence level of 95% and 5% degree of precision which gives 323. With a consideration of design effect of 2 and 10% non-response rate, the final sample size was 710.

Sampling techniques

Multistage (two stages) sampling was used to select the study participants. Fifteen Kebeles were taken out of 25 using simple random sampling methods (lottery methods). Lists of all pregnant women whose gestational age >28 weeks were obtained from health post. The total sample size was allocated proportionally to the size of the selected Kebeles. Finally, systematic sampling was employed to select the study participants in each Kebele until the desired numbers of sample were obtained. The first household was selected by simple random sampling lottery method. The sampling interval of the households in each Kebele was determined by dividing the total number of eligible households to the allocated sample size. In a case when the study participants were not able to be interviewed for some reason, the next coded house was interviewed.

Data collection methods and procedure

Six data collectors with prior data collection experience were hired, and the data gathering was overseen by three public health professionals from several district health facilities. Both data collectors and supervisors received comprehensive training on data gathering methods and instruments over the course of a day. The data were collected from women using semi-structured interviewer-administered questionnaires for 1-month duration. Data on the practice of BPCR were obtained through face-to-face interview. A pre-tested, semi-structured, interviewer-administered questionnaire which includes socio-demographic characteristics of the respondents like age, education status, religion, occupation, women's decision-making power and obstetric characteristics like parity, obstetric complication, antenatal care (ANC) visit, and danger signs of pregnancy was used. The questionnaire was adapted from EDHS³ and other published literatures.^{10–13}

Data quality management

The data collection team received extensive training from the investigators, with a special focus on the questionnaire's contents. The data collection tool was written in English, then translated into the local language by a native speaker, and then back translated by another native speaker into English to check its consistency with the original meaning. Another expert on English to check its consistency with the original meaning. Finally, data were collected using a standardized questionnaire written in the local language. Pre-testing was done on 5% of the sample size (36 women) from outside the study region who had similar characteristics to the study population and was not from the sampled clusters in the study area before data collection began.

Statistical analysis

Data were entered in to Epi-data software version 3.1 and then exported to SPSS version 23 statistical package for analysis.¹⁴ Findings have been summarized in tables and graphs using frequencies, percentages, and standard deviations. Bivariate statistical analysis was conducted using analysis of variance (ANOVA) and independent *t*-test was used to check statistical significance. Multivariate statistical analyses using generalized linear model (GLM) approach were carried out to identify the determinants of BPCR. Poisson's regression analysis was performed between dependent and independent variables. Since our response variables is count variable, Poisson's regression was used. When checking assumption for Poisson's regression model, it fulfills assumption of equi-dispersion.¹⁵ Because of that Poisson's regression was used in this study. Finally, the odd ratios and the corresponding 95% confidence interval were calculated for each independent variable. The statistical software packages SPSS 23 is used for all statistical analyses.

Variables

Dependent variable. It includes the practice of BPCR.

Independent variables

Socio-demographic variables: age, religion, and education status.

Socio-economic variable: occupation.

Health facility-related factors: distance to health facilities and exposure to mass media.

Obstetric characteristics: parity, ANC visit, pre-pregnancy contraceptive utilization, and contents of ANC.

Measurements of variables

Dependent variable. BPCR which was measured as count variables with a maximum of 8 and a minimum of 0 scores

The components of BPCR considered in this study were identified place for birth, identified birth attendants, saved money, identified emergency transportation, identified labor and birth companion, identified nearby health facility, identified blood donors if needed, and identified care giver to children's at home when the mother was away.^{9,16,17}

Explanatory variables

Knowledge on key pregnancy danger signs: women were classified as knowledgeable if they spontaneously mentioned at least three of the five key danger signs of pregnancy (vaginal bleeding, severe headache, blurring of vision, feet or face swelling, and high-grade fever) if not they were classified as not knowledgeable.

Autonomy in household decision-making: a woman was said to have autonomous decision-making power on seeking maternal and neonatal health (MNH) service if she alone or jointly (with her husband) decides on seeking MNH services; otherwise (husband alone or a third person decides on seeking MNH services) she was considered as not having autonomous decision-making power.^{18,19}

Content of care received during ANC: which was measured as continues variable with maximum score of 8 and a minimum score of 0. Eight essential elements of ANC services were included in this study: blood pressure measurement, blood sample collection, urine sample collection, weight measurement, tetanus toxoid (TT2+) vaccination, iron folate (90+) supplementation, HIV testing, and health education on danger signs and nutrition.^{20,21}

Ethics approval and consent to participate

Ethics clearance was obtained from Ethical Review Committee of Wolkite University, Department of Public Health (ethical code of IRB/175/12). Respondents were informed about the purpose and procedure of the study and written informed consent was obtained from the educated subjects before the study. Verbal informed consent was

Table 1. Socio-demographic characteristics of the study participants.

Respondents characteristics		N	(%)
Age (n = 698)	18–24	148	21.2
	25–29	317	45.4
	30–34	142	20.3
	≥35	91	13
Marital status (n = 698)	Single/divorced/widowed	27	3.9
	Married	671	96.1
Maternal Educational status (n = 698)	Unable to read or write	280	40.1
	Able to read or write	90	12.9
	Primary level of education	254	36.4
	Secondary and above	74	10.6
Employment status (n = 698)	Unemployed	424	60.7
	Employed	274	39.3
Husband's educational status (n = 698)	No formal education	193	26.2
	Formal education	107	15.3
	Primary level of education	288	41.3
	Secondary and above	120	17.2
Means of transportation to health facilities (n = 698)	On foot	567	81.2
	By motorcycle/car	131	18.8
Perceived required time to reach health facilities (n = 698)	≥30 min	302	46.3
	<30 min	396	56.7
Exposure to mass media (radio/TV) (n = 698)	No	323	46.3
	Yes	375	53.7
Membership of community-based health insurance (CBHI) (n = 698)	No	345	49.5
	Yes	353	50.6
Women's autonomy to maternity care (n = 698)	No	145	20.8
	Yes	553	79.2

obtained from the illiterate subjects before the study and this method of obtaining consent was approved by the ethics committee. Privacy and confidentiality of information were assured in advance of data collection. The questionnaire used during the data collection was anonymous by assigning unique ID numbers to each study participant. With regard to confidentiality, respondents were given information that guaranteed them that the information they provided during the study would be used for the research purpose and would not be disclosed to anybody outside the research team. A formal letter of permission was obtained from Wolaita Zone Health Department and Sodo Zuria Woreda Health Office.

Results

Of 710 sampled subjects, 698 participated, which gives a response rate of 98.3%.

Socio-demographic characteristics of the study participants

Table 1 shows the characteristics of mothers according to their backgrounds. The majority of the respondents were in the age group (25–29), married (96.1), unable to read and

write (40.1), and unemployed (60.7). Regarding the required time to reach a health facility, more than half were required to require less than 30 min (56.7) (Table 1).

Obstetric characteristics of women

Regarding to the obstetric characteristics of the mothers, majority of them were used pre-pregnancy family planning (69.5), had planned recent pregnancy (76.5), and had obtained ANC from skilled provider (65). However, only 20.9% and 23.1% had attended ANC before 16 weeks and four or more times, respectively (Table 2).

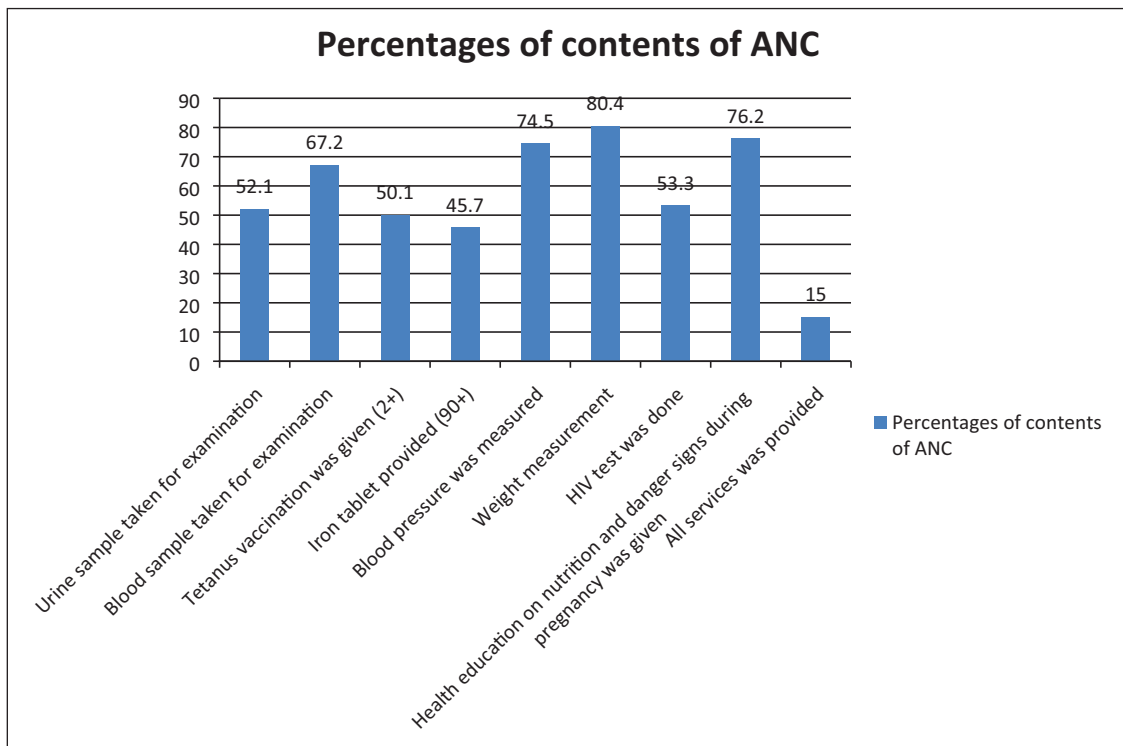
Contents of ANC

The mean score for contents of ANC was 4.99 (standard deviation (SD)=2.18), and 0 and 8 were the minimum and maximum scores of contents of ANC received by pregnant mothers. Our analysis shows that only 15% of mothers received all the eight selected elements of ANC services. Considering the individual components, weight measurement was the most common item received by 80.4% mothers, closely followed by education on danger signs and nutrition by 76.2% mothers and weight measurement by

Table 2. Obstetric history of the respondents.

Respondent's characteristics	Category	Frequency	%
Pre-pregnancy utilization of contraception (any modern methods) (<i>n</i> = 698)	No	213	30.5
	Yes	485	69.5
Women's knowledge about key pregnancy danger signs (<i>n</i> = 698)	Not-knowledgeable	415	59.5
	Knowledgeable	283	40.5
Birth order (<i>n</i> = 698)	First	120	17.2
	Second	152	21.8
	Third	191	27.4
	Four and above	235	33.7
Women's desire on recent pregnancy (<i>n</i> = 698)	Not planned	164	23.5
	Planned	534	76.5
Time for first ANC visit (<i>n</i> = 698)	At or after 16 weeks	552	79.1
	Before 16 weeks	146	20.9
Place for ANC (<i>n</i> = 698)	Hospital	41	5.9
	Health center	413	59.2
	Health post	244	35
ANC providers (<i>n</i> = 698)	Skilled	454	65
	Unskilled	244	35
Frequency of ANC (<i>n</i> = 698)	1–3 ANC visit	537	76.9
	=+4 ANC visit	161	23.1

ANC: antenatal care.

**Figure 1.** Percentages of contents of ANC received by pregnant women.

77.8% mothers. More than two-thirds (67.4%) of mothers were reported to have blood testing. More than half (53.3%) of mothers were reported to have an HIV test, 50.1% had

been vaccinated for tetanus, 52.1% had urine testing, and 45.7% of mothers reported that they had taken iron (90+) during the ANC visit (Figure 1).

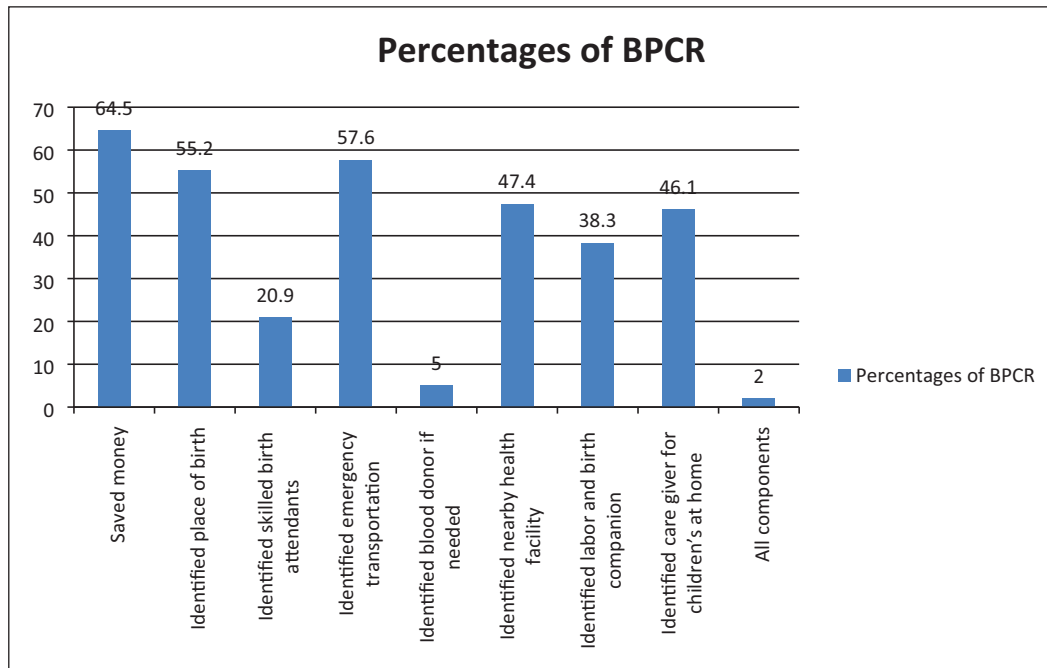


Figure 2. Percentages of birth preparedness and complication readiness practice of pregnant women.

BPCR

The mean score for BPCR was 3.3, with an SD of 1.8. The minimum score was 1 and the maximum score was 8. Regarding the percentages of individual components of BPCR, only 5% of mothers identified blood donors if needed, while 64.5% saved money for emergencies (Figure 2).

Determinants of BPCR of pregnant women

According to this Poisson's regression analysis, six independent variables were identified to determine BPCR. These were the husband's education status, pre-pregnancy contraception use, the contents of the ANC received, the mode of transportation to the health facility, and exposure to mass media on maternal care messages (Table 3).

When compared to mothers whose partners could not read or write, mothers whose partners had a primary level of education were 1.19 times more likely to have practiced BPCR (adjusted odds ratio (AOR)=1.19; 95% confidence interval (CI)=1.03, 1.37) (Table 3).

The means of transportation to and from the health facility determine the practice of BPCR. Mothers who used motorcycles or cars as means of transportation were 12% less likely to practice BPCR when compared to mothers who used bare feet as a means of transportation (AOR=0.88 (95% CI=0.77, 0.99)) (Table 3). Pre-pregnancy contraceptive utilization determines the practice of BPCR. The odds of practicing BPCR were 1.22 times higher for mothers who used pre-pregnancy contraception when compared to their counterparts (AOR=1.22 (95% CI=1.09, 1.37)) (Table 3).

Mothers who had been exposed to mass media like TV/radio on health messages were 1.11 times more likely to have practiced BPCR when compared to mothers who had not been exposed (AOR=1.11 (95% CI=1.01, 1.21)) (Table 3). The quality of the ANC was positively and significantly associated with the practice of BPCR. The analysis found that with one unit increase in use of items of content, ANC increased the practice of BPCR by 0.094 units (Beta=0.094) (Table 3).

Discussion

The odds of practicing BPCR were higher for mothers who had been exposed to mass media. This finding was consistent with a study done in Tanzania.²² This might be due to frequent exposure to health-related messages imposing behavioral change on mothers.

A number of previous studies found that the number of ANC visits determines the practice of BPCR since it is one of the components of ANC.^{9,12,23-25} However, according to this study, the frequency of ANC was not significantly associated with the practice of BPCR. But the content/quality of ANC was identified as a predictor of the practice of BPCR. The odds of practicing BPCR were 1.09 times higher for mothers who had used more of the contents of ANC. This implies that the government and health facilities should mainly focus on quality of ANC rather than frequency of ANC.

In this study, preconception care, like pre-pregnancy contraceptive utilization, was one of the predictors of practice of BPCR. The odds of practicing BPCR were higher

Table 3. Determinants of birth preparedness and complication readiness among pregnant women using multivariable generalized linear regression model with Poisson's link.

Variables	Category	Mean of components of BPCR	p-value	Beta	AOR (95% CI)
Women's education status (n = 698)	Unable to read or write	2.5	0.000 ^a		1
	Able to read or write	3.2		-0.056	0.94 (0.81, 1.10)
	Primary	4.1		0.068	1.07 (0.93, 1.23)
	Secondary and above	4.3		0.117	1.12 (0.94, 1.34)
Respondents age (n = 698)	18–24	3.5	0.001 ^a		1
	25–29	3.5		-0.127	0.88 (0.76, 1.0)
	30–34	2.7		-0.122	0.88 (0.75, 1.04)
	≥35	3.3		-0.121	0.88 (0.73, 1.07)
Husbands education (n = 698)	Unable to read and write	2.3	0.000 ^a		1
	Able to read and write	2.9		0.095	1.10 (0.94, 1.28)
	Primary	3.9		0.175	1.19 (1.03, 1.37)
	Secondary and above	3.9		0.148	1.16 (0.98, 1.37)
Marital status	Single/divorced/widowed	2.7	0.082 ^b		
	Married	3.4			
Women's employment status (n = 698)	Non-employed	3.4	0.127 ^b		
	Employed	3.2			
Means of transportation (n = 698)	By motorcycle/car	2.8	0.000 ^b	-0.129	0.88 (0.77, 0.99)
	By foot	3.5			
Perceived required time to reach health facilities (n = 698)	≥30 min	2.6	0.000 ^b	0.05	1
	<30 min	3.9			1.05 (0.94, 1.17)
Exposure to mass media (n = 698)	No	3.0	0.000 ^b		1
	Yes	3.7		0.100	1.11 (1.01, 1.21)
Women decision-making (n = 698)	Autonomous	3.3	0.325 ^b		
	Non-autonomous	3.5			
Membership of CBHI (n = 698)	No	2.7	0.000 ^b	-0.011	1
	Yes	4.0			1.02 (0.92, 1.13)
Pre-pregnancy utilization of contraception	No	2.4	0.000 ^b	0.203	1
	Yes	3.8			1.22 (1.09, 1.37)
Knowledge on key pregnancy danger signs (n = 698)	Not-knowledgeable	3.3	0.393 ^b		
	Knowledgeable	3.4			
Birth order (n = 698)	First	3.3	0.000 ^a		1
	Second	3.2		-0.0471	0.95 (0.82, 1.10)
	Third	3.8		0.091	1.09 (0.93, 1.28)
	Four and above	3.1		0.009	1.01 (0.85, 1.19)
Desire on pregnancy (n = 698)	Not planned	3.1	0.026 ^b	0.02	0.9 (0.7, 1.2)
	Planned	3.4			1
ANC provider (n = 698)	Non-skilled	3.3	0.670 ^b		
	Skilled	3.4			
Place of ANC	Hospital	4.0	0.098 ^a		
	Health center	3.3			
	Health post	3.3			
Time for first ANC booking (n = 698)	At or above 3 months	3.3	0.055 ^b		1
	Before 3 months	3.6		-0.051	0.95 (0.85, 1.06)
Frequency of ANC (n = 698)	1–3 ANC visits	3.1	0.000 ^b		1
	≥4 visits	4.2		0.01	1.01 (0.89, 1.14)
Contents of ANC		4.9		0.094	1.09 (1.06, 1.13)

AOR: adjusted odds ratio; BPCR: birth preparedness and complication readiness; CI: confidence interval; CBHI: community-based health insurance; ANC: antenatal care.

^ap-values indicate the descriptive analysis using the one-way ANOVA.

^bp-values indicate the independent t-test analysis.

for mothers who had utilized preconception care like contraception. This was supported by findings from a systematic review and meta-analysis on preconception care where the odds of attending subsequent service were higher for those counseled during the preconception period.²⁶ This implies the need for strengthening of the implementation of preconception care.

The partner's education also determines the practice of BPCR. The odds of practicing BPCR were 1.2 times higher for mothers whose husbands had attended a primary level of education when compared to mothers whose husbands had attended no formal education. This might be due to higher education status increasing the knowledge of BPCR of husbands. This in turn has a positive impact on mothers' practice of BPCR. This explains why a study done in Tanzania found knowledge of BPCR in husbands affected by level of education. Having completed the primary level of education increases BPCR knowledge by 0.157 units.²²

According to this analysis, the means of transportation were significantly associated with the practice of BPCR. The odds of practicing BPCR were higher for mothers who had used bare feet as a means of transportation to the health facility when compared to mothers who had used a motorcycle or car as a means of transportation. This might be due to the fact that, in this study, the majority of the mothers required less than 30 min to reach the health facility.

Limitation of the study

There was limited evidence on the determinants of practice of BPCR in this study area. Thus, it adds inputs at the local level. It also improves prenatal service implementation at health facilities. Since this study is cross-sectional, no cause and effect relationship was reported. In addition, social desirability bias could be another limitation.

Conclusion

The mean score and overall practice of BPCR was low. Saving money for emergencies was the predominant method of BPCR practiced by mothers.

Some important predictors were revealed for the practice of BPCR. These were the contents of ANC, pre-pregnancy utilization of contraception, husbands' education, exposure to mass media, and means of transportation to health facilities were predictors of BPCR.

The frequency and timing of ANC visits were not significantly associated with the practice of BPCR in this study, but the quality of ANC determines BPCR. This implies the need for further study of the mentioned variables.

This study revealed a low level of BPCR. In order to improve access to lifesaving care for women and neonates, there is a pressing need for implementation of existing strategies to increase practice of BPCR.

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Author contributions

D.H. wrote the proposal, participated in data collection, analyzed the data, and wrote the manuscript.

Availability of data and materials

All data are already described and will be included in the manuscript.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Ethical approval for this study was obtained from the Ethical Review Committee of Wolkite University, Department of Public Health (ethical code of IRB/175/12).

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Informed consent

Written informed consent was obtained from the educated subjects before the study. Verbal informed consent was obtained from the illiterate subjects before the study, and this method of obtaining consent was approved by the ethics committee.

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Supplemental material

Supplemental material for this article is available online.

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