



Impact of Community-Based Continuous Training on Promoting Birth Preparedness and Pregnancy Outcome in Rural Odisha, India: An Interventional Study

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Abstract

Background Birth preparedness and complication readiness extends the maternal and neonatal health continuum of care and thus contributes to one of the important tools for pregnant women to experience better pregnancy outcome, strengthening family and community health, creating space for other interventions. The present study aimed to evaluate community-based birth preparedness and complication readiness training on pregnancy outcome.

Method The study adopted a quasi-experimental time series only one experimental design which was conducted in rural south-eastern India for 1 year among the reproductive age group 15–49 years (≤ 24 weeks pregnancy), and cases were followed up till postnatal period. A standardized birth preparedness assessment index (BPAI) was used to assess preparedness level of respondents. Community-based continuous training (CBCT) was introduced, and its effect was measured on birth preparedness level, involvement of family and their pregnancy outcomes.

Result CBCT interventional program was effective in promoting positive behaviors on birth preparedness and complication readiness as per BPAI: 13% of women were at level 1, 15% at level 2, 19% at level 3, 49% participants were at 4th level and 5% were at 5th level which represented the best level of preparedness for their present delivery. Pregnant mothers who completed their antenatal visits and were well prepared for delivery were found to be having two times favorable pregnancy outcome than those who had not (OR 2.79).

Conclusion BPCR intervention strategy can be utilized as a timely and effective community action plan for ensuring a favorable pregnancy outcome.

Keywords Birth preparedness · Complication readiness · Pregnancy outcome · CBCT

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Background

With 180 maternal deaths per 100,000 live births; maternal deaths remains a major public health challenge in India [1]. Most of maternal deaths are in low-resource settings, rural areas and poor communities, many deaths are avoidable.

The Odisha Human Development Report states that pregnant women's experiences represent a complicated situation mostly in rural and tribal areas. The picture is very grim in addressing the three delays: in recognizing complications and seeking care, in reaching appropriate health facilities and delays in receiving appropriate care once they have been admitted to the health facilities. Many other studies also reveal that long delay in obtaining care during obstetric emergencies contribute heavily to high maternal death rate. Poor roads, long distance, a lack of vehicles and lack of family or community planning for getting health care in

an emergency were identified as major reasons for delay in obtaining care [2, 3].

Study reported that utilization of maternal health coverage is poor due to lack of birth preparedness, awareness and positive attitude for utilization of antenatal services in rural Odisha, India [4]. Study in Kenya also suggested that those mothers who undertook adequate birth preparations were almost three times more likely to experience favorable birth outcome than those who did not [5]. Birth preparedness and complication readiness (BPCR) extends the maternal, neonatal and child health continuum of care and thus contributes to one of the important tools for pregnant women to experience better pregnancy outcome and strengthens family and community health, creating a space for other interventions [6].

A recent systematic review of randomized controlled trials (RCTs) revealed that BPCR strategies could reduce maternal and neonatal mortality [7–10]; however, some studies implemented BPCR through action learning cycles with women's groups, a specific intervention and methodology which reported improvements in maternal and newborn health outcomes [11, 12]. BPCR, implementation strategies are diverse and include facility, community or home-based services. The presence of a skilled attendant at birth (SBA) is the key strategy to prevent the leading causes of maternal and neonatal mortality and morbidity [13–15]. Community health workers (CHWs) may not replace the need for sophisticated and quality health care delivery; they certainly play an important role in increasing access to health care and services, and thus, improving health outcomes [16, 17].

It is in this context that present research is placed to provide requisite training to the ANM's and ASHAs regarding proper use of an appropriate birth preparedness model and package at individual, family and community level which seeks to minimize the first two delays thus enabling better outcomes of pregnancy and childbirth in poor resources areas.

Purpose of the Study/Objectives

- To evaluate community-based continuous training (CBCT) on various levels of readiness for delivery and its complication.
- To find effect of level of birth preparedness, complication readiness on maternal and fetal outcome.

Materials and Methods

Research Design and Study Population

A quasi-experimental time series design only one experimental group design was used to estimate the effectiveness of community-based continuous training (CBCT)

intervention for improving birth preparedness and complication readiness among pregnant women. The study was conducted in Khordha district, rural Odisha, India (Fig. 1).

Sample Size and Sampling Method

Pregnant women aged 15–49 years with gestational age 24 weeks and less were included in this study and followed up to 42 days after delivery. Participants were excluded if they had cognitive problems and were unable to understand or follow the training. Any woman or spouse who refused to participate was also excluded.

The sample size for the study was 1080 women which was calculated by using hypothesis testing method for sample size estimation of experimental studies with standard normal deviation (1.96) at 95% confidence level and standard normal deviate (0.84) [17]. Where $n = 972$ antenatal mothers + 10% (attrition rate) = 1080. Therefore, the required sample size in the intervention group is 1080.

A multistage cluster random sampling was used to select 1080 participants from targeted population. Using this method, the first sampling unit was the village or cluster, and the second sampling unit was the households that were randomly selected. In each household, one eligible person (pregnant mother) was interviewed.

Key Outcome Measure: (Unfavorable and Favorable Birth Outcomes)

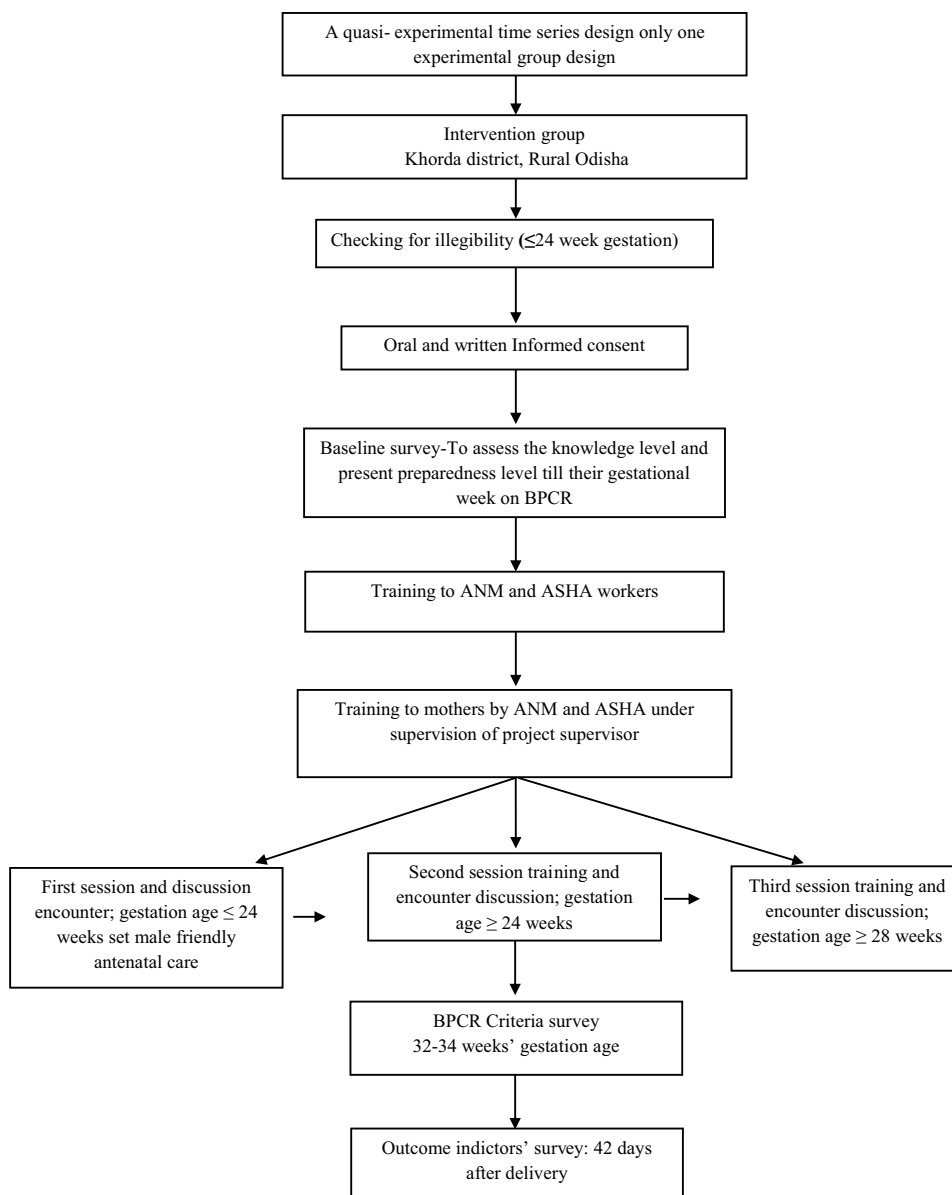
The level of birth preparedness and complication readiness and its effect on their birth outcomes like favorable and unfavorable maternal and fetal birth outcomes were the key outcomes measured. Pregnancy ending with any of the condition like adverse maternal outcomes like such as PPH, prolonged/difficult labor, obstructive fistula, maternal death and adverse neonatal outcomes such as LBW baby, neonatal death were noted as unfavourable outcomes. Pregnancy not associated with conditions like PPH, prolonged labor, obstructive fistula, maternal death, LBW baby and neonatal death were considered as favorable birth outcomes.

Data Collection Tool and Methods

Data collection was carried out using a pre-coded structured questionnaire which included demographic questions, a standardized tool for assessing knowledge of the mother regarding birth preparedness and complication readiness which consisted of reproductive health knowledge, danger signs (during pregnancy, labor and childbirth, 42 days after delivery, and neonatal danger signs), antenatal care, and preparations for childbirth [18].

Standardized birth preparedness assessment index (BPAI) was used to assess preparedness level of

Fig. 1 Study design for CBCT intervention



respondents after the community-based continuous training (CBCT) session [5] (Tables 1, 2).

An in-depth interview was conducted by qualified data collection team for baseline survey to determine the knowledge about their birth preparedness, complication readiness, preparedness of previous delivery and present delivery as per their gestational age. Training was given to the community health workers such as ANM and ASHA and was followed up by regular sessions (minimum three birth preparedness sessions) with their registered pregnant mother on a regular basis by respective ANM and ASHA workers. Continuous monitoring was done under the supervision of project supervisor. Post-training effect was

measured after their delivery within 42 days during post-natal period to find out their level of birth preparedness and its effect on their maternal and fetal birth outcome.

Statistical Analysis

Data was analyzed using the STATA version 11.2. The analysis was both descriptive and analytical using frequency distributions; logistic regression analysis was aimed at ascertaining the association between the levels of birth preparedness and pregnancy outcome.

Table 1 The birth preparedness assessment index criteria [5]

S. no.	Indicator	Scores	
		1 Point	2 Points
<i>A. Birth preparedness criteria</i>			
Preconception preparedness criteria			
1	A visit to a VCT centre for HIV testing	No	Yes
2	A visit to a doctor for medical check up or genetic counseling	No	Yes
3	Use of contraceptives	No	Yes
4	Pregnancy planned or unplanned	Unplanned	Planned
5	Age at first pregnancy	< 18 or > 35 years	19–34 years
6	Total number of pregnancies	> 4	≤ 4
7	Mothers weight	≤ 38 kg	> 38 kg
<i>B. Antenatal preparedness criteria</i>			
1	ANC attendance	No	Yes
2	Gestation age at first ANC attendance	2nd or 3rd trimester	1st trimester
3	Birth interval	< 2 years	≥ 2 years
4	Financial savings	No	Yes
5	Transport arrangements	No	Yes
6	How soon do you seek treatment while sick during pregnancy	≥ 2 weeks	< 2 weeks
7	Expected date of delivery (EDD)	Unknown	Known
8	Clothing for the baby	Unprepared	Prepared
<i>C. Intrapartum preparedness criteria</i>			
1	Birth before arrival (BBA)	Yes	No
2	Identified a professional birth attendant	No	Yes
3	Identified next of kin in case of emergency	No	Yes
4	Prepared an emergency delivery kit for a clean safe delivery	No	Yes
5	Made transport arrangements	No	Yes
6	Delivery site	Home	Health facility
7	Time in labor spend at home	≥ 12 h	< 12 h
<i>D. Postpartum preparedness criteria</i>			
1	Duration of hospital stay as a discharge in	> 2 days	≤ 2 days
2	Attendance of postnatal clinic	No	Yes
3	Attendance of child welfare clinic	No	Yes
4	Use of contraceptives	No	Yes

Table 2 The birth preparedness assessment index score/grade [5]

Birth preparedness level	Score	Comments
Level 1	26–31	Standard not met, no efforts, only excuses
Level 2	32–36	Standard not met, demonstrated effort visible
Level 3	37–42	Standard met
Level 4	43–47	Standard met, visible commitment to do even better in future
Level 5	48–52	Excellent, hardly possible to improve in future

Results

The Socio-demographic Characteristics

Study results reveal that the age of respondents ranged from 20 to more than 30 years (mean ± standard deviation = 31.8 ± 11.5 years). Over 75% of the respondents were between 20 and 30 years. Majority (63%) of respondents were primigravida, and 37% were multigravida. Majority (95%) of respondents were Hindu; 100% were married; 86% were housewife; only 35% of them had no formal education, and 65% of their husband had formal education; half percent of them were from below poverty line.

Baseline Survey of Knowledge on Birth Preparedness and Present Birth Preparedness Status

Study explored mother's perception on which cases were high-risk pregnancy. Nearly half (51%) of women viewed at least three conditions as high risk such as sick woman, pregnant woman still breastfeeding and too frequent pregnancies. Less than a quarter of women considered more than three conditions as high risk such as pregnancy at young age, previous operative delivery, twin pregnancy and other high-order pregnancies as being high risk. When asked to identify situations that they would consider as danger signs in pregnancy, labor and postpartum, study found a low level of knowledge on identifying danger signs. Proportion of respondents aware of three key danger signs in each pregnancy (26%), labor (25%) and postpartum period (11%) was low.

Approximately 40% antenatal mothers had heard about BPACR and got the information about birth preparedness and complication readiness through their mothers and health professionals. Results reveal that less than half (44.30%) subjects were having good knowledge about birth preparedness, and only 18.40% subjects expressed that they were well prepared in their previous delivery.

Assessment for present antenatal preparedness in patients with less than 24 weeks of gestation revealed that maximum had attended first antenatal visit and attendance decreased by 54% during their second antenatal visit. Other components of ANC such as HB testing, urine testing, receiving TT dose, Iron and calcium tablet were not achieved by less than 50% of mothers.

Effect of CBCT on Level of Birth Preparedness and Birth Outcome

Findings related to assessment of birth preparedness area in their previous pregnancy revealed that majority of

pregnancies were unplanned 1037 (96%). Figures show that most of them made savings for the baby's naming ceremony as compared to saving for obstetric emergencies and transportation. Identification of a decision-making process in case of obstetric emergency, decision on place of delivery, arrangement for skilled assistance at delivery and preparations for blood donation for this present delivery were made by less number of women. After continuous motivational training sessions for behavioral changes toward better birth preparedness for present pregnancy, the percentage of preparedness level improved by minimum 10–20% from baseline score which was found statistically significant ($p < 0.05$) (Fig. 2).

After three sessions of birth preparedness as per BPAI, 135 (13%) were at 1st level, 157 (15%) were at level 2 which showed no proper birth preparedness efforts have been taken and only excuses were given by women, whereas in 3rd level of preparedness 207 (19%) had met the standard preparedness level and at level 4th some visible birth preparedness efforts were seen as 527 (49%) were prepared and at the excellent 5th level 54 (5%) women were prepared. There were good numbers of participants at level 4 after regular follow-up sessions which represented the best level of preparedness (Table 2).

Maternal education, young women, low parity, birth spacing, delivery in hospital were found to be strong predictors in preparation for birth/complication. Knowing about danger signs of pregnancy was a good predictor in preparation for birth/complication. Women who knew three or more key danger signs were more likely to prepare for birth and its complications than who did not know at least one key danger signs (OR 0.18). Pregnant mothers, who had attended 2 ANC visits, were found to be more likely prepared than those who could not (OR 9.05) (Table 3).

In mothers delivered within that 1 year and attended BPCR sessions out of 1080 mothers; 269 (24.9%) had unfavorable

Fig. 2 Comparison of preparedness level of BPCR components of previous pregnancy and present pregnancy after CBCT

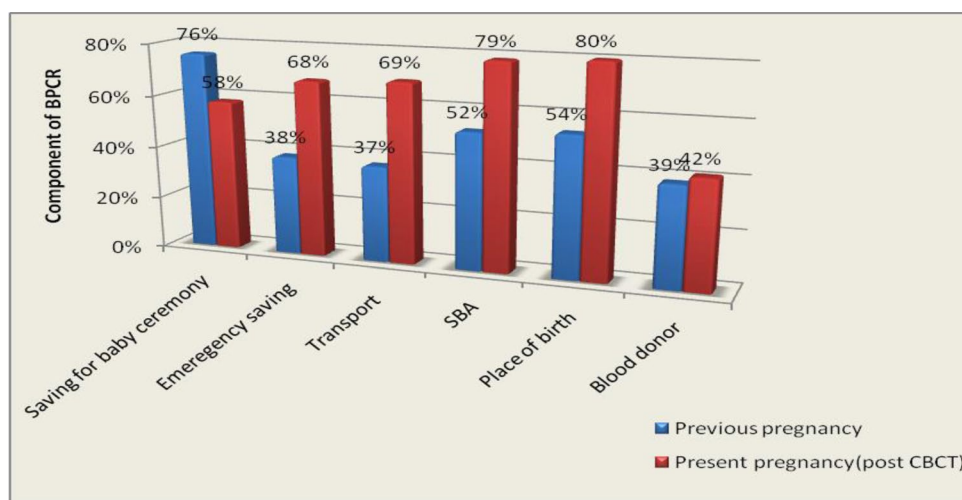


Table 3 Logistic regression model determining predictors for birth preparedness among mother, ($n = 1080$)

Characteristics	Less prepared N (%)	Prepared N (%)	OR (95% CI)	AOR (95% CI)	p value
<i>Age at first pregnancy</i>					
> 18 or < 35 years	90 (59.6%)	61 (40.4%)	Ref	Ref	Ref
19 to 34 years	202 (21.7%)	727 (78.3%)	8.86 (4.15–18.89)	5.31 (3.70–7.61)	0.001*
<i>Total number of pregnancies</i>					
< 4	169 (67.9%)	80 (32.1%)	Ref	Ref	Ref
≥ 4	123 (14.8%)	708 (85.2%)	13.09 (7.19–23.84)	12.15 (8.76–16.87)	0.001*
<i>Birth interval</i>					
< 2 years	96 (42.7%)	129 (57.3%)	Ref	Ref	Ref
> 2 years	196 (22.9%)	659 (77.1%)	2.50 (1.83–3.40)	2.23 (1.32–3.77)	0.003*
<i>Delivery site</i>					
Home	28 (77.8%)	8 (22.2%)	Ref	Ref	Ref
Health facility	264 (25.3%)	780 (74.7%)	10.34 (4.65–22.96)	4.63 (1.07–9.93)	0.039*
<i>Family income</i>					
< 5000	112 (37.3%)	188 (62.7%)			Ref
5000–10,000	135 (24.2%)	422 (75.8%)	1.86 (1.37–2.52)	0.83 (0.43–1.60)	0.593
> 10,000	45 (20.2%)	178 (79.8%)	2.35 (1.57–3.52)	0.79 (0.33–1.89)	0.599
<i>Education</i>					
No education	97 (42.0%)	134 (58.0%)	Ref	Ref	Ref
Primary	102 (68.9%)	46 (31.1%)	1.61 (0.78–3.31)	0.32 (0.21–0.50)	0.195
Secondary	54 (16.0%)	284 (84.0%)	9.24 (4.15–20.55)	3.80 (2.57–5.62)	0.001*
Graduate	39 (10.7%)	324 (89.3%)	40.99 (18.38–51.41)	6.01 (3.94–9.17)	0.001*
<i>Husband education</i>					
No education	70 (87.5%)	10 (12.5%)	Ref	Ref	Ref
Primary	54 (18.6%)	236 (81.4%)	30.59 (14.80–63.20)	0.77 (0.23–2.51)	0.670
Secondary	92 (20.7%)	352 (79.3%)	26.78 (13.28–53.99)	2.70 (0.87–8.34)	0.084
Graduate	76 (28.6%)	190 (71.4%)	17.5 (8.56–35.73)	2.03 (0.68–6.02)	0.201
<i>Number of ANC</i>					
NO ANC	105 (75.5%)	34 (24.5%)	Ref	Ref	Ref
1 ANC	59 (81.9%)	13 (18.1%)	0.39 (0.13–1.13)	0.68 (0.33–1.38)	0.085
2 ANC	58 (25.4%)	170 (74.6%)	13.14 (5.68–30.40)	9.05 (5.55–14.74)	0.001*
≥ 3 ANC	70 (10.9%)	571 (89.1%)	41.19 (18.03–54.07)	25.19 (15.91–39.88)	0.001*
<i>Knowledge of key danger signs during labor & delivery</i>					
Not know at least 1 key danger sign	102 (23.6%)	330 (76.4%)	Ref	Ref	Ref
Know 3 or more key danger signs	190 (29.3%)	458 (70.7%)	0.74 (0.56–0.98)	0.18 (0.10–0.34)	0.001*

*Statistically significant

outcomes and 811 (75.1%) women were having favorable conditions. In relation to maternal outcome, 87 mothers had unfavorable outcomes: 34 mothers had history of blood transfusion immediate after delivery, 51 had undergone prolonged labor, no case of obstructive fistula was reported and two maternal deaths were reported that group. Of the remaining mothers 993 had favorable maternal outcomes as per our study definition. In neonatal outcome measures, total of 926 (86%) babies weighed more than 2500 g, and were not referred to NICU for admission and were recorded as favorable outcomes. Of the 182 babies who weighed less than 2500 g, 84% required admission for more than 7 days in the newborn units, and there were nine (0.8%) cases of neonatal death, which were recorded unfavorable outcomes as per the definition in this study.

The odds ratio for outcome coefficient was 5.38 with a 95% confidence interval which suggested that those mothers who undertook adequate birth preparations were almost five times more likely to experience favorable birth outcome than those who did not. The higher level of birth preparedness was associated with favorable birth outcome ($p < 0.05$). Pregnant mothers, who had completed their ANC visits, were found to be having three times favorable outcome than those who could not (OR 2.79). From these results we concluded that in post-intervention strategies participant represented the best level of birth preparedness and favorable birth outcome as per the study criteria (Table 4).

Table 4 Effect of level of BPCR on pregnancy outcome

Characteristics	Unfavorable condition	Favorable condition	OR (95% CI)	AOR (95% CI)	<i>p</i> value
<i>BPCR level</i>					
Level-1	73 (54.1%)	62 (45.9%)	Ref	Ref	Ref
Level-2	77 (49.0%)	80 (51.0%)	1.22 (0.77–1.93)	1.83 (1.12–2.99)	0.093
Level-3	32 (15.5%)	175 (84.5%)	6.43 (3.88–10.68)	5.18 (3.08–8.73)	0.001*
Level-4	79 (15.0%)	448 (85.0%)	6.67 (4.41–10.10)	5.38 (3.50–8.26)	0.006*
Level-5	8 (14.8%)	46 (85.2%)	6.77 (2.97–15.42)	6.42 (2.77–14.87)	0.001*
<i>ANC status</i>					
Incomplete ANC	179 (40.8%)	260 (59.2%)	Ref	Ref	Ref
Complete ANC	90 (14.0%)	551 (86.0%)	4.21 (3.14–5.65)	2.79 (1.99–3.93)	0.001*

*Statistically significant

Discussion

Knowledge on danger signs of obstetric complications is the first step in motivating women to avoid three delays and identifying the medical facility for prompt delivery [19]. In our study, proportion of respondents aware of three key danger signs in each pregnancy (26%), labor (25%) and postpartum period (11%) was low. Same finding was reported in other settings of India, rural Odisha (22%) and Chhattisgarh (21%); where women had low level of knowledge of at least three danger signs [4, 20].

A birth plan/emergency preparedness plan includes identification of the some essential components: the desired place of birth; the preferred birth attendant; the location of the closest appropriate care facility; funds for birth-related and emergency expenses [3]. In our study, most women made savings for the baby's naming ceremony as compared to saving for any obstetric emergencies or delivery complications. Place of delivery and skilled assistance for their recent birth was not identified by more than 50% of women. Similar finding was reported in previous studies where antenatal mothers were not well prepared for managing their emergency conditions during pregnancy and delivery complications. Many women have not taken a proper decision for a medical facility and a trained birth attendant for their present delivery [20–22]. Less women preparedness was also reflected in study done in other parts of India [23, 24]. Some study show more than 50% women were found to be well prepared and had identified a medical facility and a trained birth attendant but had not saved money, nor arranged for transport and identified a blood donor [25, 26].

Our study computed that antenatal mothers were not having adequate knowledge about birth preparedness and were not well prepared for their present delivery. Higher percentage of birth preparedness and complication readiness index was reported after conducting BPCR training sessions among community health workers and with their registered pregnant mothers. Our findings are supported by Indian study conducted in Indore, where the overall birth preparedness and complication readiness index was

47.5% [4, 27]. Same scenario was observed among women in Kenya that very low preparedness level was observed, and there were no cases at best level of birth preparedness (at level 5) [5]. Therefore, our study strongly recommends that birth preparedness training is one of the best strategies to motivate pregnant mothers for higher level of birth preparedness and complication readiness which is associated with better birth outcome.

Our present study found impact of birth preparedness intervention on two key measure outcomes such as maternal outcomes (PPH, prolonged labor, obstructive fistula, maternal death) and neonatal outcomes (LBW baby, neonatal death). Women following birth preparedness strategies till their delivery experience favorable condition 88% as compared to ones without it, which shows a positive motivation of birth preparedness on pregnancy outcomes. Thus birth preparedness level was associated with good pregnancy outcome. Pregnant mothers who had attended more than 3 ANC visits and who were well prepared for delivery were found to be having three times favorable outcome than those who could not. Our findings are in agreement with other studies that ANC visits are proportional to adequate birth preparations and more likely to experience favorable birth outcome [5, 28, 29]. Therefore, our study strongly recommends that unwanted birth outcomes can be prevented through routine, timely birth preparedness, motivational counseling and training of health workers which are recommended by WHO also [30].

Conclusion

Our study suggests that supervised birth preparedness training, regular sensitization and follow-up sessions are significant components for experiencing favorable pregnancy outcome by the expectant mothers. This will reduce maternal and neonatal complications in rural community level.

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Compliance with Ethical Standards

Conflict of interest Authors would declare that no conflict of interest involved in this study.

Ethical Approval The institutional ethical approval (IEC) has been obtained from the ethical committee board before commencing the main study.

Informed Consent Informed written consent was obtained from each participant before participating in the study.

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