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BIRTH PREPAREDNESS AND COMPLICATIONS READINESS AMONG PREGNANT AND RECENTLY DELIVERED WOMEN IN RURAL AREAS OF DISTRICT GAUTAM BUDDHA NAGAR

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ABSTRACT

Background: Maternal mortality remains a pressing public health challenge globally, particularly in low- and middle-income countries. Birth Preparedness and Complication Readiness (BPCR) is an evidence-based strategy aimed at reducing maternal and neonatal morbidity and mortality by addressing the "three delays" in maternal healthcare. This study assessed the BPCR status among pregnant and recently delivered women in rural areas of Gautam Buddha Nagar district, Uttar Pradesh, and identified factors associated with optimal preparedness.

Materials and Methods: An analytical cross-sectional study was conducted between January and June 2022 among 382 pregnant and recently delivered women from four randomly selected villages. Data were collected using a semi-structured, pre-tested questionnaire based on JHPIEGO indicators. BPCR index and status were computed, and logistic regression analysis was used to identify associated socio-demographic and obstetric factors.

Results: The BPCR index was 50.9. Only 148(38.7%) of women demonstrated optimal BPCR, while 234(61.3%) had suboptimal practices. Knowledge of obstetric and newborn danger signs was low, with only one-third of participants able to identify at least two key signs during pregnancy, labor, postpartum, or in the newborn. While the majority attended ≥4 ANC visits 360(94.2%) and planned for skilled birth attendance 328(85.9%), fewer arranged transportation 190(49.7%), saved money 222(58.1%), or identified a blood donor 32(8.4%). Socioeconomic status and maternal employment emerged as significant determinants of optimal BPCR.

Conclusion: Despite satisfactory antenatal service utilization, overall BPCR practices were suboptimal, particularly in areas of emergency preparedness and awareness of government support schemes. Socioeconomic disparities strongly influenced preparedness levels.

Keywords: Birth preparedness, Complication readiness, Danger signs, Maternal health, Rural women.

INTRODUCTION

Maternal mortality remains a major global public health issue, with an estimated 295,000 maternal deaths occurring worldwide in 2017, the majority of which could have been prevented through timely access to appropriate maternal healthcare services (World Health Organization, 2019).[1] Birth Preparedness and Complication Readiness (BPCR) is an evidence-based strategy aimed at improving maternal and neonatal outcomes by ensuring that women, their families, and communities are adequately prepared for childbirth and potential obstetric emergencies (JHPIEGO, 2004).[2] The

concept of BPCR was developed under the Maternal and Neonatal Health Program of the Johns Hopkins Program for International Education in Gynecology and Obstetrics (JHPIEGO) to address the three major delays contributing to maternal mortality, namely delays in deciding to seek care, reaching an appropriate health facility, and receiving adequate care after arrival.[3]

The BPCR framework focuses on enhancing awareness of danger signs during pregnancy, childbirth, and the postpartum period, while encouraging advance planning for skilled birth attendance, transportation, identification of potential blood donors, and financial preparedness. Existing evidence indicates that effective BPCR practices are associated with reductions in maternal and neonatal morbidity and mortality.[4,5] Furthermore, BPCR aligns closely with global priorities such as Sustainable Development Goal 3.1, which targets a reduction in the global maternal mortality ratio to below 70 per 100,000 live births by 2030.[6]

In India, although maternal and child health indicators have improved following the implementation of programs such as the Janani Suraksha Yojana (JSY) and the Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA), considerable regional and rural–urban disparities continue to exist. Studies conducted in states such as West Bengal and Maharashtra have reported suboptimal BPCR practices among pregnant women, highlighting the need for focused and context-specific interventions.[7,8]

In this context, the present study was undertaken to assess the status of birth preparedness and complication readiness among currently pregnant and recently delivered women residing in rural areas of Gautam Buddha Nagar district and to identify factors associated with BPCR.

MATERIALS AND METHODS

Study design and setting: An analytical cross-sectional study was carried out from January 2022 to June 2022 in the Catchment area of Rural Health and Training Centre, Panchayatan, under the Department of Community Medicine, School of Medical Sciences and Research, Sharda University. It is covering a population of approximately 15,000 over eight villages.

Study Participants: Currently pregnant women and women who have recently delivered (either a live- or stillbirth in the last 24 months) and were permanent residents of the study area were included in the study. Recently delivered women were included as they are able to provide comprehensive information on both birth preparedness planning and its actual implementation during pregnancy, labor, and delivery. This approach minimizes intention practice gaps commonly observed among antenatal respondents and allows a more accurate assessment of BPCR practices. Women who were not willing to participate in the study, mentally disabled or severely ill, were excluded.

Sample size: Based on the BPCR index of 34.5% of a study from Dinajpur, West Bengal, absolute precision of 5% [formula used for cross-sectional study design n= Z2PQ/L2, where, Z=1.96 (critical value at 95% confidence level of certainty), P= Prevalence, Q= 100-P and L= Absolute Precision], the sample size was 347 [7]. Considering a non-response rate of 10%; the final sample size of 382 was taken.

Sampling technique: A multistage sampling method was employed. Out of the eight villages in the catchment area of RHTC, four villages were selected by simple random sampling. A list of pregnant and recently delivered women for each of the 4 villages was made with medical social workers' help. In the selected villages, the probability proportional to size technique was used to find out the required number of participants from each village. Finally, participants will be selected by using a simple random sampling method. Women who were not available for the interview even after three consecutive visits to their houses were replaced by other women selected randomly from the sampling frame.

Data Collection: Prior to data collection, the objectives of the study were explained to each participant in their local language, and written informed consent was obtained. Participation was entirely voluntary, and confidentiality of responses was assured. No personal identifiers were recorded, and participants were free to withdraw at any time without consequence. The interview was done in isolation to avoid prompting of answers. Undergraduate medical students and medical social workers were recruited for the interview purpose under the supervision of the principal and co-investigators. One day of training was imparted to them about the BPCR and interview procedure. The interview was done in isolation to avoid prompting of answers.

Study Tool: Data were collected using a pre-designed, pre-tested, semi-structured interview schedule. The BPCR assessment tool was adapted from the monitoring tool developed by the Johns Hopkins Bloomberg School of Public Health under JHPIEGO (2004). The questionnaire was modified to reflect locally available government maternal health services and was translated into Hindi, followed by back-translation into English to ensure consistency in meaning.

The interview schedule included information on socio-demographic characteristics and BPCR components such as knowledge of key danger signs during pregnancy, labor and childbirth, the postpartum period, and in the newborn; planning and utilization of maternal health services; and awareness of community-based resources. Socioeconomic status was assessed using the Modified B. G. Prasad scale based on the All India Consumer Price Index for Industrial Workers (CPI-IW = 338, August 2020).

BPCR indicators were derived from the Johns Hopkins Bloomberg School of Public Health monitoring framework and adapted to the local context [2]. Thirteen indicators were used to construct the BPCR index, including knowledge of danger signs, utilization and planning of antenatal and delivery services, financial preparedness, identification of transportation and blood donors, and awareness of government support services such as ambulance services, home-based newborn care by ASHAs, and the Janani Suraksha Yojana. The BPCR index was calculated by taking the average of the percentages of each indicator.

Each indicator was assigned a score of one. The BPCR score for each participant was calculated using the formula: BPCR score = (Σ indicators × 100) / 13. Participants with a score greater than 60% were categorized as having optimal BPCR, while those with a score of 60% or less were classified as having suboptimal BPCR, consistent with previous studies.[8,9]

Ethical considerations

The study was conducted as part of an academic project undertaken by undergraduate medical students under faculty supervision. This was a non-interventional, community-based survey involving minimal risk to participants. Written informed consent was obtained from all participants prior to data collection. Confidentiality and voluntary participation were ensured.

Statistical Analysis: The data were entered into Microsoft Office Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software version 21.0 (IBM, New York, USA). Frequencies, proportions, and percentages were used to discuss the results. Mean, range, and standard deviation were used for continuous variables. Odds ratio with a 95% confidence interval generated from binary logistic regression was used to determine the association between BPCR and potential influencing sociodemographic and obstetric factors. Multiple logistic regression was applied to adjust the confounders and predict the factors associated with optimal BPCR.

RESULTS

A total of 382 pregnant women and the women who gave live or stillbirths in the last 24 months were included in the study. The mean age of the participants was 25.11 ± 3.025 years (Range: 18-36 years) and the mean age at marriage was 20.51 ± 2.167 years. Most of the study participants were Hindu 376(98.4%) and homemakers 339(88.7%) and had completed their education up to high school or above 308(80.6%). A significant majority 327(85.6%) resided more than 5 kilometers from the nearest delivery point. The majority of them were multiparous 249(65.2%) and recently delivered 291(76.2%). [Table 1]

Optimal BPCR practice was observed in 148(38.7%) of the participants while 234(61.3%) demonstrated suboptimal BPCR practices. About two-thirds of the mothers did not know even 2 key danger signs during pregnancy 265(69.4%), labor and childbirth 234(61.3%), postpartum 264(69.1%), and in the newborn 243(63.6%) each. Most of the mothers 360(94.2%) had planned or attended at least 4 antenatal care visits with a skilled provider like a doctor or ANM. It was observed that 222(58.1%), 190(49.7%), and 32(8.4%) of women planned or saved money for childbirth, planned or identified a mode of transport to the place of delivery, and planned or identified blood donor respectively. Most of the women were aware about home visits by ASHA for home based newborn care 332(86.9%) but very few were aware about government services for transportation of pregnant females 150(39.3%) and government financial support scheme like Janani Suraksha Yojna 104(27.2%). [Table 2]

[Table 3] presents the knowledge of key danger signs during pregnancy, labor and childbirth, postpartum period, and in the newborn among the study participants. During pregnancy, more than one-third of participants 148(38.7%) knew that bleeding is a key danger sign. However, only about one-third 122(31.9%) were aware of blurred vision, and just 53(13.9%) recognized swollen hands or face as a potential danger sign.

When asked about labor and childbirth, 152(39.8%) knew that severe bleeding is a danger sign, while roughly one-third 121(31.7%) identified convulsions as a risk and just 109(28.5%) were aware that failure to deliver the placenta within 30 minutes poses a risk. Alarmingly, less than one in five 73(19.1%) recognized prolonged labor (more than 12 hours) as dangerous.

In the postpartum period, over one-third 144(37.7%) recognized severe vaginal bleeding as a key danger sign, while knowledge of foul-smelling vaginal discharge 112(29.3%) and high fever 129(33.8%) was comparatively lower.

For newborn danger signs, Just over one-third 131(34.3%) recognized a very small baby as a potential risk and 116(30.4%) were aware of difficulty or fast breathing as a danger sign. Less than one-third of the participants identified convulsions 109(28.5%) or lethargy/unconsciousness 114(29.8%) as critical danger sign.

[Table 4] presents the association between selected sociodemographic and obstetric factors and the status of BPCR among pregnant and recently delivered women.

Age group showed a significant association with BPCR in the binary logistic regression analysis. Women aged 27–36 years had higher odds of optimal BPCR (Crude OR: 1.641, 95% CI: 1.054–2.553) compared to those aged 18–26 years. However, this association lost its significance after adjusting for other variables in the multiple logistic regression (Adjusted OR: 1.259, 95% CI: 0.714–2.219).

Education appeared to play a role in BPCR status, with women educated up to high school or above more likely to have optimal BPCR 131(42.5%) than those educated up to middle school 17(23.0%). While significant in the unadjusted analysis (Crude OR: 2.482, 95% CI: 1.380–4.463), the association was not statistically significant after adjustment (Adjusted OR: 1.479, 95% CI: 0.749–2.919).

Similarly, husband's education showed a strong unadjusted association with BPCR status (Crude OR: 5.358, 95% CI: 1.214–23.651). However, this association was attenuated and lost statistical significance after adjustment (Adjusted OR: 3.631, 95% CI: 0.719–18.348).

Employment status was significantly associated with optimal BPCR both in binary and multiple logistic regression analyses. Employed women had more than twice the odds of optimal BPCR compared to homemakers (Adjusted OR: 2.353, 95% CI: 1.101–5.028).

Socioeconomic status emerged as the most robust determinant: women from upper, upper middle, and middle classes had substantially higher odds of optimal BPCR (Adjusted OR: 11.154, 95% CI: 5.625–22.117) compared to those from lower middle and lower classes.

Type of family (nuclear versus joint) and parity (nulliparous/primiparous versus multiparous) did not show significant associations with BPCR status after adjusting for potential confounders.

Table 1: Sociodemographic and obstetric characteristics of the pregnant and recently delivered women of rural Gautam Buddha Nagar

Characteristics	Frequency (%), N=382
Age-group	
18-26 years	265 (69.4)
27-36 years	117 (30.6)
Religion	
Hindu	376 (98.4)
Muslim or others	6 (1.6)
Education (Completed)	
Illiterate	22 (5.8)
Primary	7 (1.8)
Middle school	45 (11.8)
High school	132 (34.6)
Intermediate	148 (38.7)
Graduation and above	28 (7.3)
Occupation	
Homemaker	339 (88.7)
Unskilled worker	30 (7.9)
Semiskilled worker	12 (3.1)
Skilled worker	1 (0.3)
Husband's education	
Illiterate	3 (0.8)
Primary	2 (0.5)
Middle school	13 (3.4)
High school	47 (12.3)
Intermediate	204 (53.4)
Graduation and above	113 (29.6)
Socioeconomic status (Modified B G Prasad scale)	
Upper class	16 (4.2)
Upper middle class	115 (30.1)
Middle class	123 (32.2)
Lower middle class	107 (28.0)
Lower class	21 (5.5)
Type of family	
Nuclear family	69 (18.1)
Joint family	313 (81.9)
Average distance from the delivery point	
≤ 5 kilometers	55 (14.4)
> 5 kilometers	327 (85.6)
Parity	
Nulliparous / primiparous	133 (34.8)
Multiparous	249 (65.2)
Current status	
Pregnant	91 (23.8)
Recently delivered	291 (76.2)

Table 2: Status of BPCR and BPCR index among the study participants

Variables	Frequency (%), N=382
BPCR status	
Optimal BPCR	148 (38.7)

Suboptimal BPCR	234 (61.3)
BPCR indicators	
Percentage of women who knew at least two key danger signs during pregnancy	117 (30.6)
Percentage of women who knew at least two key danger signs during labor and childbirth	148 (38.7)
Percentage of women who knew at least two key danger signs during postpartum	118 (30.9)
Percentage of women who knew at least two key danger signs in the newborn	139 (36.4)
Percentage of women who plan to or attended at least four antenatal care visits with a skilled provider	360 (94.2)
Percentage of women who attended first antenatal care visit with a skilled provider during the first trimester	288 (75.4)
Percentage of women who plan to or gave birth with a skilled provider	328 (85.9)
Percentage of women who plan to or save money for childbirth	222 (58.1)
Percentage of women who plan to or identified blood donor	32 (8.4)
Percentage of women who plan to or identified a mode of transport to the place of delivery	190 (49.7)
Percentage of women who knew that government provides services for transportation of pregnant women (102,108 ambulances)	150 (39.3)
Percentage of women who knew about home visits by ASHA for home-based newborn care	332 (86.9)
Percentage of women who knew about the government's financial support scheme (Janani Suraksha Yojana)	(27.2)
BPCR Index	50.9

Table 3: Knowledge of key danger signs among pregnant and recently delivered women*

Variables	**Frequency (%), N=382**
Knowledge of key danger signs during pregnancy	
Bleeding	148 (38.7)
Blurred vision	122 (31.9)
Swollen hands or face	53 (13.9)
Knowledge of key danger signs during labor and childbirth	
Severe bleeding	152 (39.8)
Convulsions	121 (31.7)
Prolonged Labor (>12 hours)	73 (19.1)
Placenta not delivered 30 minutes after the baby	109 (28.5)
Knowledge of key danger signs during postpartum	
Severe vaginal bleeding	144 (37.7)
Foul-smelling vaginal discharge	112 (29.3)
High fever	129 (33.8)
Knowledge of key danger signs in newborn	
Convulsions/spasm/rigidity	(28.5)
Difficulty/ fast breathing	(30.4)
Very small baby	(34.3)
Lethargy/ unconsciousness	114 (29.8)

*Multiple responses

Table 4: Association of sociodemographic and obstetric characteristics with the status of BPCR of pregnant and recently delivered women

Variables	**BPCR status**		**Crude OR (95% CI) ***	**Adjusted OR (95% CI) ***
	Optimal (N=148)	**Suboptimal (N=234)**		
Age group (In years)				
18-26 years	93 (35.1)	172 (64.9)	1	1
27-36 years	55 (47.0)	62 (53.0)	**1.641 (1.054-2.553)**	1.259 (0.714-2.219)
Religion				
Hindu	145 (38.6)	231 (61.4)	0.628 (0.125-3.152)	0.297 (0.028-3.111)
Muslim and others	3 (50.0)	3 (50.0)	1	1
Education (Completed)				
Up to Middle School	17 (23.0)	57(77.0)	1	1
High school and above	131 (42.5)	177 (57.5)	**2.482 (1.380-4.463)**	1.479 (0.749-2.919)
Husband's education (Completed)				
Up to Middle School	2 (11.1)	16 (88.9)	1	1
High school and above	146 (40.1)	218 (59.9)	**5.358 (1.214-23.651)**	3.631 (0.719-18.348)
Occupation				
Homemaker	122 (36.0)	217 (64.0)	1	1
Employed	26 (60.5)	17 (39.5)	**2.720 (1.420-5.213)**	**2.353 (1.101-5.028)**
Socioeconomic status				
Upper/ upper middle/ middle class	137 (53.9)	117 (46.1)	**12.455 (6.402-24.231)**	**11.154 (5.625- 22.117)**
Lower middle/ lower	11 (8.6)	117 (91.4)	1	1
Type of family				
Nuclear	29 (42.0)	40 (58.0)	1.182 (0.696-2.007)	0.944 (0.513- 1.740)
Joint	119 (38.0)	194 (62.0)	1	1
Parity				
Nulliparous or Primiparous	43 (32.3)	90 (67.7)	1	1
Multiparous	105 (42.2)	144 (57.8)	1.526 (0.981-2.374)	1.377 (0.775- 2.446)

* Bold indicates significance.

DISCUSSION

This study assessed the status of Birth Preparedness and Complication Readiness (BPCR) among pregnant and recently delivered women in the rural areas of Gautam Budh Nagar, Uttar Pradesh. The findings reveal that BPCR index was 50.9 percent and 148,38.7 percent of women had optimal BPCR. Index was comparable to the findings of studies conducted in rural western Maharashtra (59.56%), Uttar Pradesh (45.12%) and villages of Odisha (44.6%).[8,10,11] However, Mukhopadhyay, et al. reported slightly lower BPCR index (34.5%) in West Bengal.[7]

In the present study, the level of BPCR (Birth Preparedness and Complication Readiness) practice was found to be slightly higher than that reported in a study from Odisha, India 26 percent.[11] However, it was consistent with findings from studies conducted in Uganda (35%) and Nepal (32%).[4,12] In contrast, several other studies have reported a higher prevalence of optimal BPCR. For instance, a study from Maharashtra, India, reported that 52% of participants practiced optimal BPCR.[8] Outside India, higher levels were observed in Ethiopia (72.6%) and Thailand (78.6%).[13,14] These variations in BPCR practices may be attributed to differences in the socio-demographic characteristics of the study populations as well as regional and contextual factors related to healthcare access, education, and awareness.

Awareness of obstetric and newborn danger signs among the participants was found to be poor. Approximately one-third of women could identify at least two key danger signs during pregnancy 117(30.6%), labor 148(38.7%), postpartum 118(30.9%), and in the newborn 139(36.4%). These findings are in line with studies from Tanzania and Karnataka, where knowledge of key danger signs ranged from 20% to 45%.[5,9] This lack of awareness is concerning, given that recognition of danger signs is critical for timely care-seeking and reducing the first delay in the "three delays" model described by Thaddeus and Maine.[3]

Most women in our study had planned or received at least four antenatal check-ups 360(94.2%) and delivered or intended to deliver with the help of a skilled health provider 328(85.9%). These are promising signs, suggesting that basic maternal healthcare services are reaching women in this rural area. It reflects the positive impact of national programs like Janani Suraksha Yojana (JSY) and Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA).[7,8] When we compare these figures with the NFHS-5 data for rural Uttar Pradesh, where only 39.6% of women had four or more ANC visits and 83.8% delivered with skilled attendance,[15] our study shows slightly better outcomes—possibly due to effective outreach efforts by ASHAs and local health workers in the RHTC Panchayatan area.

However, when we look beyond ANC visits and delivery plans, other aspects of BPCR tell a different story. Less than half of the women in our study had arranged or intended to arrange transportation in advance 190(49.7%), and only a small number had identified a potential blood donor 32(8.4%). These are simple yet life-saving steps that can significantly reduce delays during obstetric emergencies but they are often overlooked. Interestingly, higher levels of preparedness were reported in studies from Dakshina Kannada, Karnataka, and rural Maharashtra, where 71.7% and 63% of women, respectively, had arranged transportation, and 15.8% and 9.5% had identified a blood donor.[8,9]

These findings suggest regional disparities in BPCR components across India. While some areas are making strides in emergency preparedness, others including parts of Uttar Pradesh still lag behind. This reinforces the need to strengthen behavior change communication and community-based interventions that promote not just clinical care, but also the logistical planning essential for timely maternal healthcare.[2]

Awareness about key government support services was notably low among the women in our study. For instance, only 150(39.3%) were aware of the free transport services available through the 102/108 ambulance schemes. Even fewer just 104(27.2%) knew about Janani Suraksha Yojana (JSY), the government's flagship financial assistance program for pregnant women, despite it being in place for over a decade. Similar trends were seen in a study from Uttar Dinajpur, West Bengal and rural Maharashtra, where knowledge about such schemes was also suboptimal.[7,8] These results suggest an issue that while government schemes exist, their visibility at the community level especially in rural areas—remain limited. Strengthening communication and community engagement can help bridge this information gap and ensure that more women benefit from the support already available to them.

Socioeconomic status emerged as the strongest predictor of optimal BPCR in our study. Women from higher socioeconomic strata had more than 11 times the odds of being well-prepared compared to those from lower strata. This finding is consistent with the results of Kabakyenga et al. (2012) and the study from rural Karnataka, both of which reported a significant association between higher socioeconomic status and better birth preparedness.[4,9]

Employment status was also significantly associated with BPCR in our study, with employed women demonstrating higher preparedness. Employment likely enhances women's autonomy, access to resources, and health-seeking behavior. This observation is in line with findings from Tanzania,[5] but contrasts with those from Uganda and rural Karnataka, where employment was not found to be a significant predictor.[4,9]

Although both women's and husbands' education showed positive associations with BPCR in unadjusted analyses, the associations lost statistical significance after adjusting for other variables,

suggesting the role of confounding factors. This trend is similar to the findings from rural Karnataka but differs from studies in Uganda and Tanzania, where education was a significant determinant.[4,5] In line with some previous studies, parity did not significantly influence BPCR in our population, indicating that prior obstetric experience does not necessarily translate into better awareness or preparedness.[5,9]

Limitations: This study has several limitations, first its cross-sectional design limits the ability to establish causal relationships between sociodemographic factors and BPCR practices. Second, reliance on self-reported data may have introduced recall and social desirability bias, particularly regarding danger sign awareness and birth planning. Third, since the study was conducted in a limited rural population within one district, which may restrict the generalizability of findings to other regions of Uttar Pradesh or India. Moreover, the exclusion of healthcare providers' perspectives limits understanding of systemic barriers affecting BPCR implementation, while this study did not explore cultural beliefs, family decision-making dynamics, or health system constraints, which may also influence preparedness.

CONCLUSION

This study highlights that while basic maternal healthcare services such as antenatal visits and skilled birth attendance are widely practiced, significant gaps remain in comprehensive BPCR among rural women in Gautam Buddha Nagar. Awareness of danger signs and government support schemes was limited, and essential emergency planning measures—such as arranging transportation and blood donors—were largely neglected. Socioeconomic status and women's employment were key predictors of preparedness, underscoring the role of economic empowerment in improving maternal health outcomes. Strengthening community-based health education, enhancing the visibility of government schemes, and addressing socioeconomic inequities are critical to improving BPCR and achieving maternal health targets.

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