

Knowledge of Postnatal Danger Signs and Associated Factors among Mothers in Nepal

Indira Adhikari (Poudel)

Associate Professor, Madan Bhandari Academy of Health Sciences, Hetauda, Nepal.

Abstract

BACKGROUND: The postpartum period is crucial, and it is essential to recognize warning signs. Unfortunately, maternal mortality rates remain high due to postpartum complications, especially in developing countries like Nepal. Many mothers are not aware of postnatal warning signs, which can delay them from seeking necessary medical care and increase the risk of maternal mortality. The main objective of study to identify mothers' knowledge of postnatal danger signs and the relevant factors.

METHOD: A study was conducted in Chitwan, covering three municipalities: Madi, Rapti, and Ratnanagar. A stratified proportionate-based simple random sampling technique was used to recruit 527 mothers for the study. Data was collected through face-to-face interviews using a structured questionnaire, and statistical analysis was conducted using SPSS version 21. A multivariate logistic regression was used to determine the factors associated with the knowledge of postnatal danger signs.

RESULT: Out of the total respondents, only 209 (39.7%) demonstrated good awareness regarding postpartum danger signs. To be considered informed, a woman must be able to list at least three common warning signs. However, the majority of respondents consistently identified vaginal bleeding as a dangerous sign postpartum. The study found that modern health care seeking behavior (AOR=1.63, 95% CI:1.04-2.55), occupation in service (AOR=3.19, 95% CI:1.39-7.29), and time to reach the health facility (AOR=1.96, 95% CI:1.18-3.25) were significantly associated with knowledge of postnatal danger signs. Of these, 67 (12.7%) faced postnatal danger signs during their postpartum period. Among those, the majority (39 or 7.4%) had a good practice of seeking a health facility for care and treatment.

CONCLUSION: It is encouraging that mothers become more aware of postnatal danger signs despite their initial low level of awareness. Factors such as the mother's age, occupation, educational background, age of marriage and first childbirth, number of ANC visits, and healthcare-seeking behavior are significantly associated with their awareness of postnatal danger signs. Therefore, healthcare providers should focus on these factors to improve the mothers' knowledge of postnatal danger signs.

KEYWORDS: Danger signs; Postnatal; Associated; Factors; Mothers, Nepal

INTRODUCTION

During the postpartum period, some symptoms can indicate possible complications that may occur within six weeks after giving birth. Severe vaginal bleeding, foul-smelling vaginal discharge, and high fever are key maternal danger signs (World Health Organization, 2018).¹ Identifying danger signs during postpartum is crucial for saving lives. Even non-medical personnel can play a vital role in recognizing these warning signs and seeking medical assistance promptly (Bakar et al., 2019).² Age,

educational status, family income, and decision-making power were significantly associated with knowledge of obstetric danger signs (Woldeamanuel, Lemma, & Zegeye, 2019).³

A study revealed that 37% of maternal deaths occur within 42 days after birth, and an additional 23.6% occur between 43 days to 1 year after birth, according to data from 14 maternal mortality review committees (2008–2017) (Davis, 2019). It is estimated that globally, there were 303000 maternal deaths due to complications related to pregnancy and childbirth (Darmstadt et al., 2006).⁵ Study shows that most participants could not recognize all postpartum danger signs, and 25% could not recognize any. The study linked awareness of these warning signs with hospital delivery, income, and education on warning signs before discharge (Adams & Yound, 2022).⁶ The main causes of maternal death in Nepal were hemorrhage (Suvedi et al., 2008/2009).⁷ Postpartum hemorrhage and long obstructive labor were the leading causes of maternal death in rural areas, whereas unsafe abortion, infection, and hypertension with preeclampsia were the leading causes of maternal death in urban areas (Bogale & Markos, 2015).⁸ Most of the evidence shows poor knowledge of obstetric danger signs not only during pregnancy but also during delivery and after childbirth (Bhandari & Dangal, 2012).⁹ Septic abortion was the leading cause of maternal death in Kathmandu Valley in the study of Rana et al. 2009.¹⁰

A study finding shows the postnatal danger signs include fast or difficult breathing, convulsions, being too weak to get out of bed, blurred vision and headaches, pain in calf muscles, redness or swelling, urinary incontinence, swollen or tender breasts or nipples, increased perineal pain and depression within 42 days of birth.⁸ The study conducted in Turkey indicated that cultural influences were linked to delay in seeking care when they experience complications during the postpartum period, and this was contributed by factors such as age, educational level, health insurance, getting antenatal care, family structure, and knowledge of the danger signs during pregnancy (Hoque, 2011).¹¹ Visiting a health facility for care is the best way to identify any problem that may endanger the health of the mother/unborn baby and take action early and promptly (Ay et al., 2009).¹² Reviews of maternal deaths indicate that lack of knowledge about the signs of maternal complications among patients and families is a contributing factor in many deaths (Teshoma et al., 2020).¹³ Association for Women's Health, Obstetric and Neonatal Nursing (AWHONN) and the Council on Patient Safety in Women's Health Care have developed standardized warning signs education materials (Petersen, et al., 2019).¹⁴ Globally, the majority (80%) of maternal deaths are happening due to direct obstetric complications. These include hemorrhage, unsafe abortion, pregnancy-induced hypertension, infection, and obstructed and prolonged labor (Killion, 2020).¹⁵ Approximately one-third of maternal deaths occur during pregnancy, and another one-third occur between 7 days and one year postpartum (Venn, 1013).¹⁶ Postpartum death is linked to the quality of maternal care provided during pregnancy and delivery (Bhutta et al., 2014).¹⁷

Raising awareness among women about obstetric danger signs can lead to early detection of obstetric complications, resulting in timely medical care and reduced mortality (Mahara et al., 2016).¹⁸ Almost half of all postnatal maternal deaths occur within the first 24 hours, and 66% within the first week. Proper postnatal care can help ensure the well-being of both mother and newborn during this critical period (Nambala & Ngoma, 2013).¹⁹ Various contextual factors influence maternal health, and it is a social phenomenon. Social factors like governance, policies, cultural values, and laws create hierarchies based on social class, ethnicity, gender, education, occupation, and income (WHO, 2015).²⁰

The World Health Organization's global maternal mortality ratio is 211 in 2021. Of concern is the highest reported MMR of 1150 in South Sudan (Damayanti, Wulandari, & Ridlo, 2023).²¹ MMR has significantly increased in developing countries, while developed countries have only slightly increased.

Low-income countries have an MMR of 462 per 100,000 live births, compared to 11 per 100,000 in high-income countries (WHO, 2018).²² The issue of high maternal mortality rates is more prevalent in developing countries, where 99% of maternal deaths occur ((Solar & Irwin, 2010).²³ The late pregnancy, childbirth, and the postpartum period to bring down the number of maternal and neonatal deaths, which can be avoided with proper care (WHO, 2014).²⁴

Knowledge is essential in the formation of behavior. Health-conscious behavior will maintain and improve the health status of individuals (Belay & Limenih, 2020).²⁵ The determinants of awareness of maternal danger signs include education, poverty, nutrition, lack of social amenities, inadequate healthcare, insufficient family planning, low status of women, gender-based violence, paternity and sex preference (Alemayehu, 2020).²⁶ Maternal Mortality Rate is an essential measure of women's health and is included in the development index and sustainable development goals (Tjandraprawira & Ghazali, 2019).²⁷ To achieve the Sustainable Development Goals set by the United Nations in 2015, which include reducing the global maternal mortality ratio to less than 70 per 100,000 live births by 2030 (Ayoga, 2016-2030).²⁸ Nepal's maternal mortality ratio is 151 per 100,000 live births. The primary cause of maternal deaths was obstetric hemorrhage, accounting for 26% of all deaths MoHP, 2021).²⁹

METHODS AND METERIALS

Study Setting and period: The study occurred in Chitwan - Nepal's central region district. Nepal is a federal republic comprising seven federal provinces and 77 districts, with Chitwan being one of them. It is situated in the southwest corner of Bagmati Province, which has 13 districts and features the second-largest city in Nepal, Bharatpur. Chitwan spans 2,238.39 square kilometers, divided into one metropolitan city, one rural municipality, and five municipalities - Bharatpur Metropolitan City, Kalika, Khairahani, Madi, Ratnanagar, Rapti Municipality, and Ichchhakamana Rural Municipality. The name "Chitwan" comes from the Chitwan Valley, nestled between the Mahabharat and Siwalik ranges - the foothills of the Himalayas.³⁰ According to the 2021 Census, Chitwan has a population of 720,000, with a 2.07% growth rate compared to the previous year, surpassing the national average of 0.92%. Females constitute 53.91% of the population. Chitwan is home to diverse ethnic groups, religions, and cultures. It boasts a wide range of public and private healthcare facilities, making it a popular destination for medical care. It is regarded as Nepal's second-largest medical hub, featuring seven public health centers, three NGO-run facilities, and 175 private institutions. The district also has 24 birthing centers, three primary emergency obstetric neonatal care sites, and three comprehensive emergency obstetric neonatal care sites. However, maternal and child health in Chitwan still requires attention despite these resources. Several grassroots and district-level initiatives have been implemented to address this issue, but there is still scope for improvement. As per the Annual Report of the District Health Office, there are 36 health posts, three primary healthcare centers, and three hospitals in the area. The study was carried out from October 2021 to March 2022.

Study Population: All eligible mothers who gave birth the previous year and had an infant aged between 45 to 365 days in the selected clusters during the data collection period were included, while those who were seriously ill throughout the data collection period were excluded.

Study Variables

Dependent/ Outcome Variable: Awareness of postnatal danger signs

Independent Variables: This study focuses on awareness of postnatal danger signs as the dependent variable and uses independent variables to assess social factors that may affect it. The social factors include a mother's age, economic status, education, occupation, religion, ethnicity, distance of health facility, decision-making and healthcare-seeking. The obstructive factors include parity, age at marriage, age at first childbirth, number and timing of ANC and PNC visits, and several childbirths. The study found a significant relationship between these factors and PNS.

Designs: A study was conducted in Chitwan to identify the social factors that influence mothers' awareness of postnatal danger signs. The research used quantitative methods; the primary aim was to identify the factors that affect postnatal danger signs in specific municipalities within Chitwan in Nepal.

$$n_0 = \frac{z^2 pq}{d^2} = \text{Sample size was } = 362$$

For finite population, where $N = \text{total postnatal mother i.e } 1633$

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

where $n =$ required sample size, $\alpha =$ level of significant, $z =$ standard normal distribution curve value for 95% confidence level = 1.96, $P =$ proportion of mother's awareness about postnatal danger sign, $d =$ margin of error. To conduct the sampling process, we utilized a multistage technique incorporating a design effect of two, and we factored in a 5% non-response rate. Chitwan district has five municipalities, and three municipalities (Rapti, Madi, and Ratnanagar) were selected by simple random sampling. House-to-house visits were carried out in the selected clusters to identify eligible mothers. All eligible mothers in the selected clusters were interviewed. Finally, because of the cluster effect, 527 mothers were interviewed.

Various aspects of awareness of postnatal danger signs were examined, focusing on social factors that influence it. Random sampling techniques were employed to draw samples from each stratum.

Data Collection Tools and Techniques: Data was collected through closed-ended, structured questionnaires administered during direct face-to-face interviews with participants.

Data Collection Procedure: Face-to-face interviews were conducted using a structured questionnaire to obtain quantitative data. The questionnaire was developed in English after a literature review and then translated into Nepali. The principal investigator was present to offer guidance and ensure data quality. Written consent was obtained from participants, and their privacy was maintained throughout the data collection process. Confidentiality was also ensured by using de-identified data when disseminating the results.

Data Management and Analysis: To ensure accuracy, the data was meticulously checked for completeness, inconsistencies, and missing values. Descriptive statistics were used to describe the study population based on socio-demographic and other relevant variables. Bivariate analysis was conducted confidently to determine the association between each independent variable and awareness of postnatal danger signs management. Only variables with a p-value of less than 0.05 were included in the multivariable analysis. Mothers' social characteristics and knowledge of postnatal danger signs were analyzed with utmost diligence using SPSS. Significant variables were identified through cross-tabulation, and binary logistic regression was used to study the determinants of independent variables on

postnatal danger signs with unwavering confidence (Kabakyenga, 2011).³¹ The dependent variable, awareness of postnatal danger signs, was categorized into two levels: good awareness and poor awareness, with the categorization of the level of awareness adapted from a Tanzanian study (Mwilike et al.,2018).³²

The adjusted odds ratio was utilized to ascertain the degree and direction of the association of the significantly linked variables, with complete confidence in our conclusions (Salem et al., 2018).³³

Ethical Approval: Ethical approval was obtained from Nepal Health Research Council (Ref. No. 2827) Review Committee. Participants were given a clear explanation of the study's purpose and confidentiality guarantee, and verbal consent was obtained from each survey participant. No discrimination based on caste or religion occurred, and participation was voluntary. Anonymity was protected with a code system.

Results

Table 1 Socialdemographic characteristics of respondents

Of the 527 respondents, 37.2% were aged between 20 and 24, while only 5.1% were aged 35 or above. Regarding education, the majority (53.5%) had received secondary education, and only 2.7% had received a bachelor's degree or higher. Concerning occupation, 63.2% were involved in household work, 7.0% in service, and 1.3% in daily wages. Regarding family type, 75.7% belonged to a joint family, and 3.5% belonged to a single family. Concerning ethnicity, 65.5% were Janajati, and 2.8% were Muslim. Regarding religion, 81% were Hindu, and 19.0% were non-Hindu (Buddhist, Christian, and Muslim). Among them, 59.4% of respondents' healthcare-seeking behaviors followed modern and traditional methods, and at least 7.6% followed the modern approach (Table 1).

n=527

Variables	Frequency (N)	Percentage (%)
Mother Age group in years		
Less than 20 years	56	10.6
20-24 years	196	37.2
25-29 years	165	31.3
30-34 years	83	15.7
35 years and above	27	5.1
<i>Mean age ± SD = 25.20 ± 4.88 (Min=15,Max=42)</i>		
Mother Educational status	527	100
level of education		
Just literate, with no formal education	10	1.9
Primary	88	16.7
Secondary	282	53.5
Higher Secondary	133	25.2
Bachelor and above	14	2.7
Mother Occupation status		
Household work	333	63.2
Agriculture	109	20.7

Service	37	7.0
Wages	7	1.3
Business	41	7.8
Type of family		
Single	124	23.5
Joint	399	75.7
Extended	4	.8
Ethnicity		
Dalit	73	13.9
Janajati	345	65.5
Madhesi	21	4.0
Muslim	15	2.8
Brahmin/Chettri	73	13.9
Religion		
Hindu	427	81.0
Buddha	44	8.3
Christian	41	7.8
Muslim	15	2.8
Health care seeking behaviours		
Modern	174	33.0
Traditional	40	7.6
Both	313	59.4

Table 2 *Obstetrical Characteristics of Respondents*

n=527

Variables	Frequency (N)	Percent (%)
Age of first childbirth		
≤16years	43	8.2
17-19years	191	36.2
≥20years	293	55.6
Number of children		
Less than 2 children	432	82.0
3-4 Children	89	16.9
≥5children	6	1.1
Mode of delivery		
Normal	435	82.5
Caesarean Section	90	17.1
Vacuum	2	.4
Antenatal checkup during last pregnancy		
No	15	2.8
Yes	512	97.2

Number of ANC visits (n=512)		
Less than 4 ANC Visits	157	29.8
≥4 or More ANC visits	355	67.4
Time to reach the health facility		
≤30 minutes	151	28.7
>30 minutes	376	71.3

Source: Field Survey, 2022

Out of 527 respondents, the majority, 55.6%, had their first childbirth at the age of 20 or more, and 8.2% had their first childbirth at the age of 16 or younger. Of these respondents, 82.0% had two children, with only 1.1% having five or more children. In terms of delivery, most 82.5% had a spontaneous vaginal delivery, while 17.1% had a cesarean section. The survey found that 97.2% of respondents attended antenatal clinics for checkups, and 67.4% attended four or more checkups during their last pregnancy (Table 2).

Table 3 Respondents Awareness of Postnatal Danger Signs and Method of Treatment
n=527

Variables	Frequency (N)	Percentage (%)
Types of maternal danger signs **		
Excessive vaginal bleeding	321	60.9
Offensive vaginal discharge	230	43.6
Severe Headache	524	99.4
Blurred vision	522	99.1
High-grade fever	524	99.4
Lower abdominal pain	445	84.4
Fits or loss of consciousness	456	86.5
Pale and weak	526	99.8
Experienced problems during the postpartum period		
Yes	67	12.7
No	460	87.3
If yes, (n=67)		
Fever	7	1.3
Per vaginal bleeding	34	6.5
Lower abdominal pain	8	1.5
Foul vaginal discharge	6	1.1
Weakness	12	2.3
Method of treatment (n=67)		
Hospital Treatment	39	7.4
Home Treatment	12	2.3
Ayurvedic	11	2.1
Traditional	5	.9

Source: Field Survey, 2022, ***Multiple responses*

According to the table provided, it is evident that a vast majority of the respondents, 99%, were aware of severe headaches, blurred vision, high-grade fever, paleness, and weakness as symptoms of maternal danger signs. Furthermore, a significant percentage (ranging from 43.6% to 86.5%) were also aware of other danger signs such as excessive vaginal bleeding, offensive vaginal discharge, lower abdominal pain, and fits or loss of consciousness. Out of the 527 respondents, 12.7% had experienced postnatal health problems, including 6.5% with excessive vaginal bleeding and 1.3% who had a fever. Interestingly, only 7.4% of respondents sought medical attention from a hospital, while 0.9% used traditional treatment (Table 3).

Table 4 Respondents’ Awareness of Postnatal Danger Signs

Awareness of postnatal danger sign	Frequency (N)	Percentage (%)
Poor awareness	318	60.3
Good awareness	209	39.7
Total	527	100.0

Based on the data, 60.3%, displayed poor level of awareness when recognizing warning signs of potential postpartum complications. Conversely, 39.7% demonstrated a good understanding of these warning signs, which required listing at least three common indicators, such as severe vaginal bleeding, foul-smelling vaginal discharge, and high fever, in order to be considered well-informed (Table 4).

Table 5 Bivariate Analysis of Awareness of Postnatal Danger Signs and Social Variables

Variables	Awareness of postnatal danger sign		Unadjusted OR	p-value	95% CI
	Poor no. (%)	Good no (%)			
Type of Family					
Single	74(59.7)	50(40.3)	1.037	.863	.688-1.563
Joint and Extended	244(60.5)	159(39.5)	Ref		
Education level					
Up to Secondary	257(67.6)	123(32.4)	Ref		
Secondary and above	61(41.5)	86(58.5)	2.946	<0.001	1.990-4.360
Occupation					
Household work	228(68.9)	103(31.1)	Ref		
Agriculture	66(59.5)	45(40.5)	1.509	.070	.968-2.354
Business	14(29.8)	33(70.2)	5.218	<0.001	2.678-10.167
Service	10(26.3)	28(73.7)	6.198	<0.001	2.903-13.235
Age of first childbirth					
≤ 19 years	160(68.4)	74(31.6)	Ref		
≥20 years	158(53.9)	135(46.1)	1.847	<0.001	1.291-2.645
Number of children					
≤2 children	248(57.4)	184(42.6)	2.077	0.004	1.266-3.408
Three and more	70(73.7)	25(26.3)	Ref		

children					
ANC visit					
≤ 3 visits	113(72.0)	44(28.0)	Ref		
≥ 4 visits	192(54.1)	163(45.9)	2.180	<0.001	1.453-3.272
Time to reach the health facility					
< 30 minutes	66(45.7)	85(56.3)	2.617	<0.001	1.778-3.853
≥ 30 minutes	252(67.0)	124(33.0)	Ref		
Ethnicity					
Dalit	34(46.6)	39(53.4)	Ref		
Janajati	222(64.3)	123(35.7)	1.524	.479	.475-4.887
Madhesi	13(61.9)	8(38.1)	1.692	.475	.399-7.172
Muslim	11(73.3)	4(26.7)	2.533	.140	.738-8.692
Brahmin/Chettri	38(52.1)	35(47.9)	3.154	.068	.919-10.828
Health care seeking behaviour					
Modern method	70(40.2)	104(59.8)	3.509	<0.001	2.401-5.128
Traditional	248(70.3)	105(29.7)	Ref		

I=Reference group, Significance at 95%CI, OR=Odd Ratio: CI= Confidence Interval

Table 5 indicates that single-type families had 0.86 times greater awareness of PDS than joint or extended families. This difference was statistically significant, with a p-value of 0.015. Additionally, individuals 20 or older were 1.03 times more likely to understand PDS than those under 19, with a statistically significant variance below 0.05. Furthermore, those with at least a secondary education were 2.94 times more aware of PDS than those with a secondary level or lower education. Occupation was also a significant factor, with individuals in business and service being significantly more knowledgeable about PDS than those in household work. Specifically, according to the data, the former group was 5.21 and 6.91 times more knowledgeable than the latter group.

Studies have shown that individuals with one or two children are 2.07 times more likely to know PDS compared to those with three or more children. Similarly, those who attended at least four ANC visits had 2.18 times higher chances of knowing about PDS than those who had fewer than four visits. Living within a 30-minute radius of a health facility also increased the likelihood of PDS awareness. In terms of ethnicity, the Janajati group had a 1.52 times higher chance of being knowledgeable about PDS. Similarly, the Madhesi group had 1.69 times higher likelihood, and Muslims were 2.53 times more likely to be aware. The Brahmin/Chhetri individuals were the most knowledgeable, with 3.15 times higher chances of being informed about PDS. However, the Dalit group respondents needed to be more familiar with PDS; this difference was statistically significant.

Table 6 *Multivariate Analysis of Awareness of Postnatal Danger Signs with Selected Variables*

Variables	Awareness of postnatal danger sign		Unadjusted OR	Adjusted OR	p-value	95% CI
	Poor no (%)	Good no (%)				

Occupation						
Household work	228(68.9)	103(31.1)	Ref			
Agriculture	66(59.5)	45(40.5)	1.509(.968-2.354)	1.339	.225	.835-2.148
Business	14(29.8)	33(70.2)	5.218(2.678-10.167)	3.401	.001	1.637-7.063
Service	10(26.3)	28(73.7)	6.198(2.903-13.235)	3.192	.006	1.396-7.299
Time to reach the health facility						
<30 minutes	66(45.7)	85(56.3)	2.617(1.778-3.853)	1.965	.009	1.187-3.253
≥ 30 minutes	252(67.0)	124(33.0)	Ref			
Health care seeking behaviour						
Modern method	70(40.2)	104(59.8)	3.509(2.401-5.128)	1.636	.030	1.048-2.553
Traditional	248(70.3)	105(29.7)	Ref			

I=Reference group, Significance at 95%CI, OR=Odd Ratio: CI= Confidence Interval

Table 6 presents a multivariate logistic regression analysis, revealing the factors linked to PDS awareness. The data indicates that respondents employed in the agriculture, business, and service industries had 1.33 times, 3.40 times, and 3.19 times more PDS awareness, respectively, compared to those involved in household work, which was statistically significant. Additionally, those who could reach a health facility within 30 minutes were 1.96 times more aware of PDS than those who needed to travel longer. Furthermore, the analysis shows that respondents who adopted modern healthcare-seeking behavior had 1.63 times more PDS awareness than those who relied on traditional methods.

Discussion

The study reveals that people who have completed their secondary and higher education are 2.94 times more aware of postnatal danger signs than those who have only completed their secondary education or lower ($p < 0.001$). A similar study shows that secondary or tertiary education participants are more likely to know postnatal danger signs than their counterparts. A higher education level makes a woman more likely to understand the information received, leading to better decisions (Hibstu & Siyoum, 2017).³⁴ Educated women can better understand the information provided during postnatal care, making it easier to report danger signs and manage problems on time.

According to a recent study, a mere 39.7% of postpartum women were familiar with warning signs related to postnatal complications. To earn the label of knowledgeable, a woman needed to recognize at least three of the following danger signs: severe vaginal bleeding, foul-smelling vaginal discharge, and high fever. In contrast, another study revealed that only 55.1% of postpartum women were aware of maternal danger signs Nabugwere et al., (2022).³⁵ The most commonly recognized danger signs were severe vaginal bleeding, high fever, and foul-smelling vaginal discharge, which aligns with earlier research conducted in Tanzania and Kenya (Mwilike et al., 2018; Phanice & Zachary, 2018).^{36,37}

According to research, individuals who attended at least four antenatal care appointments were 2.18 times more knowledgeable about PDS than those with fewer than 3 ANC visits. This finding is

statistically significant ($p < 0.001$) and consistent with similar studies conducted in Thailand and Ethiopia (Kaewkiattikun & Lekbornvornwong, 2019; Wassihun et al., 2020).^{38,39} Regular attendance of antenatal care appointments in Nepal is beneficial in gaining awareness about potential health risks and exchanging information with other expectant mothers during health education sessions at the clinic. According to the study, mothers with one or two children have a significantly higher awareness of PDS than those with more than two children ($p = 0.003$). However, Hailu, D., & Berhe, H. (2014) found a contradictory result, showing a significant association between knowledge of postnatal danger signs and mothers with more than two children.⁴⁰

Mothers' occupation is also linked to their knowledge of obstetric danger signs. Those employed in the service sector are 6.19 times more aware of PDS than those engaged in household work (adjusted 6.19, 95% CI: 2.90-13.23). Similarly, a study by Teshoma et al. (2020) found that government employees were 3.28 times more likely to have good knowledge of obstetric danger signs than housewives (adjusted OR=3.28, 95% CI: 1.98–5.42).⁴¹ These findings could be attributed to the fact that women with their source of income may have better decision-making power when seeking healthcare services.

Strength and limitations

In cross-sectional studies with a retrospective design, participants are often asked to remember information from memory, which can introduce recall bias and lead to potential inaccuracies in the study's findings. Moreover, our study revealed a need for more literature on factors associated with postnatal danger signs, emphasizing the importance of future research to supplement the current literature and obtain a more comprehensive understanding of the factors influencing awareness on postnatal danger signs.

Recommendations

According to the study, many mothers lack knowledge about the warning signs that may arise after giving birth. This could result in a delay in seeking medical attention. Therefore, it is crucial to implement effective strategies, such as tailored health education and information dissemination, to increase maternal awareness. This will facilitate early detection of potential health complications during pregnancy, delivery, and postpartum. Moving forward, research should incorporate mixed study designs to establish causal links and explore the factors that impact maternal recognition of danger signs.

Conclusion

According to a recent study conducted in a municipality in Chitwan, Nepal, many mothers have a limited understanding of postnatal danger signs. However, the research also revealed that attending multiple antenatal care visits, giving birth at 19 years or older, working in business or services, and residing close to a health facility correlated with a better understanding of these PDS. Therefore, providing mothers with specialized health education during pregnancy and childbirth is important. In order to increase awareness, healthcare providers and local governments should incorporate IEC materials in the mother's native language. Further qualitative studies should be conducted to understand women's comprehension of danger signs better. Additionally, conducting an interventional study to evaluate the effectiveness of various health education methods on knowledge of danger signs may be beneficial.

Funding sources

This research received no specific funding from public, commercial, or nonprofit sectors.

Conflict of Interest

The author declare that there are no conflict of interest

Author Contributions

Designed the study, created tools, collected and analyzed data, interpreted results and wrote the manuscript.

Acknowledgements

I thank all the study participants for their unwavering commitment to responding to our questionnaire. Additionally, I would like to acknowledge the invaluable contribution of Dr. Govinda Prasad Dhungana towards the study analysis. Lastly, I want to recognize the immense support the reproductive health focal persons, Tulsi Adhikari, provided during the fieldwork.

Abbreviations

PNC: Postnatal care

PDS: Postnatal Danger Signs

CI: Confidence interval

aOR: Adjusted odds ratio

SDG: Sustainable development goals

WHO: World Health Organization

IEC: Information Education and Communication

REFERENCES

1. World Health Organization. Maternal mortality. (2018). <https://www.who.int/en/news-room/fact-sheets/detail/maternal-mortality> (accessed 6 October 2022)
2. Bakar, R. R., Mmbaga, B. T., Nielsen, B. B., & Manongi, R. N. (2019). Awareness of danger signs during pregnancy and post-delivery period among women of reproductive age in Unguja Island, Zanzibar: a qualitative study. *African journal of reproductive health*, 23(1), 27-36.
3. Woldeamanuel, G. G., Lemma, G., & Zegeye, B. (2019). Knowledge of obstetric danger signs and its associated factors among pregnant women in Angolela Tera District, Northern Ethiopia. *BMC research notes*, 12(1), 1-6.
4. Davis, D. A. (2019). Obstetric racism: the racial politics of pregnancy, labor, and birthing. *Medical anthropology*, 38(7), 560-573.
5. Darmstadt, G. L., Syed, U., Patel, Z., & Kabir, N. (2006). Review of domiciliary newborn-care practices in Bangladesh. *Journal of health, population, and nutrition*, 24(4), 380.
6. Adams, Y. J., & Young, J. (2022). Perceptions of postpartum teaching and knowledge of warning signs among Black mothers. *Western Journal of Nursing Research*, 44(1), 31-41.
7. Suvedi BK, Pradhan A, Barnett S, Puri M, Chitrakar SR (2008/2009). Maternal mortality and morbidity study 2008/2009: summary of preliminary findings. Kathmandu: Government of Nepal.

8. Bogale, D., & Markos, D. (2015). Knowledge of obstetric danger signs among child bearing age women in Goba district, Ethiopia: a cross-sectional study. *BMC pregnancy and childbirth*, 15(1), 1-8.
9. Bhandari, T. R., & Dangal, G. (2012). Maternal Mortality: Paradigm Shift in Nepal. *Nepal Journal of Obstetrics & Gynaecology*, 7(2).
10. Rana, A., Pradhan, N., Manandhar, B., Bitsta, K. D., Adhikari, S., Gurung, G., & Amatya, A. (2009). Maternal mortality over the last decade: A changing pattern of death due to alarming rise in hepatitis in the latter five-year period. *Journal of Obstetrics and Gynaecology Research*, 35(2), 243-251.
11. Hoque, M., & Hoque, M. E. (2011). Knowledge of danger signs for major obstetric complications among pregnant KwaZulu-Natal women: implications for health education. *Asia Pacific Journal of Public Health*, 23(6), 946-956.
12. Ay, P., Hayran, O., Topuzoglu, A., Hidiroglu, S., Coskun, A., Save, D., ... & Eker, L. (2009). The influence of gender roles on health seeking behaviour during pregnancy in Turkey. *The European Journal of Contraception & Reproductive Health Care*, 14(4), 290-300.
13. Teshoma Regasa, M., Markos, J., Habte, A., & Upashe, S. P. (2020). Obstetric Danger Signs: Knowledge, Attitude, Health-Seeking Action, and Associated Factors among Postnatal Mothers in Nekemte Town, Oromia Region, Western Ethiopia—A Community-Based Cross-Sectional Study. *Obstetrics and Gynecology International*, 2020, 1-8.
14. Petersen, E. E., Davis, N. L., Goodman, D., Cox, S., Mayes, N., Johnston, E., ... & Barfield, W. (2019). Vital signs: pregnancy-related deaths, United States, 2011–2015, and strategies for prevention, 13 states, 2013–2017. *Morbidity and Mortality Weekly Report*, 68(18), 423.
15. Killion, M. M. (2020). Empowering women to recognize maternal warning signs. *MCN: The American Journal of Maternal/Child Nursing*, 45(6), 372.
16. J. I. Venn (2013). "HIV status of infants attending (well baby) immunization clinics in Calabar, Cross River State, Nigeria," *International Journal of Child Health and Nutrition*, vol. 5.
17. Bhutta, Z. A., Das, J. K., Bahl, R., Lawn, J. E., Salam, R. A., Paul, V. K., ... & Walker, N. (2014). Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost?. *The Lancet*, 384(9940), 347-370.
18. Mahara, G., Barr, J., Thomas, J., Wang, W., & Guo, X. (2016). Maternal health and its affecting factors in Nepal. *Family Medicine and Community Health*, 4(3), 30-34.
19. Nambala, B. S., & Ngoma, C. (2013). Knowledge and perception of women towards danger signs in pregnancy in Choma Rural District, Zambia. *Medical Journal of Zambia*, 40(2), 43-47.
20. World Health Organization. (2015). *Trends in maternal mortality: 1990-2015: estimates from WHO, UNICEF, UNFPA, world bank group and the United Nations population division*. World Health Organization.
21. Solar, O., & Irwin, A. (2010). *A conceptual framework for action on the social determinants of health*. WHO Document Production Services.
22. World Health Organization. (2014). *WHO recommendations on postnatal care of the mother and newborn*. World Health Organization.
23. Damayanti, N. A., Wulandari, R. D., & Ridlo, I. A. (2023). Maternal Health Care Utilization Behavior, Local Wisdom, and Associated Factors Among Women in Urban and Rural Areas, Indonesia. *International Journal of Women's Health*, 665-677.

24. World Health Organization. "Factsheet/maternal health topic."2018. Retrieved June 18, 2018 (www.who.int/topics/maternal_health/en/)
25. Belay, H. G., & Limenih, M. A. (2020). Intents of women on obstetric danger signs and its associated factors in Farta Woreda, Ethiopia, 2017. *Journal of Health Care for the Poor and Underserved, 31*(1), 140-152.
26. Alemayehu, M., Gebrehiwot, T. G., Medhanyie, A. A., Desta, A., Alemu, T., Abrha, A., & Godefy, H. (2020). Utilization and factors associated with antenatal, delivery and postnatal Care Services in Tigray Region, Ethiopia: a community-based cross-sectional study. *BMC Pregnancy and Childbirth, 20*(1), 1-13.
27. Tjandraprawira, K. D., & Ghozali, I. (2019). Knowledge of pregnancy and its danger signs not improved by maternal and child health handbook. *The Journal of Obstetrics and Gynecology of India, 69*, 218-224.
28. Āyoga, N. R. Y. Sustainable development goals 2016-2030: national (preliminary) report. (No Title).
29. MoHP, NSO. National Population and Housing Census 2021: Nepal Maternal Mortality Study 2021. Kathmandu: Ministry of Health and Population; National Statistics Office;2022
30. Chitwan District Profile (2019). Retrieve from: <https://nepalmap.org/profiles/district-12-chitwan/> on 2077-10-11 at 2pm
31. Kabakyenga, J. K., Östergren, P. O., Turyakira, E., & Pettersson, K. O. (2011). Knowledge of obstetric danger signs and birth preparedness practices among women in rural Uganda. *Reproductive health, 8*, 1-10.
32. Mwilike, B., Nalwadda, G., Kagawa, M., Malima, K., Mselle, L., & Horiuchi, S. (2018). Knowledge of danger signs during pregnancy and subsequent healthcare seeking actions among women in Urban Tanzania: a cross-sectional study. *BMC pregnancy and childbirth, 18*, 1-8.
33. Salem, A., Lacour, O., Scaringella, S., Herinianasolo, J., Benski, A. C., Stancanelli, G., ... & Schmidt, N. C. (2018). Cross-sectional survey of knowledge of obstetric danger signs among women in rural Madagascar. *BMC pregnancy and childbirth, 18*(1), 1-9.
34. Hibstu, D. T., & Siyoum, Y. D. (2017). Knowledge of obstetric danger signs and associated factors among pregnant women attending antenatal care at health facilities of Yirgacheffe town, Gedeo zone, Southern Ethiopia. *Archives of Public Health, 75*(1), 1-9.
35. Nabugwere, R. S., Mbalinda, S. N., & Ayebare, E. (2022). Knowledge of postnatal danger signs and associated factors among first-time mothers at Tororo General Hospital, Uganda. *African Journal of Midwifery and Women's Health, 16*(4), 1-9.
36. Mwilike, B., Nalwadda, G., Kagawa, M., Malima, K., Mselle, L., & Horiuchi, S. (2018). Knowledge of danger signs during pregnancy and subsequent healthcare seeking actions among women in Urban Tanzania: a cross-sectional study. *BMC pregnancy and childbirth, 18*, 1-8.
37. Phanice, O. K., & Zachary, M. O. (2018). Knowledge of obstetric danger signs among pregnant women attending antenatal care clinic at health facilities within Bureti Sub-County of Kericho County, Kenya. *Research in Obstetrics and Gynecology, 6*(1), 16-21.
38. Kaewkiattikun, K., & Lekbornvornwong, T. (2019). Awareness of obstetric danger signs and associated factors among pregnant women attending antenatal care at the Faculty of Medicine Vajira Hospital. *Vajira Medical Journal: Journal of Urban Medicine, 63*(2), 75-84.

39. Wassihun, B., Negese, B., Bedada, H., Bekele, S., Bante, A., Yeheyis, T., ... & Hussen, E. (2020). Knowledge of obstetric danger signs and associated factors: a study among mothers in Shashamane town, Oromia region, Ethiopia. *Reproductive Health, 17*, 1-8.
40. Hailu, D., & Berhe, H. (2014). Knowledge about obstetric danger signs and associated factors among mothers in Tsegedie district, Tigray region, Ethiopia 2013: community based cross-sectional study. *Plos one, 9*(2), e83459.
41. Teshoma Regasa, M., Markos, J., Habte, A., & Upashe, S. P. (2020). Obstetric Danger Signs: Knowledge, Attitude, Health-Seeking Action, and Associated Factors among Postnatal Mothers in Nekemte Town, Oromia Region, Western Ethiopia—A Community-Based Cross-Sectional Study. *Obstetrics and Gynecology International, 2020*, 1-8.