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Knowledge of Neonatal Danger Signs among Postnatal Mothers at Women and New born Hospital - University Teaching Hospitals in Lusaka Zambia.

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Abstract

Purpose: The awareness and identification of neonatal danger signs by mothers play a significant role in a neonate's survival and future health. The survival of neonates is thought to be increased by providing a clear understanding of neonatal danger signs. This study aimed to assess postnatal mothers' knowledge of neonatal danger signs and associated factors.

Methodology: A cross-sectional analytical study design was used to conduct a study at Women and Newborn Hospital UTH in Lusaka Zambia with a total number of 150 participants. Participants recruited in the study included all mothers aged 18 and above seeking care at UTH from day six today twenty-eight after delivery. Data was collected using the validated Neonatal Danger Signs Knowledge and Practices Questionnaire (NDSKQ) tool and SPSS version 26 was used to analyse data. A Binary logistic regression analysis was done to identify factors associated with Neonatal danger signs.

Findings: Slightly above half (53%) of the respondents had poor knowledge on neonatal danger signs. Age, marital status, educational level, parity, antenatal care attendance and family support system were associated with knowledge on neonatal danger signs with all p values of less than or equal to 0.05. Younger mothers (18-20 years) (56.5%) were more likely to have poor knowledge compared to older mothers. Married mothers (68%) and those who were divorced or widowed (60%) were more likely to have better knowledge compared to single mothers, mothers with tertiary education (60%) had better knowledge compared to those with none/primary education (58%), mothers with more children (66.7%) were less likely to have poor knowledge compared to those with their first child (50%), mothers who attended antenatal care six times or more (67.1%) had better knowledge compared to those who attended five times or less (53.8%) and mothers with a family support system (75%) were more likely to have good knowledge compared to those without (53%) all the associations were statistically significant.

Unique contribution to theory, policy and practice: There is need to focus on training in maternal identification of neonatal danger signs. Personalised education for mothers, considering age and education level, and integrating family involvement and cultural competence into care delivery are crucial. Nursing education should advance through specialized curricula, utilizing advanced simulation training and interdisciplinary collaboration to enhance clinical skills in identification of neonatal danger signs and promote maternal awareness of neonatal dangers signs, ultimately improving neonatal health.

Keywords: *Knowledge, Neonatal Danger Signs and Mothers*

Introduction

Neonatal mortality is still a concern around the world, with 75% of deaths occurring within the first seven days after birth (Chimdessa et al., 2020. It accounts for 40% of all infant deaths. Globally, 99% of neonatal deaths occur in low and middle-income countries (Ekwochi et al., 2015). The awareness and identification of neonatal danger signs by mothers play a significant role in a neonate's survival and future health. The survival of neonates is thought to be increased by providing a clear understanding of neonatal danger signs (Chimdessa et al., 2020).

Educating mothers about neonatal danger signs during the antenatal and postnatal phase is crucial. Mothers must be able to recognize neonatal dangers and know when to seek medical help. Early warning of neonatal danger signs, as well as timely and effective health care services, are essential to lowering neonatal mortality rates. To promote early health care seeking actions, families should be told about assessment methods (Nigatu et al., 2015).

The families' health-seeking behaviour is adversely affected by their lack of awareness of neonatal danger signs. The lack of awareness of mothers and primary health providers, along with weak cultural attitudes about obtaining medical assistance, are contributing factors in severe neonatal morbidity and mortality (Abdulrida, et al., 2018; Thakur et al., 2017). Further, the quality of health-care facilities and the practice of counselling neonatal danger signs are significant determinants of neonatal mortality and morbidity. Studies have shown that most neonatal deaths occur at home, suggesting that families are unaware of neonatal danger signs, resulting in inadequate health-care seeking behaviour (Nigatu et al., 2015).

Every year, about four million babies die in their first four weeks of life around the world. Even though the neonatal duration is just 28 days long, it accounts for nearly 40% of all deaths in children under the age of five (Bulto, 2019). The countries with the highest numbers of neonatal deaths are in South-Central Asia, while Sub-Saharan Africa has the highest rates. Sub-Saharan Africa reported a neonatal mortality rate of 28 deaths per 1000 live births in 2018 (Masaba and Mmusi, 2020). The majority of newborn deaths occur at home, where only a few families know signs and symptoms of newborn disease, and almost all neonates are not taken to hospitals when they are sick (Demis et al., 2020). According to the World Health Organization (WHO), neonatal danger signs include failure to feed or cessation of feeding, seizures, rapid breathing (two counts of 60 breaths or more in one minute), chest in drawing, elevated temperatures (37.5°C or more), extremely low temperature (35.4°C or less), yellow heels, movements only when stimulated or no movement at all, and symptoms of local infection such as umbilical redness or pus drainage (Yosef et al., 2020).

The presence of clinical signs that suggest a high risk of newborn morbidity and mortality, as well as the necessity for early treatment intervention, is referred to as neonatal danger signs. Fever is defined as an increase in body temperature above the typical daily range. It is one of the most well-known disease symptoms, and it is the most common reason for children to seek medical help and visit doctors. Convulsions, a neonatal risk indication, occur when the brain experiences sudden, aberrant electrical activity. Lethargy and poor sucking are critical and sensitive indications of

newborn disease, especially in an infant who was previously feeding well. A rapid respiration rate (more than 60 per minute for at least one minute) and chest retractions suggest a serious condition. Vomiting and jaundice are other serious warning signs that demand immediate medical attention (Anmut et al., 2017; Bulto, 2019).

The early identification of neonatal sickness is critical for improving infant survival rates. A mother or caregiver is the person closest to a neonate who can identify, present, and handle the neonate's problem, ensuring that the neonate can live a healthy life. It is possible to prevent neonatal mortality if mothers are knowledgeable on the manifestations of the causes of death in newborn because mothers' health-seeking attitude is strongly dependent on their perception of neonatal danger signs (Yosef et al., 2020). Previously conducted research on mothers' knowledge of neonatal danger signs by Mersha in 2017 in Ethiopia found that 11.67 percent of mothers in Woldiya, 18.2 percent in Gondar, 20.3 percent in Ambo, 32.9 percent in Harar, 40.9 percent in Arba, Minch and 50.3 percent in Haramaya. About 15.5 percent was reported in Kenya, 28.1 percent in Ghana, and 48.18 percent in Nepal had knowledge of neonatal danger signs (Thakur et al., 2017). Furthermore, studies have shown that maternal age, education level, occupational status, place of residence, background and frequency of antenatal care (ANC) visits, history of postnatal care (PNC) visits, parity, and place of delivery are factors that have been shown to affect mothers' level of awareness regarding neonatal danger signs (Degefa et al., 2019).

Zambia has not been unique in its contribution to the high rates of neonatal mortality in Sub-Saharan Africa and throughout the world. Neonatal mortality is currently at 27 deaths per 1000 live births (Zambia Statistics Agency, 2019). In 2020, there were 9754 perinatal deaths, with 4728 of them occurring within 7 days of life and 5026 being still births (MOH, 2020). Reducing neonatal mortality is among the health-related indicators of sustainable development goal number three (SDG 3) to be achieved by 2030. The SDG 3 projection is to ensure healthy lives and promote well-being for all at all ages. It is targeted at ending preventable deaths of newborn with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births by 2030. In the same way, the Zambian Ministry of Health has outlined the ten legacy goals in the health strategic plan 2022-2026, with the first goal aimed at lowering maternal neonatal and child mortality. Neonatal mortality rate is projected to be reduced from 27/1000 live births in 2018 to 12/1000 live births by 2026. (MOH, 2022).

According to clinical records from the Lusaka Women and Newborn hospital – University Teaching Hospital (WNH - UTH) (2021), 33 neonates were brought in dead in the year 2020. The causes of death included sepsis, jaundice and aspiration. The Zambian families have continued to lose neonates owing to inadequate awareness of neonatal danger signs. Little was known regarding mothers' levels of knowledge of neonatal danger signs and associated factors in the Zambian context therefore this study aimed to fill in the knowledge gap.

Neonatal mortality rates in Zambia remain alarmingly high, despite the various interventions implemented by the Zambian Government through the Ministry of Health (Zambia Statistics Agency, 2019). The current rate of neonatal mortality stands at 27 deaths per 1000 live births,

reflecting a critical issue that needs to be addressed urgently. According to the records obtained from the Women's and Newborn Hospital - University Teaching Hospitals in Lusaka (2021), a distressing number of neonates have been brought in dead in recent years. In the last quarter of 2019, eight (8) neonates were reported as brought in dead, followed by 33 in 2020, 21 in 2021, and 24 in 2022. The primary causes of these tragic deaths were identified as sepsis, jaundice, and aspiration.

The presence of these alarming figures and the specific causes of death underscore a significant knowledge gap among postnatal mothers regarding neonatal danger signs. Sepsis, jaundice, and aspiration are conditions that could be recognized and potentially treated if mothers possess adequate knowledge of the associated signs and symptoms. In such cases, prompt medical attention can be sought, potentially preventing neonatal deaths. However, the increasing trend of neonates being brought in dead suggests that mothers' awareness of these danger signs is inadequate. Therefore, this study aimed to assess the level of knowledge on neonatal danger signs among postnatal mothers at Women's and Newborn Hospital - University Teaching Hospitals. Additionally, it sought to identify the factors associated with the existing knowledge gap.

By gaining a deeper understanding of the mothers Knowledge on neonatal danger signs, WNBH-UTH can develop targeted interventions and supportive services to improve the knowledge levels. Based on the available published literature, no study had been conducted on knowledge of neonatal danger signs at WNBH-UTH and Zambia at large. The current study has provided valuable insights into the Knowledge levels of neonatal danger sings and the associated factors. Additionally, the study has laid the groundwork for future research on the Knowledge of neonatal danger signs among Postnatal Mothers at WNBH – UTH in Lusaka Zambia.

Methodology

The study employed a cross-sectional analytical study design to investigate the current state of knowledge regarding neonatal danger signs and the factors associated with it among mothers of neonates in the Women and Newborn Hospital - University Teaching Hospitals in Lusaka, Zambia. This design was selected because it offers several advantages, such as providing a snapshot of the population's characteristics, allowing for the examination of relationships between variables, being efficient in terms of time, and facilitating the collection of data from a large and diverse group of participants on various aspects of the study.

The study was conducted at the Women and Newborn Hospital - University Teaching Hospitals in Lusaka, Zambia. This hospital was chosen as the study site because it is one of the largest teaching hospitals in the country, making it a suitable location to gather comprehensive data. The choice of this hospital allowed the research to provide valuable insights into the actual state of knowledge regarding neonatal danger signs and the associated factors among postnatal mothers in the region. Moreover, the hospital was likely to provide a diverse group of participants included in the study. This further contributed to the study's ability to collect representative data and draw meaningful conclusions about the research objectives.

The research population for this study included all post-natal women who were present at the Women and Newborn Hospital - University Teaching Hospitals (UTH) in Lusaka, Zambia. This population encompasses all women who had recently given birth and were seeking care at the hospital during the study period. It includes a diverse group of individuals with varying demographic characteristics, experiences, and backgrounds, making it relevant to the research objectives and the study's focus on assessing knowledge of neonatal danger signs and associated factors among postnatal mothers in that hospital setting.

The sample size comprised of 150 respondents who were postnatal mothers accessing day six postnatal services at the women and newborn hospital UTH. In this study, a Simple Random Sampling was used. Numbers were assigned to each potential respondent in the population and used a random number generator to select the respondents. This method ensured equal representation and minimizes bias, but it may not guarantee a representative sample in terms of specific characteristics or subgroups. All postnatal mothers who accessed day six postnatal services at Women and Newborn Hospital-UTH and provided their consent were included in this study. The participants comprised individuals aged 18 years and older. The decision to include participants aged 18 years and above was driven by legal and ethical considerations. In Zambia, the legal age of adulthood is set at 18 years. Individuals below this age are classified as minors, necessitating additional ethical and legal precautions for their involvement in research. By excluding minors from the study, we ensured compliance with prevailing legal and ethical standards, thereby sidestepping potential complications related to consent and safeguarding during the research. Mothers who were critically ill were excluded from the study. Additionally, mothers with infants who were severely ill were not included. Furthermore, any mothers displaying signs of mental illness, such as frequent crying spells, heightened feelings of vulnerability, irritability, loneliness, and weariness, were also excluded from the study. This precaution was taken to ensure that the data collected accurately represented the reality on the ground, as individuals with severe illness or mental health issues may not provide a true reflection of the situation.

The Neonatal Danger Signs Knowledge and Practices Questionnaire (NDSKQ) was selected for use in this study. This questionnaire, originally developed and validated in India, assesses mothers' knowledge and practices regarding neonatal danger signs. It consists of 17 items and has demonstrated good reliability and validity. The tool's Cronbach's alpha, a measure of internal consistency and reliability, was reported to be 0.77, indicating its reliability. To employ the adapted Neonatal Danger Signs Knowledge and Practices Questionnaire (NDSKQ), the researcher administered it to a sample of 150 post-natal mothers. The questionnaire comprises 17 items that gauge knowledge and practices related to neonatal danger signs. Participants were asked to respond to True or False statements concerning neonatal danger signs, and their responses were scored based on a validated scoring system in accordance with authoritative tool guidelines. The collected data provided insights into mothers' knowledge and practices regarding neonatal danger signs, which were analyzed to assess the level of awareness and identify associated factors. The scoring system for measuring knowledge, which relies on participants' responses to True or False

statements about neonatal danger signs, was validated by the developers of the NDSKQ in Ethiopia. Furthermore, this scoring system aligns with authoritative medical guidelines on knowledge in this context.

The analysis of the Knowledge of neonatal danger signs and associated factors among postnatal mother's scores was conducted using SPSS version 26. Initially, raw data underwent manual coding, and a rigorous cleaning process was implemented to rectify errors and ensure data accuracy. Subsequently, essential participant information, including identity codes, age, level of education, occupational status, and marital status, was meticulously entered into a Microsoft Excel spreadsheet. The dataset was then exported to SPSS version 26, where descriptive statistics were computed for all measurements. The analysis adhered to a significance level of 5% and a confidence level of 95%, with responses and outcomes transformed into binary variables to facilitate the calculation of frequencies and percentages. Data presentation employed frequency tables, cross-tabulation tables, and graphical representations. Statistical tests included Fisher's exact test to examine associations between categorical variables, and both univariate and multivariate logistic regression analyses were performed, given the categorical nature of the variables, to identify associations among postnatal mothers.

The reliability of this study was ensured by use of validated tool Neonatal Danger Signs Knowledge and Practices Questionnaire (NDSKQ), this tool has the Cronbach's alpha that ranges between 0.77 and 0.86. The reliability was also ensured by making sure that the researcher is the only one to administer the questionnaire and physical interviews. The same interview schedule and method of collecting data was used on the entire mothers with babies of less than twenty eighty days during the study to ensure external reliability. Face validity was measured by consulting expert opinion on whether the instrument will effectively measure Knowledge of neonatal danger signs and associated factors among mothers of sick neonates as intended. Questionnaires had a variety of questions on Knowledge of neonatal danger signs and associated factors among postnatal mothers. The questions were as simple as possible with clear instructions given to respondents for clarity and ease of understanding.

The collection of data was done at the women and newborn hospital- UTH the biggest teaching hospital in Zambia through structured interviewer administered questionnaire. Permission was obtained from the hospital management. The researcher commenced by giving a self-introduction after which the purpose of the interaction was elaborated. After assurance of confidentiality was emphasized, written consent was obtained. Those who were unable to sign were asked to make a thumbprint. During the interview process, the researcher read out the questions in the questionnaire and clarified for those who had difficulties understanding the questions. At the end of each interview, the researcher thanked each participant. The interview was taking 25 to 30 minutes with each respondent.

Data were collected on 150 postnatal mothers who were seeking care on day six after delivery at the time of the study. After data collection, interview schedules were sorted, responses verified, coded and entered on excel spreadsheet. Data was then exported to SPSS version 26.0 for analysis.

Frequencies and proportions were used to summarise all the variables, as they were all categorical. The Fisher's exact test was used test for differences in the distribution of Knowledge levels across different categorical variables. The level of Knowledge on neonatal danger signs was determined using the individual scores on the seventeen items of the Neonatal Danger Signs Knowledge and Practices Questionnaire (NDSKQ) tool. Based on the scores obtained, the Knowledge was then arbitrarily dichotomised into Knowledgeable (scores ≥50 %) or not Knowledgeable (scores ≤ 50%) for each participant. To identify the associated factors of neonatal danger signs among post-natal mothers, binary logistic regression (univariable and multivariable) analysis was used. Due to limited independent variables, the modelling process adopted all the independent variables regardless of their significance. Statistical significance cut-off was set at 5%, thus only p-values of or less than 0.05 indicated statistical significance.

Ethical clearance was obtained from the University of Zambia Biomedical Research Ethical Committee (UNZABREC) clearance number REF.NO. 3976-2023 and permission from National Health Research Authority of Zambia (NHRA) was sought (REF NO. NHRAR-R-188/28/02/2023) before collecting data for the study. Written permission was sought from the Senior Medical Superintendent of Women's and Newborn Hospital UTH for the collection of data from the hospital. All respondents were provided with an information sheet explaining the objective of the study and the expected benefits, thereafter informed written consent was obtained from the respondents before the interview, and respondents were informed about their right to withdraw from the study without fearing any penalties.

All structured questionnaires were identified by serial numbers to maintain the anonymity of respondents, and that was carefully secured. Only the principal researcher had access to the questionnaires and the data.

Results

Table 1. Demographic Characteristics of Participants (N = 150)

Demographic characteristics	Frequency (n)	Percentage (%)
Age of the mother		
I8 - 20 years	23	15.3
21 – 30 years	65	43.3
31 -40 years	56	37.3
Above 40 years	6	4.0
Employment status		
Employed	61	40.7
Unemployed	89	59.3
Marital status		
Single	72	48.0
Married	63	42.0
Divorced/Widow	15	10.0
Level of education		
None/ Primary	29	19.3
Secondary	76	50.7
Tertiary	45	30.0

Table 1 above presents the distribution of age, employment status, marital status, and level of education of the participants. The results show that close to half of participants were in the age group of 21-30 years old (43.3%), followed by 31-40 years old (37.3%). A smaller percentage were in the age group of 18-20 years (15.3%), and very few were above 40 years old (4.0%). In terms of employment status, more than half (59.3%) were unemployed and less than half (40.7%) were employed. Regarding marital status, close to half (48.0%) participants were single, 42.0% were married and 10% were divorced/widowed. Lastly, level of education, there was a fairly even

distribution. Approximately 19.3% had none or primary education, 50.7% had secondary education, and 30.0% had tertiary education.

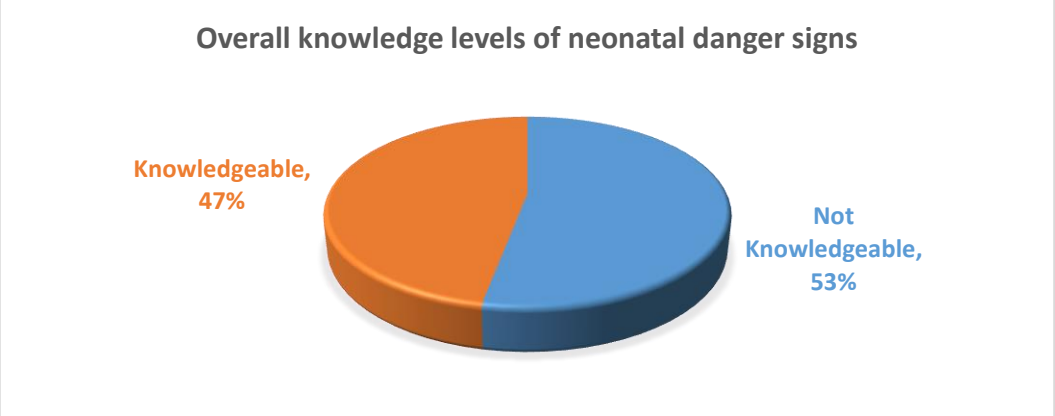
Knowledge on neonatal danger signs

Table 2: Mother awareness of specific neonatal danger signs (n=150)

Neonatal danger sign	Categories	Frequency	Percentage
Persistent vomiting	Yes	69	46
	No	81	54
Fever	Yes	64	42.7
	No	86	57.3
Difficulty in breathing	Yes	76	50.7
	No	74	49.3
Hypothermia	Yes	54	36
	No	96	64
Poor feeding	Yes	69	46
	No	81	54
Convulsions	Yes	79	52.7
	No	71	47.3
Lethargic	Yes	61	40.7
	No	89	59.3
Yellow discoloration of skin	Yes	67	44.7
	No	83	55.3
Bulging fontanelle	Yes	74	49.3
	No	76	50.7
Stiff body or Stiff neck	Yes	77	51.3
	No	73	48.7
Swollen or Red Umbilical Cord Stump	Yes	66	44
	No	84	56

According to table 2 above, a significant proportion of mothers demonstrated awareness of danger signs such as difficulty in breathing (50.7%), neck or body stiffness (51.3%), and convulsions (52.7%). However, certain danger signs, such as hypothermia (36%) and swollen or red umbilical cord stump (44%), revealed comparatively lower awareness levels.

Figure 1: Overall Knowledge levels of Neonatal Danger signs



The pie chart above illustrates that more than half (53%) of the participants had reported poor knowledge on neonatal danger signs, with only less than half (47%) having good knowledge on neonatal danger signs.

Factors associated with mothers' knowledge of neonatal danger signs

Table 3: Association between Knowledge of neonatal danger signs and Demographic characteristics (n=150).

Characteristic	Overall, n (%)	Not Knowledgeable, n (%)	Knowledgeable, n (%)f	P-value
Age				
I8 - 20 years	23 (15.3)	13 (56.5)	10 (43.5)	**0.030** [FE]
21 – 30 years	65 (43.3)	32 (49.2)	33 (50.8)	
31 -40 years	56 (37.3)	27 (48.2)	29 (51.8)	
Above 40 years	6 (4.0)	1 (16.7)	5 (83.3)	
Marital status				
Single	72 (48.0)	36 (50.0)	36 (50.0)	**0.051**[FE]
Married	63 (42.0)	20 (31.7)	43 (68.3)	
Divorced/Widow	15 (10.0)	6 (40.0)	9 (60.0)	
Employment status				
Employed	61 (40.7)	28 (45.9)	33 (54.1)	0.2221[FE]
Unemployed	89 (59.3)	34 (38.2)	55 (61.8)	
Level of education				
None/ Primary	29 (19.3)	12 (41.4)	17 (58.6)	**0.021**[FE]
Secondary	76 (50.7)	32 (42.1)	44 (57.9)	
Tertiary	45 (30.0)	18 (40.0)	27 (60.0)	
Parity				
First child	48 (32.0)	24 (50.0)	24 (50.0)	**0.022**[FE]
Second child	42 (28.0)	18 (42.9)	24 (57.1)	
Third Child	30 (20.0)	11 (36.7)	19 (63.3)	
Fourth and above	30 (20.0)	10 (33.3)	20 (66.7)	
Socio Economic status				
Low (K5000 and below)	115 (76.7)	44 (38.3)	71 (61.7)	0.201[FE]
Middle (K5100- 9000)	25 (16.7)	10 (40.0)	15 (60.0)	
High (above K9000)	10 (6.6)	4 (40.0)	6 (60.0)	
Antenatal care attendance				
Seven times or less	65 (43.3)	30 (46.2)	35 (53.8)	0.031[FE]
eight times or above	85 (56.7)	28 (32.9)	57 (67.1)	
Family support system				
Yes	124 (82.7)	31 (25.0)	93 (75.0)	0.041[FE]
No	26 (17.3)	12 (46.2)	14 (53.8)	

FE= Fisher's exact test

The table 3 above presents the results of the relationship between demographic characteristics, parity, socio-economic status, antenatal care attendance, family support system, and the knowledge

of neonatal danger signs among the 150 participants in the study. The p-values for Age, Marital status, Level of education, Antenatal care visits, and Family support system indicate statistically significant associations with knowledge of neonatal danger signs, all with p-values less than or equal to 0.05.

Results showed that a lower age is associated with a lower likelihood of reporting good knowledge of neonatal danger signs. For example, 56.5% of individuals aged 18-20 years reported poor knowledge of neonatal danger signs. Furthermore, a slightly higher percentage of married and divorced/ widowed women were knowledgeable about neonatal danger signs compared to single individuals.

However, when it comes to employment status and socio-economic status, the results showed no significant association with knowledge of neonatal danger signs, as evidenced by p-values greater than 0.05. This suggests that employment status and socio-economic status do not appear to have a statistically significant impact on the participants' knowledge of neonatal danger signs.

Table 4 Binary logistic regression analysis of factors associated with Neonatal danger signs

Simple and multiple binary logistic regression analysis of factors associated with Neonatal danger signs (n=150)

	Univariate estimates			Multivariable estimates		
Variable	**cOR**	**95% CI**	**P-value**	**aOR**	**95% CI**	**P-value**
Age						
I8 - 20 years	**Ref**			**Ref**		
21 – 30 years	0.07	0.01, 0.42	0.003	0.12	0.02, 1.09	0.063
31 -40 years	0.19	0.04, 0.86	0.031	0.15	0.02, 1.26	0.077
Above 40 years	0.88	0.17, 4.54	0.877	0.61	0.09, 4.36	0.612
Employment status						
Employed	**Ref**			**Ref**		
Unemployed	0.47	0.08, 2.93	0.406	0.37	0.05, 2.86	0.347
Marital status						
Single	**Ref**			**Ref**		
Married	0.35	0.08, 0.55	0.039	0.32	0.06, 1.74	0.183
Divorced/ widow	0.30	0.03, 1.42	0.044	0.21	0.01, 2.95	0.101
Education level						
Tertiary	**Ref**			**Ref**		
None/Primary	0.33	0.03, 3.26	0.028	0.27	0.02, 2.91	0.039
Secondary	0.41	0.09, 1.90	0.073	0.38	0.07, 2.02	0.259
Parity						
First child	**Ref**			**Ref**		
Second child	0.42	0.18, 0.97	0.043	0.41	0.16, 1.08	0.052
Third Child	0.22	0.07, 0.71	0.069	0.18	0.04, 0.86	0.072
Fourth child or more	0.19	0.02, 2.11	0.164	0.11	0.02, 2.41	0.089
Socio economic status						
Low (K5000 and below)	**Ref**			**Ref**		
Middle (K5100- 9000)	0.39	0.26, 0.89	0.223	0.38	0.15, 0.98	0.345
High (above K9000)	0.20	0.05, 0.75	0.303	0.18	0.03, 0.91	0.463
Antenatal care attendance						
Seven time or less	**Ref**			**Ref**		
Eight times or above	0.65	0.23, 1.83	0.045	0.71	0.23, 2.17	0.052
Family support system						
Yes	**Ref**			**Ref**		
No	0.42	0.08, 0.92	0.042	0.46	0.05, 1.11	0.056

cOR *= Crude Odds Ratio,* ***aOR*** *= Adjusted Odds Ratio,* ***CI*** *= Confidence interval*

Table 4 above shows the results of the binary logistic regression analysis at both univariate and multivariable levels. This analysis outlines the potential associations between various factors - age, employment status, marital status, education level, parity, socio-economic status, antenatal care attendance, and family support system - and the knowledge of neonatal danger signs among the 150 participants in the study.

The findings indicate that several factors are associated with knowledge of neonatal danger signs, as evidenced by p-values less than or equal to 0.05. Age, the univariate analysis revealed that age is significantly associated with knowledge of neonatal danger signs. Specifically, individuals aged 18-20 or 21-30 years had lower odds of having good knowledge compared to individuals aged 31 years and above who had higher odds of good knowledge. Employment status did not show significant associations with knowledge of neonatal danger signs in both univariate and multivariable analyses. Regarding Marital Status, the, analysis found that married individuals had higher odds of good knowledge compared to single individuals, although this association was significant only in the univariate analysis. Education level played a significant role in knowledge of neonatal danger signs. Participants with none/primary education had lower odds of good knowledge compared to those with tertiary education, which remained significant in the multivariable analysis. Parity also showed significant associations in the univariate analysis, first time mothers had lower odds of good knowledge compared to those with two children's or above. Socio-economic status did not show significant associations with knowledge of neonatal danger signs in both univariate and multivariable analyses. Antenatal care attendance was significantly associated with knowledge of neonatal danger signs. Participants who attended antenatal care eight times or more had higher odds of good knowledge compared to those who attended fewer times. This association remained significant in both the univariate and multivariable analyses. The presence of a family support system was significantly associated with good knowledge of neonatal danger signs, as participants with family support had higher odds of good knowledge compared to those without support. This association remained significant in both univariate and multivariable analyses.

Discussions of findings

The study aimed to investigate knowledge of neonatal danger signs among postnatal mothers at Women's and Newborn Hospital in Lusaka, Zambia, and to identify associated factors. The findings show that majority of the respondents were in the age group 21 to 30 years (43.3%), (see table 2). Several studies have reported similar findings regarding the age distribution of respondents in similar studies, for example a study conducted in Ghana by Kyei et al., (2019) found that majority of the respondents were in the age range of 21-31 years. Similarly, Akoume et al., (2020) in Gabon also found the exact findings as this study's findings in which majority were in the age range of 21-30 years of age. Li et al., (2020) in China reported age range of 23 to 29 years. The consistent findings regarding the age distribution of respondents could be attributed to several potential explanations, this age group is often associated with parenthood or immediate concerns about family planning and child-rearing. Consequently, they may be more inclined to participate in studies related to neonatal health and demonstrate a greater interest in acquiring knowledge in this area. The age distribution in these studies could also reflect the demographic composition of the regions where the studies were conducted.

Regarding employment status, majority of the respondents were unemployed, accounting for 59.3% of the respondents. Meanwhile, 40.7% of the respondents were employed. This is in line

with the finding of Adebayo et al., 2018 in Nigeria who reported similar findings. On contrast, studies conducted in Egypt by Abdula et al., (2019) and Brazil by João., et al (2021) found that majority of the respondents in their studies were employed with only a small percentage being unemployed. The discrepancies in employment status findings between the current study and that of others could be influenced by the economic context of each country or region. Economic conditions, job availability, and unemployment rates can vary significantly between countries and regions. Zambia and Nigeria may have a slightly higher unemployment rates compared to Egypt and Brazil during the respective study periods, which would explain the higher proportion of unemployed participants in the current study and Adebayo et al.'s study.

The study found that nearly half (48%) of the respondents were single. This is supported by Mwale et al.'s study (2020) conducted among postnatal mothers in Malawi where it was found that majority of the respondents in their study were single. This suggests that being single may have some negative effects on the knowledge of neonatal danger signs among mothers, as compared to being married. Additionally, Kasule, (2018) in Uganda and Ijioma et al in Nigeria also found that the majority of their respondents were single, 61% and 63% respectively. The finding that a significant proportion of participants in multiple studies were single, especially among first-time mothers, could be influenced by several interconnected factors such as Age of Participants. First-time mothers, particularly in their late teens and twenties, are more likely to be single. This age group is often still in the early stages of building long-term relationships or may not have entered into marriage or long-term partnerships yet. Thus, it is common for young, first-time mothers to be single.

Being married may have some positive effects on the knowledge of neonatal danger signs, as their partners could also have knowledge on the danger signs and could provide support for caring of the babies. However, it is important to note that being single or divorced does not necessarily mean that one has a good knowledge of neonatal dangers signs, as this can be influenced by other factors such as level of education, access to information about danger signs, and several other factors.

The level of education among mothers plays a significant role in their ability to recognize and respond to neonatal danger signs. Educated mothers are better equipped to access information, understand healthcare advice, communicate effectively with healthcare providers, and make informed decisions regarding their newborns' health. This, in turn, contributes to improved neonatal care and outcomes. In this study approximately half (50.7%) of the respondents had secondary education. The current study's findings are in agreement with the findings of the studies conducted in different countries in Africa. For example, a study by Kasule, (2018) and Ijoma et al., (2019) also found that most of their participant had attained at least secondary or tertiary.

Knowledge on neonatal danger signs

This study revealed that the majority (53%) of the respondents had reported poor knowledge on neonatal danger signs. These findings are in line with findings of many other scholars who have conducted similar study in countries with different settings, a review of the existing literature

reveals some common trends and variations. For instance, a study in a neighboring region Cameroon by Pierre et al., (2019) showed that 58% of their respondents were not knowledgeable about neonatal danger signs and Zhou and Hua (2022) in South West china found that 58% of the mothers had poor knowledge about neonatal danger signs. These similar distributions of knowledgeable and not knowledgeable mothers about danger signs in developing countries indicate that this issue is not only unique to Lusaka, Zambia. This proportion was higher than findings from Kenya by Wanjiku (2021), 51%. Several factors may contribute to the prevalence of inadequate knowledge among postnatal mothers regarding neonatal danger signs, these include Socioeconomic Status, economic disparities educational opportunities and cultural and social factors. Other factors may include health care infrastructure, information dissemination and family and peer influence.

On the other hand, studies from regions with more developed healthcare systems exhibited a higher proportion of knowledgeable mothers due to better access to healthcare and educational resources. For example a study by María et al., (2018) in Spain and Carmen (2020) in Canada found that majority of the respondents were knowledgeable about the neonatal danger signs with only a minority having little knowledge about the danger signs. Other studies that reported good knowledge on neonatal danger signs were Abdulrida et al. (2018) in Bagdhdad 81%, Shally (2006) in India, 68.9%, Muyawimana et al. (2020) in Rwanda (67%), Hunde et al. (2023) in Ethiopia (55.6%) and Ekwochi et al (2015) in Nigeria (30%). The difference may be attributed to exposure to sources of information, differences in study environments and methodological differences.

The univariate and multivariable analysis revealed that age was significantly associated with knowledge of neonatal danger signs. Specifically, individuals aged 18-20 or 21-30 years had lower odds of having good knowledge compared to individuals aged 31 years and above who had higher odds of good knowledge in the multivariable analysis. This finding is supported by studies done in Ethiopia by Jemberia et al. 2018 and Nepal by Manju (2018). The finding aligns with the notion that experience and exposure to information may increase with age. Younger mothers might not have had the opportunity to acquire knowledge through prior pregnancies or parenting experiences. This emphasizes the importance of targeting health education efforts towards younger mothers to improve their awareness of neonatal danger signs.

In this study, employment status was not significantly associated with knowledge of neonatal danger signs in both univariate and multivariable analysis. On the contrary, a study by Guta et al. (2020) reported the opposite. The possible reason could be that those mothers who are employed are educated and are have access to information through various sources. In the current study marital status had higher odds of good knowledge compared to single individuals, although this association was significant only in the univariate analysis.

Education level played a significant role in knowledge of neonatal danger signs. Participants with none/primary education had lower odds of good knowledge compared to those with tertiary education, which remained significant in the multivariable analysis. The finding is supported by

Jemberia et al. (2018) and Yosef, Nigussie and Asafa (2020). However, a study by Zhou and colleagues in China was not in agreement with this finding.

Mother's parity showed significant associations in the univariate analysis, first time mothers had lower odds of good knowledge compared to those with two children's or above. Similar findings were reported from studies conducted in North West Ethiopia by Kebede et al. (2020) and Yitawew et al. (2021) in North Wollo, Ethiopia. In current study socio-economic status did not show significant associations with knowledge of neonatal danger signs in both univariate and multivariable analysis. This was not congruent with a study conducted in China by Zhuo et al., where it was found that mothers with family financial difficulty were likely to unaware of danger signs than those mothers no financial difficulties.

Antenatal care attendance was significantly associated with knowledge of neonatal danger signs. Participants who attended antenatal care six times or more had higher odds of good knowledge compared to those who attended fewer times. This association remained significant in the multivariable analysis.this finding was consistent with studies conducted by Yosef, Nigussie and Asafa (2020) in Ethiopia and Abdulrida et al., in Baghdad (2018). On the contrary a study conducted by Sandberg et al., (2014) in Uganda showed no association between antenatal visits and knowledge of danger signs. The presence of a family support system was significantly associated with good knowledge of neonatal danger signs, as participants with family support had higher odds of good knowledge compared to those without support. This association remained significant in both univariate and multivariable analyses.

There are limitations to consider when interpreting the results of this study. First, the sample size was relatively small, which may limit the generalizability of the findings to other populations. Additionally, the study only included postnatal mothers from UTH in Lusaka, so the results may not be applicable to individuals from other parts of the country with different settings to UTH. Second, the study relied on self-reported data collected through questionnaires. Self-reporting can introduce response bias, as participants may provide answers that they perceive as socially desirable or may not accurately reflect their actual knowledge of neonatal danger signs. This bias could impact the accuracy of the results. Third, the study focused solely on postnatal mothers at UTH in Lusaka, Zambia. This limited scope may not account for variations in knowledge and influencing factors among postnatal mothers in different regions of Zambia or in different healthcare settings. The findings may not be applicable to a broader context, including rural areas or other healthcare facilities. These limitations should be considered when interpreting the study's findings, and future research in this area may benefit from addressing these limitations to enhance the validity and generalizability of results.

The study aimed to assess the level of knowledge of neonatal danger signs and associated factors among postnatal mothers. The findings revealed that 53% of the post-natal women had poor knowledge levels on neonatal danger signs. The factors associated with mothers knowledge on neonatal danger sings were being first time mothers or younger mothers, being married, mother's education level, Antenatal care attendance and having a family Support System. Therefore, great

efforts are required from all relevant stakeholders to create awareness on the importance of early identification of neonatal danger signs in order to reduce neonatal mortality in the country.

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