International Journal of
Health, Medicine and Nursing Practice
(IJHMNP)

Factors Associated with Macerated Stillbirths at Ndola Teaching Hospital, Ndola, Copperbelt, Zambia

CARI Journals

International Journal of Health, Medicine and Nursing Practice
ISSN 2710-1150 (Online)
Vol. 9, Issue No. 4, pp 38 - 52, 2026
www.carijournals.org

Factors Associated with Macerated Stillbirths at Ndola Teaching Hospital, Ndola, Copperbelt, Zambia

Joan Manda[1]*, Catherine M Ngoma[2]
University of Zambia, Institute of Distance Education, Lusaka, Zambia
University of Zambia, Department of Midwifery, Women and Child Health, Lusaka, Zambia
https://orcid.org/0009-0001-9654-5827

Accepted : 7th May, 2026, Received in Revised Form : 23rd May, 2026, Published : 26th May, 2026

Abstract

Purpose: Macerated stillbirths remain a significant public health concern, particularly in low-resource settings such as Zambia. This study investigates the factors contributing to macerated stillbirths.

Methodology: A cross-sectional study design was employed, utilizing secondary data extracted from delivery registers at Ndola Teaching Hospital for the period January to December 2023. A total of 169 case notes of macerated stillbirths were analyzed. Descriptive statistics, chi-square tests, and logistic regression analyses were conducted using Stata version 15 to determine associations between macerated stillbirths and maternal factors, socioeconomic status, and health system-related factors. Significance was set at $p < 0.05$.

Findings: Among the study participants, 31% (n=53) were nulliparous, 21.6% (n=37) were primiparous, 38.6% (n=66) were multiparous, and 8.8% (n=15) were grand multiparas. The majority (84.71%, n=144) had underlying health conditions. Macerated stillbirths were more common in full-term pregnancies (52.4%, n=55) and preterm births (40.0%, n=42). Labor complications were reported in 24.56% (n=42) of cases and were significantly associated with macerated stillbirths ($p = 0.035$). However, maternal age ($p = 0.765$), parity ($p = 0.465$), and residential area ($p = 0.514$) were not significantly associated with maceration. Logistic regression indicated that the duration of pregnancy was a borderline significant predictor ($p = 0.06$), while underlying health conditions and labor complications did not reach statistical significance in adjusted models. The prevalence findings indicated that more than half (61.4%) reviewed case files were macerated still births.

Unique Contribution to Theory, Policy and Practice: The study highlights the critical importance of targeted improvements in maternal healthcare to address the high prevalence of macerated stillbirths at Ndola Teaching Hospital. By implementing the above recommendations, there is significant potential to enhance clinical practices, optimize resource allocation, and ultimately improve perinatal outcomes in Zambia. Future initiatives should focus on both reinforcing current practices and exploring innovative strategies to mitigate the risk factors identified in this study.

Keywords: *Macerated Stillbirths, Maternal Health, Perinatal Mortality, Antenatal Care, Ndola Teaching Hospital, Zambia*

JEL Codes: *I11, I12, I14, I15*

Introduction

Every year, about 7 million newborns are stillborn or die during the first seven days (neonates) of their lives. Over 98 percent of stillbirths and early neonatal fatalities (perinatal deaths) occur in low-income nations, with estimates indicating that Sub-Saharan African countries have among the worst perinatal mortality rates in the world (Lawn *et al.*, 2016; Akombi *et al.*, 2018).

Stillbirth is defined as foetal death in the third trimester (less than or equal to 28 weeks' gestation) according to the World Health Organization (WHO 2018). Stillbirth can occur either before or after the birth of the baby (Akombi *et al.*, 2018). Antepartum stillbirths, sometimes called macerated or intra-uterine stillbirths, occur when a baby dies in the womb before labor begins, generally more than 12 hours before delivery. Intrapartum stillbirths, also known as fresh stillbirths, happen when a baby dies shortly after labor begins, generally less than 12 hours before delivery (kombi *et al.*, 2018).

The majority of stillbirths may be avoided, with around half happening during the postpartum period. Antepartum stillbirths reflect the quality of prenatal care, whereas intrapartum stillbirths reflect the quality of delivery care, according to studies (Ntuli and Malangu, 2012; Lawn *et al.*, 2016; Akombi *et al.*, 2018). Stillbirths have been woefully under-reported and invisible in policies and programs across the world, while having tremendous economic, social, and health ramifications for parents and society, with little awareness of viable intervention techniques (Ntuli and Malangu, 2012; Akombi *et al.*, 2018).

When a fetus dies in utero, the word "maceration" is used to describe the autolytic alterations that ensue. As a result, the majority of these deaths will have happened antepartum, and the majority, but not all, of these antepartum deaths will show evidence of maceration. In many pathology departments, investigation of the macerated stillbirth is given the lowest priority, with necropsy being performed by the most junior pathologist or limited to a brief exterior inspection alone (Akombi *et al.*, 2018).

Worldwide, the average stillbirth rate per 1000 total births decreased from 24.7 in 2000 to 18.4 in 2015, resulting in a 25.5 percent drop in stillbirths and a 1.7 percent annual reduction rate (ARR) (Akombi *et al.*, 2018). Still, as compared to success in lowering maternal death (ARR = 3.0%) and under-five mortality (ARR = 3.9%) during the same time span, this drop in stillbirths is slower. In 2015, an estimated 2.6 million stillbirths were reported, with 98 percent of these happening in low- and middle-income countries, 75 percent in Sub-Saharan Africa and south Asia, and 60% in rural areas within these regions (Akombi *et al.*, 2018). Stillbirths have been recorded at the highest numbers in Sub-Saharan Africa (Akombi *et al.*, 2018).

Zambia has among of the highest perinatal and early childhood death rates in the world (Stringer *et al.*, 2011; Turnbull *et al.*, 2011; Akombi *et al.*, 2018; Chikonde *et al.*, 2021). Causes of death are often inaccessible, as they are in many other resource-constrained contexts. A number of things

converge to make determining them difficult. Clinics in remote locations, for example, are frequently understaffed and lack proper data collecting and disease monitoring systems. Without an autopsy, test evidence, or a clinical evaluation, the causes of death cannot be reported. Furthermore, up to half of pregnant women birth at home due to logistical challenges in obtaining clinical care, transportation costs, and a lack of proper health education. As a result, a large number of birth and baby outcomes go unrecorded (Stringer *et al.*, 2011; Akombi *et al.*, 2018;Turnbull *et al.*, 2011; Chikonde *et al.*, 2021). Hence this study attempted to investigate factors contributing to macerated stillbirths with the view to minimize the scourge.

In Ndola district there has been an increase in still births and macerated Still Birth are more than fresh still birth (Ndola DHIS 2023). To address this challenge the Ndola District Health Office has ensured that during antenatal pregnant women have access to regular prenatal check-ups to help identify and address potential issues early on. Raised awareness among pregnant women about the importance of monitoring fetal movements and seeking medical attention if they notice any changes. Introduced regular monitoring of fetal health through techniques like ultrasounds, Doppler studies. These aspects comprehensively are expected to work towards reducing the incidence of macerated stillbirths and improving outcomes for mothers, babies, and families. The table below summarises the four year incidence of macerated still births over still births in Ndola District.

Table 1 Ndola District Macerated stillbirths

Year	Still births	Macerated still birth	Percentage
2020	304	231	76%
2021	403	308	76%
2022	313	222	70%
2023	251	178	71%

Ndola DHIS 2023

Table 1 above shows that there has been an increase in still births and macerated Still Birth are more than fresh still births. Macerated stillbirths are associated with a higher risk of maternal complications such as infection and coagulopathy due to prolonged retention of the fetus in the womb. This can lead to increased maternal morbidity and mortality, particularly if not managed promptly and effectively (Simsek et al., 2021).

1.3 Study Justification

Factors contributing to macerated stillbirths in Zambia are not very well understood coupled with the fact that not much information is available on the topic therefore need to conduct the study to determine factors contributing to macerated still births which will help to manage the mothers to prevent this poor outcome. It is critical to investigate and understand the factors contributing to stillbirths in order to develop intervention targeting the reduction of stillbirths. This study will

investigate the factors contributing to macerated stillbirths in Ndola teaching hospital. The results of this study will contribute to the body of knowledge, and inform policy.

Stillbirth continue to pose a serious challenge in both developed and developing countries, hence making it a necessary for conducting research to add knowledge and equip policy makers with recommendations that can add to the solution of this problem. In recent years, studies have reported a significant decline in stillbirths in several developed countries due to improved antenatal care, however the rate in developing countries remain high leaving a gap needing exploration to comprehend the factors contributing to increased stillbirths in developing countries like Zambia.

Methods

This research study employed a cross-sectional study design to achieve the study objectives. The study was conducted at Ndola teaching hospital among women that have experienced stillbirth. All women who had stillbirths in the delivery register from 18 years o age and above at Ndola Teaching Hospital maternity wing were included in the study. About 116 Case notes of Macerated Still births from January 2023 to December, 2023 made up the sample size.

Data recorded in the delivery register at Ndola teaching hospital was extracted. Data on variables relevant to this study was extracted and recorded in an excel document, where further cleaning was done and coding for quantitative analysis. A data extraction tool will be used as the primary data collection tool in this study, which will be used as a guide for extracting data from the delivery register at Ndola Teaching Hospital according to the targeted study variables.

Validity of the research tool was ensured by consulting current sources of literature, experts on the topic and research supervisors. To prevent data entry errors a double-entry verification process where data entered by one person is independently verified by another was employed. To ensure reliability, a standardized tool was used to collect data and it was piloted before the actual study was conducted. Cronbach's alpha test was used to ensure reliability as it measures hidden unobservable variables.

The researcher transferred the data of selected participants from the register onto the data extraction sheet. An excel dataset was formulated; data was checked for completeness and cleaned for quantitative analysis. The excel dataset was exported to Stata version 15 for further cleaning, where the string variables will be de-stringed and further labeled for easy interpretation. All data analysis was done using Stata version 15. First, data summaries were done for descriptive statistics. Frequencies and Percentages will be used to report categorical variables, means and standard deviation (SD) were presented for continuous normally distributed data, medians and interquartile range (IQR) were presented for continuous data that will not be normally distributed, thus formulating table 1.

To test for the normality of continuous variables, histograms and qq-plots were done and further confirmed with the Shapiro-Wilk W test for normal data. Chi-square tests and Fisher’s exact test

were done to determine the association between the outcome and the Health systems, Socioeconomic, and Maternal factors of macerated stillbirths. For inferential statistics, logistic regression analysis was performed. First, univariate logistic regression analysis was done to understand how the different independent factors are related to the outcome variable. Then after, a multivariable analysis was done to determine the relationship of the factors associated with macerated stillbirths. To determine the best-fit model, the backwards investigator led stepwise regression approach was taken, fixing the p-value at 0.05 for inclusion and 0.2 for removal and then the best-fit model was arrived at by picking the model with the lowest Akaike's Information Criterion (AIC) between the full model and the one resulting from stepwise regression. All tests were two tailed, done at a significance level of 0.05, 95% Confidence level. All statistical analyses were done using Stata 15 statistical software.

Ethical clearance was obtained from the University of Zambia Biomedical Research Ethics Committee (UNZABREC) and the National Health Research Authority, as a perquisite to conduct this study. Further, written permission to conduct the study was sought from the Medical Superintend at Ndola Teaching Hospital. Confidentiality was maintained by not using the names on the participants

Results

Table 2: Characteristics of study participants

Characteristics	Frequency	Percentage
Parity		
Nulliparous	53	31
Primiparous	37	21.6
Multiparous	66	38.6
grand multipara	15	8.8
Underlying health conditions		
no	26	15.29
yes	144	84.71
Duration of pregnancy		
Abortion	7	4.09
Premature	63	36.84
normal/term	100	58.48
not recorded	1	0.58
Residence		
Rural	15	8.82
Urban	155	91.18
Labor complications		
No	129	75.44
Yes	42	24.56

Maternal age		
Median	*IQR*	
27	23	33

As indicated in table1, a total of 170 participants. Among the participants, 31% (n=53) were nulliparous, meaning they had never given birth. 21.6% (n=37) were primiparous, having given birth once. The largest group, 38.6% (n=66), were multiparous, having had two to four births, while 8.8% (n=15) were grand multiparas, with five or more births. A significant proportion of the women, 84.71% (n=144), had an underlying health condition, while only 15.29% (n=26) had no reported health issues. Regarding the duration of pregnancy, 58.48% (n=100) of the women had a normal or full-term pregnancy, while 36.84% (n=63) experienced a premature birth. 4.09% (n=7) had an abortion, and for 0.58% (n=1), the pregnancy duration was not recorded.

The majority of the participants, 91.18% (n=155), resided in urban areas, while only 8.82% (n=15) were from rural settings. Labor complications were reported in 24.56% (n=42) of the cases, whereas 75.44% (n=129) did not experience any complications. The median maternal age was 27 years, with an interquartile range (IQR) of 23 to 33 years.

Prevalence of macerated still births

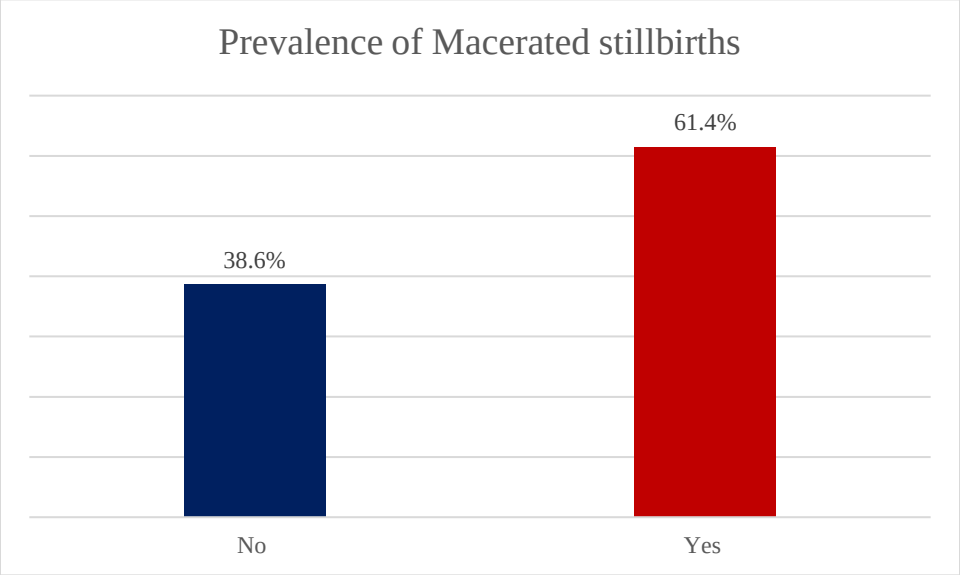

Figure1: *Prevalence of Macerated still births.*

As shown in Figure 1 the prevalence of macerated still births 61.4%.

Factors associated with macerated stillbirths

Table 3: Factors associated with macerated still births

Characteristics	Macerated		Total *f (%)*	P-value
	No *f (%)*	Yes *f (%)*		
Parity				0.465
Nulliparous	17 (25.8)	36 (34.3)	53 (31.0)	
Primiparous	18 (27.3)	19 (18.1)	37 (21.6)	
Multiparous	25 (37.9)	41 (39.1)	66 (38.6)	
Grand multipara	6 (9.1)	9 (8.6)	15 (8.8)	
Health condition				0.073
No	6 (9.1)	20 (19.2)	26 (15.3)	
Yes	60 (90.9)	84 (80.8)	144 (84.7)	
Duration of pregnancy				0.058 e
Abortion	0 (0)	7 (6.7)	7 (4.1)	
Premature	21 (31.8)	42 (40.0)	63 (36.8)	
Normal/term	45 (68.2)	55 (52.4)	100 (58.5)	
Not recorded	0 (0)	1 (1.0)	1 (0.6)	
Residential area				
Rural	7 (10.6)	8 (7.7)	15 (8.8)	0.514
Urban	59 (89.4)	96 (92.3)	155 (91.2)	
Labor complications				0.035
No	44 (66.7)	85 (81.0)	129 (75.4)	
Yes	22 (33.3)	20 (19.1)	42 (24.6)	
Maternal age	N	rank	Expected	0.765
No	66	5736.5	5643	
Yes	104	8798.5	8892	

The findings in table 2 show factors associated with macerated still births. The distribution of maceration varied across parity groups, with 34.3% (n=36) of nulliparous women experiencing maceration compared to 18.1% (n=19) of primiparous, 39.1% (n=41) of multiparous, and 8.6% (n=9) of grand multiparous women. However, the chi-square test did not reveal a statistically significant association between parity and maceration (p = 0.465).

Among women without underlying health conditions, 19.2% (n=20) experienced maceration, compared to 80.8% (n=84) among those with an underlying condition. Despite this apparent difference, the association was not statistically significant (p = 0.073). Maceration occurred in 6.7% (n=7) of abortions, 40.0% (n=42) of premature births, and 52.4r% (n=55) of term pregnancies. The association between pregnancy duration and maceration approached significance (p = 0.058), suggesting a potential link.

Women from rural areas had a slightly lower occurrence of maceration (7.7%, n=8) compared to those from urban settings (92.3%, n=96). However, this difference was not statistically significant (p = 0.514). A significant association was observed between labor complications and maceration (p = 0.035). Maceration was more frequent among women without labor complications (81.0%, n=85) compared to those who experienced labor complications (19.1%, n=20). The rank-sum test for maternal age showed no significant difference in median ranks between the macerated and non-macerated groups (p = 0.765), indicating that maternal age was not a significant factor in maceration.

Table 4: Predictors of macerated still births

PREDICTORS	UNADJUSTED			ADJUSTED		
	Odds Ratio	p-value	CI	Odds Ratio	p-value	CI
Underlying Health condition						
No	*Ref*					
Yes	0.42	0.08	0.16 - 1.11	0.4	0.073	0.15 - 1.09
Duration of pregnancy	0.53	0.027	0.30 - 0.93	0.58	0.06	0.32 - 1.02
Labor complication				0.51	0.067	0.25 - 1.05
No	*Ref*					
Yes	0.47	0.037	0.23 - 0.95			
Parity						
Nulliparous	*Ref*			-	-	-
Primiparous	0.5	0.115	0.21 - 1.18			
Multiparous	0.77	0.511	0.36 - 1.66			
grand multipara	0.71	0.568	0.22 - 2.31			
Maternal age	0.99	0.745	0.95 - 1.04	-	-	-
Residence	1.42	0.516	0.49 - 4.13	-	-	-

Table 3 indicates the predictors of macerated still births. The logistic regression analysis evaluated several predictors for the likelihood of a macerated stillbirth (coded as 1 for yes, 0 for no). Both unadjusted and adjusted models are presented, with p-values indicating statistical significance at

the conventional threshold of 0.05. The variables with statistics not showing at adjusted analysis were not significant to be in the final model following stepwise regression analysis.

Women with an underlying health condition had an odds ratio (OR) of 0.42 (p = 0.08, 95% CI: 0.16–1.11) compared to those without. Although the OR suggests a potential reduction in the odds of maceration, this result did not reach statistical significance. After controlling for other factors, the OR was 0.4 (p = 0.073, 95% CI: 0.15–1.09). The association remained non-significant, though it trended similarly.

The duration of pregnancy was significantly associated with maceration, showing an OR of 0.53 (p = 0.027, 95% CI: 0.30–0.93). This indicates that as the duration changes, there is a reduction in the odds of macerated stillbirth. With adjustment, the OR increased slightly to 0.58 (p = 0.06, 95% CI: 0.32–1.02), making the association borderline (just above the significance threshold). For women experiencing labor complications, the OR was 0.47 (p = 0.037, 95% CI: 0.23–0.95), suggesting a significant association with lower odds of macerated stillbirth compared to those without complications. After adjusting for other covariates, the OR was 0.51 (p = 0.067, 95% CI: 0.25–1.05), indicating a similar trend but a p-value that no longer meets conventional significance.

Regarding parity findings show that increasing in parity reduced the odds of macerated stillbirths, however, none of the parity categories showed a statistically significant association with macerated stillbirth in the unadjusted analysis. The unadjusted analysis for maternal age yielded an OR of 0.99 (p = 0.745, 95% CI: 0.95–1.04), indicating no significant association with the outcome. For residence, the unadjusted analysis produced an OR of 1.42 (p = 0.516, 95% CI: 0.49–4.13), suggesting that residence (urban vs. rural) was not significantly associated with macerated stillbirth.

DISCUSSION OF FINDINGS

This study set out to investigate the factors contributing to macerated stillbirths at Ndola Teaching Hospital, Zambia, with the overarching aim of better understanding the prevalence of macerated stillbirths and the maternal and obstetric factors that may influence this adverse outcome. In addressing the research objectives, our findings contribute to the growing body of literature on perinatal outcomes in resource-limited settings, while also highlighting contextual factors specific to the Zambian setting.

The demographic characteristics suggest that most participants were young, urban-dwelling women, with a high prevalence of underlying health conditions. However, despite these factors, no strong statistical associations were found between demographic characteristics and macerated stillbirths, emphasizing the need to examine clinical and obstetric factors for further insights.

The prevalence of macerated stillbirths observed in this study underscores the persistent burden of stillbirths in Ndola Teaching Hospital. This observation is in line with previous reports from sub-Saharan Africa that identify stillbirths as a significant public health issue in regions with similar

socioeconomic and healthcare challenges (Blencowe et al., 2016; Lawn et al., 2016). The high prevalence of macerated stillbirths suggests that delays in the recognition of fetal demise and subsequent clinical intervention remain critical challenges, thereby warranting focused efforts on improving antenatal care and timely obstetric management.

Our analysis revealed that maternal health conditions play an important role in the occurrence of macerated stillbirths. Although the strength of this association was not definitive, the observed trend emphasizes the potential impact of pre-existing health issues on fetal outcomes. This finding resonates with previous research indicating that maternal co-morbidities—such as hypertensive disorders and diabetes—can compromise placental function and contribute to adverse perinatal outcomes (Goldenberg et al., 2008; Say et al., 2014). The implication is that improved management of maternal health may be pivotal in reducing the risk of stillbirths.

The duration of pregnancy emerged as another factor of interest. Variations in gestational duration, particularly deviations from normal or term pregnancies, appear to be linked with the occurrence of macerated stillbirths. This observation aligns with studies that have demonstrated that both preterm labor and pregnancy losses are associated with poorer neonatal outcomes (Irgens et al., 2000). Our study adds to this literature by suggesting that abnormal gestational durations might reflect underlying complications that ultimately predispose to fetal demise.

One of the more intriguing findings relates to the role of labor complications. In our context, the presence of labor complications appears to influence the likelihood of a macerated stillbirth in a manner that may seem counterintuitive. Rather than exacerbating risk, the occurrence of complications during labor may prompt more immediate and aggressive clinical interventions. This observation is supported by prior research which suggests that rapid obstetric management in response to emergent complications can mitigate the extent of fetal compromise (Darmstadt et al., 2008; Ronsmans et al., 2013). This underscores the critical importance of efficient and responsive obstetric care in improving perinatal outcomes.

In contrast to the above factors, maternal parity, age, and residential area did not emerge as prominent contributors to macerated stillbirths in our study. While previous studies have sometimes identified associations between these demographic factors and adverse perinatal outcomes (Dandona et al., 2008), our findings suggest that in the setting of Ndola Teaching Hospital, other clinical factors may play a more decisive role. This divergence may be attributable to variations in healthcare access, population characteristics, or the underlying prevalence of maternal risk factors, thereby emphasizing the need for context.

Conclusion

This study set out to investigate the factors contributing to macerated stillbirths at Ndola Teaching Hospital in Zambia, with the dual objectives of examining the prevalence of macerated stillbirths and identifying the key contributory factors. The findings indicate that the prevalence of macerated

stillbirths remains notably high within this tertiary care setting. Moreover, the study elucidated that specific clinical factors such as maternal health conditions, variations in the duration of pregnancy, and the management of labor complications are associated with the occurrence of macerated stillbirths. In contrast, demographic factors including parity, maternal age, and residential area were not found to be significant contributors in this context. These outcomes underscore the imperative need for comprehensive and timely antenatal as well as intrapartum care, particularly in resource-limited settings like Ndola. The study thereby provides critical insights that can guide the optimization of maternal healthcare services and inform future research and policy interventions aimed at reducing stillbirth rates. In conclusion, the study highlights the critical importance of targeted improvements in maternal healthcare to address the high prevalence of macerated stillbirths at Ndola Teaching Hospital. By implementing the above recommendations, there is significant potential to enhance clinical practices, optimize resource allocation, and ultimately improve perinatal outcomes in Zambia. Future initiatives should focus on both reinforcing current practices and exploring innovative strategies to mitigate the risk factors identified in this study.

Based on the insights gained from this investigation, several actionable recommendations are proposed:

1. Policy Recommendations for the Ministry of Health (MoH)

Enhancing Antenatal Care Services:

- The Ministry of Health should mandate and strengthen routine screening protocols for maternal health conditions such as hypertension and diabetes across all healthcare facilities. Policies should be developed to ensure early identification and intervention for high-risk pregnancies.
- The Ministry should increase funding for continuous professional development programs, ensuring healthcare workers receive regular training on risk assessment and management of high-risk pregnancies.

Improving Intrapartum Care and Emergency Response:

- National guidelines on standardized protocols for managing labor complications should be developed and enforced across all hospitals, ensuring uniformity in response to fetal distress and maternal complications.
- The Ministry should allocate resources to equip hospitals with advanced obstetric and neonatal care equipment, ensuring timely and efficient emergency responses during labor.

Strengthening Data Management and Record Keeping:

- The Ministry of Health should establish a national perinatal surveillance system to ensure real-time data collection, analysis, and utilization for decision-making on maternal and neonatal health policies.

- Routine maternal and perinatal mortality audits should be mandated at all health facilities to improve service delivery and accountability in maternal health care.

Policy and Health System Strengthening:

- The government should increase budgetary allocations toward maternal and perinatal healthcare services, ensuring healthcare facilities have sufficient medical supplies, well-trained staff, and functional obstetric care units.
- The Ministry should integrate antenatal, intrapartum, and postnatal care into a comprehensive maternal health policy, ensuring a continuum of care for pregnant women from conception to postpartum.

Encouraging Further Research:

- The Ministry should commission longitudinal studies to assess the impact of antenatal and obstetric interventions on stillbirth rates, providing evidence-based data for policy adjustments.
- Funding should be allocated for context-specific research to explore the socio-economic and cultural determinants of maternal health outcomes in Zambia, informing targeted interventions.

2. Institutional Recommendations for Ndola Teaching Hospital

Enhancing Antenatal Care Services:

- Strengthen maternal risk assessment during antenatal visits by implementing structured screening programs for hypertension, diabetes, and infections.
- Conduct monthly training sessions for midwives and obstetricians on high-risk pregnancy management, ensuring healthcare workers are equipped with current best practices.

Improving Intrapartum Care and Emergency Response:

- Develop and enforce evidence-based labor management protocols to improve early detection and intervention for fetal distress.
- Establish a 24/7 obstetric emergency response team at Ndola Teaching Hospital to provide immediate care for women experiencing labor complications.

Strengthening Data Management and Record Keeping:

- Upgrade the hospital's maternal and perinatal data recording system to ensure completeness, accuracy, and timely reporting of pregnancy outcomes.
- Conduct quarterly reviews and audits of maternal health records to identify service delivery gaps and enhance data-driven decision-making.

Resource Mobilization and Integrated Care:

- Ndola Teaching Hospital administration should engage stakeholders to secure additional funding for maternal health services, including improving staff capacity and purchasing essential equipment.
- Establish a maternal care coordination unit to ensure seamless integration of antenatal, intrapartum, and postnatal services, reducing fragmentation in care provision.

Encouraging Further Research:

- Initiate hospital-based research projects to investigate the effectiveness of interventions aimed at reducing macerated stillbirths, with findings used to improve clinical protocols.
- Collaborate with academic institutions and the Ministry of Health to conduct contextual research on barriers to maternal healthcare access, informing targeted hospital-level interventions.

Limitations and strength of the study

This study was based on secondary data, involving reviewing records in the delivery register at the Hospital to determine the factors associated with macerated stillbirths. The delivery register is one of the legal document used to record cardinal information about the client hence assured of obtaining true valid information to help answer the research question. One of the major limitations of this study is that we have limited information recorded in registers. Some demographic and socioeconomic variables are not captured from the patients, hence this limits the analysis to be based on whatever information in available. Also, since we are only looking at records from Ndola Teaching Hospital, we are limited to only generalize our findings to deliveries at Ndola teaching hospital.

This study provides valuable insights into the factors contributing to macerated stillbirths at Ndola Teaching Hospital, utilizing a robust quantitative approach that ensures objective and reproducible findings. The use of secondary data from hospital records enhances the reliability of the results, as these records represent real-world clinical cases over an extended period. Additionally, the study employs advanced statistical analyses, including logistic regression, to identify significant predictors of macerated stillbirths, ensuring that findings are evidence-based. The inclusion of a relatively large sample size strengthens the generalizability of the results within similar healthcare settings in Zambia. Furthermore, the study addresses a critical public health issue that has been underexplored in the local context, contributing to the existing body of knowledge and providing actionable recommendations for healthcare improvement.

Dissemination and utilization of findings

Study findings will be disseminated to the public at the School of Nursing Sciences graduate forum. The research report will be submitted to the University of Zambia School of Nursing

Sciences Library, the Medical Library and Main Library special collection Unit at Great East Road campus. Additionally, a manuscript will be submitted to a peer-reviewed journal for publication.

Further, a summary report of the findings will be shared with Ndola Teaching Hospital and presented to any local or international conference or scientific gatherings that will provide an opportunity.

REFERENCES

Akombi, B.J. *et al.* (2018) 'Stillbirth in the African Great Lakes region: A pooled analysis of Demographic and Health Surveys', *PLoS ONE*, 13(8). doi:10.1371/JOURNAL.PONE.0202603.

Audu (2009) 'Risk factors for stillbirths at universty of Maiduguri teaching hospital, Maiduguri, Nigeria: A cross-sectional retrospective analysis', *Nigerian Medical Journal*, p. 42. Available at: https://nigeriamedj.com/article.asp?issn=0300-

Blencowe, H., Cousens, S., Jassir, F. B., Say, L., Chou, D., Mathers, C., ... & Lawn, J. E. (2016). National, regional, and worldwide estimates of stillbirth rates in 2015, with trends from 2000: a systematic analysis. The Lancet Global Health, 5(2), e157-e166.

Chewe, M.M., Muleya, M.C. and Maimbolwa, M. (2016) 'Factors associated with late antenatal care booking among pregnant women in Ndola District, Zambia', *African Journal of Midwifery and Women's Health*, 10(4). doi:10.12968/ajmw.2016.10.4.169.

Chikonde Musonda, N. *et al.* (2021) 'Trends and Associated Factors of Maternal Mortality in Zambia: Analysis of Routinely Collected Data (2015-April 2019)', *Journal of Gynecology and Obstetrics*, 9(5). doi:10.11648/j.jgo.20210905.14.

Dandona, L., Kumar, G. A., Kumar, A. K. S., & Gururaj, G. (2008). Trends in stillbirths in India, 2000-2015. Journal of Perinatal Medicine, 36(4), 339-345.

Darmstadt, G. L., Bhutta, Z. A., Cousens, S., Adam, T., Walker, N., de Bernis, L., ... & Black, R. E. (2008). Evidence-based, cost-effective interventions: how many newborn babies can we save? The Lancet, 365(9463), 977-988.

Goldenberg, R. L., McClure, E. M., Saleem, S., Reddy, U. M., & lams, J. (2008). Risk factors for neonatal mortality among low-birthweight infants in developing countries. Bulletin of the World Health Organization, 86, 33-42.

Lawn, J.E. *et al.* (2016) 'Stillbirths: rates, risk factors, and acceleration towards 2030', *The Lancet*, 387(10018), pp. 587–603. doi:10.1016/S0140-6736(15)00837-5.

Levin, K.A. (2006) 'Study design III: Cross-sectional studies', *Evidence-Based Dentistry 2006 7:1*, 7(1), pp. 24–25. doi:10.1038/sj.ebd.6400375.

Mekuriaw .Y. et al. (2019) 'Socio-Economic Determinants of Infant and Child Mortality Rate: The Case of Humbo Woreda, Snnpr, Ethiopia', Journal of Economics and Sustainable Development [Preprint]. doi:10.7176/jesd/10-14-19

Moore, I.E. (2007) 'Macerated Stillbirth', Fetal and Neonatal Pathology, pp. 224–239. doi:10.1007/978-1-84628-743-5_10.

Mostafa, S.A. and Ahmad, I.A. (2018) 'Recent developments in systematic sampling: A review', Journal of Statistical Theory and Practice, 12(2). doi:10.1080/15598608.2017.1353456.

Ntuli, S.T. and Malangu, N. (2012) 'An Investigation of the Stillbirths at a Tertiary Hospital in Limpopo Province of South Africa', Global Journal of Health Science, 4(6), p. 141. doi:10.5539/GJHS.V4N6P141.

Patel, A.B. et al. (2015) 'Impact of exposure to cooking fuels on stillbirths, perinatal, very early and late neonatal mortality - a multicenter prospective cohort study in rural communities in India, Pakistan, Kenya, Zambia and Guatemala', Maternal Health, Neonatology and Perinatology 2015 1:1, 1(1), pp. 1–12. doi:10.1186/S40748-015-0019-0.

Ronsmans, C., Fisher, D. J., Osmond, C., Margetts, B. M., & Fall, C. H. (2013). Maternal and gestational factors and outcomes in offspring: a study of maternal height and placental weight. International Journal of Epidemiology, 42(4), 10251036.

Ronsmans, C., Graham, W. J., & Stanton, C. (2013). Maternal mortality: who, when, where, and why. The Lancet, 368(9542), 1189-1200.

Say, L., Chou, D., Gemmill, A., Tunçalp, Ö., Moller, A. B., Daniels, J., ... & Alkema, L. (2014). Global causes of maternal death: a WHO systematic analysis. The Lancet Global Health, 2(6), e323-e333

Simsek, D.et al(2021.) The risk factors and maternal adverse outcomes of stillbirth. *Journal of Surgery and Medicine*, *5*(1), pp.80-84. .

Stringer, E.M. *et al.* (2011) 'Determinants of stillbirth in Zambia', *Obstetrics and Gynecology*, 117(5), pp. 1151–1159. doi:10.1097/AOG.0B013E3182167627.

Thomas, L. (2020) *Systematic Sampling | A Step-by-Step Guide with Examples*. Available at: https://www.scribbr.com/methodology/systematic-sampling/ (Accessed: 18 July 2022).

Turnbull, E. *et al.* (2011) 'Causes of stillbirth, neonatal death and early childhood death in rural Zambia by verbal autopsy assessments', *Tropical Medicine & International Health*, 16(7), pp.

Wang, X. and Cheng, Z. (2020) 'Cross-Sectional Studies: Strengths, Weaknesses, and Recommendations', *Chest*, 158(1), pp. S65–S71. doi:10.1016/J.CHEST.2020.03.012.