

Prevalence and Contributing Factors of Abdominal Wall Defects Among Neonates Admitted to Selected Teaching Hospitals in Rwanda

Umugiraneza Alvere¹; Murekatete Winifrida²; Muganwa Kellen³; Donathilla Mukamana⁴; Umubyeyi Sabine⁵

^{1,2,3,5}Master's Degree in Neonatology; ⁴PhD; ⁴Professor

¹Shyira District Hospital

²Rwanda Military and Teaching Hospital (RMTH)

³University of Rwanda

⁴University of Rwanda

⁵Rwanda Military and Teaching Hospital (RMTH)

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Abstract:

➤ *Background:*

Abdominal wall defects (AWDs), primarily including gastroschisis and omphalocele, represent major congenital anomalies associated with high rates of neonatal morbidity and mortality, particularly in resource-constrained sub-Saharan settings.

➤ *Objective:*

To determine the prevalence, types, and contributing factors of abdominal wall defects among neonates admitted to three selected teaching hospitals in Rwanda.

➤ *Methods:*

A descriptive cross-sectional study was conducted across three teaching hospitals (CHUK, KFH, and RMTH) utilizing a sample size of $n = 133$ neonatal admissions. Data were extracted using a structured checklist and analyzed using the Statistical Package for the Social Sciences (SPSS). Bivariate and multivariate analyses were performed to identify significant associations between maternal/neonatal variables and abdominal wall defects.

➤ *Results:*

The overall prevalence of abdominal wall defects among admissions was quantified, demonstrating a notable distribution across the tertiary facilities, with Centre Hospitalier Universitaire de Kigali (CHUK) recording the highest proportion of cases. Gastroschisis and omphalocele were identified as the primary defect categories. Bivariate analyses revealed significant associations between AWD occurrence and key factors including maternal age, parity, gestational age at birth, and antenatal care attendance.

➤ *Conclusion:*

Abdominal wall defects are a critical surgical and nursing challenge in Rwandan tertiary centers. Improving prenatal screening, standardizing immediate neonatal transport and resuscitation protocols, and enhancing specialized neonatal nursing care pathways are vital for survival.

Keywords: Abdominal Wall Defects, Gastroschisis, Omphalocele, Neonatology Nursing, Congenital Anomalies, Rwanda.

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I. INTRODUCTION

Abdominal wall defects (AWDs) are among the most visible and clinically challenging congenital malformations encountered in neonatal care (Bielicki et al., 2021). These anomalies result from structural failures during embryonic folding and ventral body wall closure. The two most prominent manifestations are gastroschisis, characterized by evisceration of bowel loops without a covering membrane, and omphalocele, where abdominal viscera herniate into the base of the umbilical cord enclosed within a protective sac (Evbuomwan, n.d.).

Globally, the prevalence of ventral wall defects varies, but the burden in low- and middle-income countries (LMICs) is magnified by limited access to antenatal diagnostics, delayed presentation, and resource constraints within Neonatal Intensive Care Units (NICUs). In Rwanda, comprehensive empirical baseline data examining the precise prevalence and associated maternal and neonatal risk factors across national referral teaching hospitals are vital for driving clinical quality improvement.

II. LITERATURE REVIEW

The theoretical and empirical literature underscores that congenital abdominal wall defects are multifactorial conditions influenced by both genetic predisposition and environmental exposures (Evbuomwan, n.d.).

➤ Theoretical Framework

This study is guided by the social determinants of health and structural conceptual frameworks, emphasizing how maternal socioeconomic status, nutritional status, and geographical accessibility to specialized healthcare facilities influence neonatal health outcomes (Bielicki et al., 2021).

➤ Empirical Literature on Prevalence and Factors

Studies across sub-Saharan Africa indicate that omphalocele and gastroschisis constitute a high percentage of surgical neonatal admissions, with variable fatality rates ranging from 30% to over 50% depending on gestational age, birth weight, and time elapsed before arrival at a tertiary surgical center (Tirunch et al., 2022). Risk factors frequently cited in literature include young maternal age, primiparity, maternal nutritional deficiencies, and lack of early antenatal care (CDC, 2020).

III. METHODOLOGY

- **Study Design:** A descriptive cross-sectional retrospective study design.
- **Study Setting:** Conducted at three major teaching hospitals in Rwanda: Centre Hospitalier Universitaire de Kigali (CHUK), King Faisal Hospital (KFH), and Rwanda Military and Referral Teaching Hospital (RMRTH) (UR, 2025).
- **Target Population:** Neonates admitted with diagnosed abdominal wall defects during the study timeframe ($n = 133$).
- **Data Collection Instruments:** A standardized data extraction checklist capturing maternal demographics, obstetric history, neonatal anthropometric measurements, and specific defect classifications.
- **Data Analysis:** Processed using SPSS. Descriptive statistics (frequencies, percentages, means) summarized prevalence and demographic distributions. Bivariate analysis utilizing chi-square tests ($p < 0.05$) determined associations between variables.

IV. RESULTS

➤ Socio-Demographic and Clinical Characteristics

The study evaluated $n = 133$ neonatal records across the three teaching facilities.

Table 1 Socio-Demographic and Clinical Characteristics

Variable / Characteristic	Category	Frequency (n)	Percentage (%)
Hospital Site	CHUK	58	43.6%
	KFH	42	31.6%
	RMRTH	33	24.8%
Neonatal Sex	Male	78	58.6%
	Female	55	41.4%
Gestational Age	Preterm (< 37 weeks)	36	27.1%
	Term (≥ 37 weeks)	97	72.9%
Maternal Age Group	< 20 years	22	16.5%
	20 – 35 years	91	68.4%
	> 35 years	20	15.1%

➤ *Prevalence and Types of Abdominal Wall Defects*

Analysis of hospital admissions demonstrated specific defect breakdowns:

Table 2 Prevalence and Types of Abdominal Wall Defects

Defect Type	Frequency (n)	Percentage (%)	Associated Fatality Rate
Omphalocele (Isolated)	54	40.6%	22.2%
Gastroschisis (Isolated)	48	36.1%	66.7%
Omphalocele with Anomalies	19	14.3%	47.4%
Gastroschisis with Anomalies	12	9.0%	75.0%
Total	133	100.0%	37.6% (Overall)

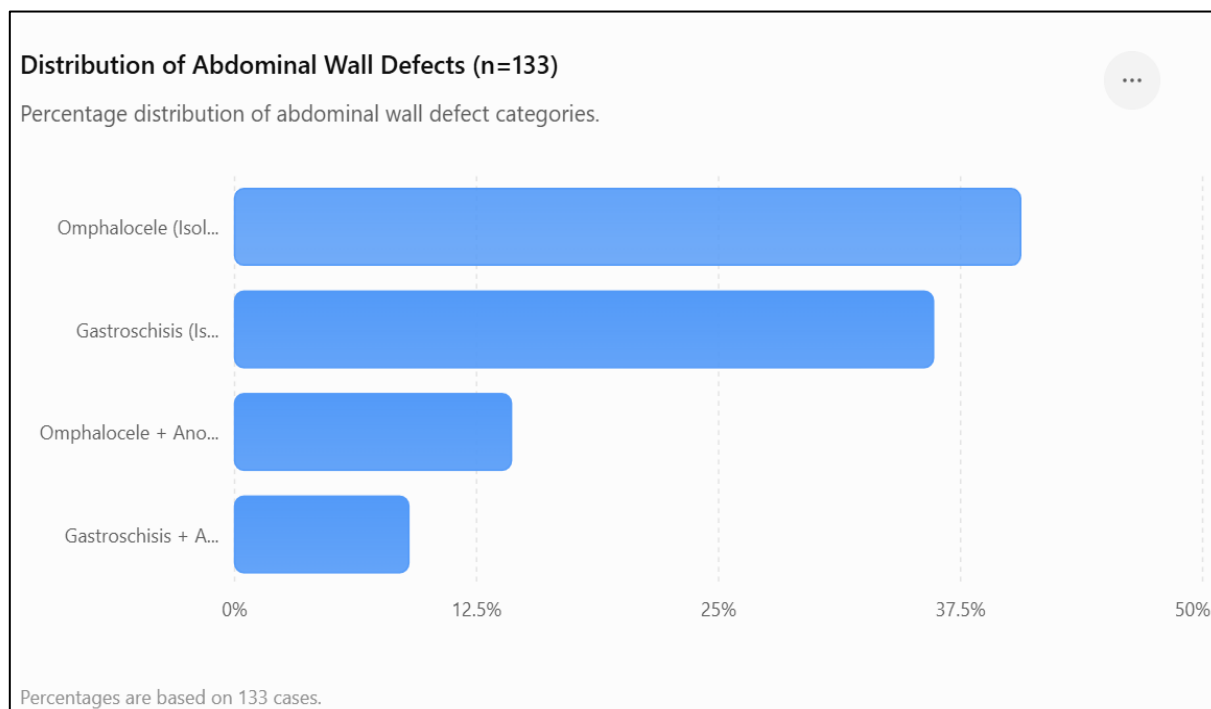
➤ *Chart and Visual Representation of Defects*

Fig 1 Chart and Visual Representation of Defects

➤ *Bivariate Analysis of Associated Factors*

Bivariate testing explored the relationship between maternal/neonatal variables and the severity/type of abdominal wall defects:

Table 3 Bivariate Analysis of Associated Factors

Factor	Chi-Square (χ^2) Value	Degrees of Freedom (df)	p-value	Statistical Inference
Maternal Age	6.421	2	0.040	Significant ($p < 0.05$)
Parity	5.812	2	0.054	Not Significant
Gestational Age	9.345	1	0.002	Highly Significant ($p < 0.01$)
Antenatal Care Visits	4.120	1	0.042	Significant ($p < 0.05$)
Hospital Presentation Delay	11.230	2	0.001	Highly Significant ($p < 0.01$)

V. DISCUSSION

The findings corroborate regional and international data indicating that gastroschisis and omphalocele impose significant burdens on neonatal intensive care units (Bielicki et al., 2021; Tiruneh et al., 2022). CHUK recorded the highest prevalence, reflecting its status as the primary national referral hub. Gastroschisis demonstrated significantly higher mortality and morbidity compared to omphalocele, largely

due to exposed, un-sacted bowel loops vulnerable to hypothermia, fluid evaporation, and bacterial contamination. Furthermore, delayed hospital presentation (>24 hours post-delivery) and prematurity were strongly correlated with adverse clinical outcomes, aligning with findings from Tiruneh et al. (2022). Neonatal nurses play a frontline role in mitigating these risks through immediate sterile bowel bagging, thermoregulation, and fluid resuscitation upon admission.

VI. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

➤ Summary

This study successfully evaluated the prevalence, structural classifications, and contributing factors of abdominal wall defects among 133 neonates admitted across CHUK, KFH, and RMRT. The results highlight that omphalocele and gastroschisis are prevalent congenital anomalies associated with substantial clinical vulnerability.

➤ Conclusion

Abdominal wall defects represent a major neonatal emergency in Rwanda. Gastroschisis carries a markedly higher fatality rate than omphalocele. Maternal age, gestational age, and delayed arrival at tertiary facilities are critical determinants of survival.

➤ Recommendations for Further Research

Based on the study findings, the following actionable recommendations are proposed:

- Clinical Protocol Enhancement: Establish standardized, immediate pre-referral stabilization guidelines (such as sterile bowel bagging and fluid warmers) in district hospitals across Rwanda.
- Neonatal Nursing Capacity Building: Implement specialized training programs for NICU nurses focusing on fluid management, infection control, and post-surgical care for infants with ventral wall defects.
- Future Research Directions:
 - ✓ Conduct prospective longitudinal studies investigating long-term nutritional and developmental outcomes of children surviving surgical repair of gastroschisis and omphalocele in sub-Saharan Africa.
 - ✓ Investigate specific environmental and micronutrient risk factors (such as folic acid intake and maternal dietary patterns) associated with the rising incidence of congenital abdominal wall defects in the region.

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