Case Report

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Risk Factors and Hospitalization Outcome of Intrauterine Growth Retardation in the Neonatal Units of the Buea and Limbe Regional Hospitals

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Abstract

Background: Fetal growth and development are a significant milestone for adequate Intrauterine Growth (IUG) being crucial for healthy pregnancies. Intrauterine Growth Restriction (IUGR) occurs when a foetus fails to reach its genetic growth potential, resulting in small for gestational age, a leading cause of low birth weight in neonates and affects approximately 10-15% pregnancies world-wide. The aim was to determine the prevalence, risk factors and hospitalisation outcome of intrauterine growth retardation in the neonatal units of the Buea and Limbe Regional Hospitals.

Method and Materials: The study employed a cross-sectional descriptive and analytical study design. Participants included postpartum mothers and neonates (0-28 days) admitted from December 2023 to May 2024 at the neonatal units of the Buea and Limbe Regional Hospitals. Socio-demographic characteristics, anthropometric parameters, obstetric/social history and hospitalisation outcome were recorded using a consecutive sampling technique. Data was analysed using SPSS version 25 and results were presented using frequency, percentages and charts and odd ratios.

Results: Out of 260 neonates recruited, 91 were diagnose for IUGR, giving a prevalence of 35%. Most mothers (33.7%) where aged (20 and 29 years). Majority of the babies were females (56%), born at term (54.9%) and preterm (45.1%). IUGR was strongly associated with a medical condition during pregnancy, intrauterine growth screening and labour complications, with p-values < 0.05. Neonatal complications included sepsis (27.5%), jaundice (24.2%), birth asphyxia (19.8%), hypoglycaemia (13.1%), spina bifida (2.1%), congenital heart defect (2.1%), club foot (3.2%) and neuroblastoma (1.1%). Hospitalization outcomes included 79.1% discharge, 11% mortality and 9.9% referrers.

Conclusion: The prevalence of IUGR remains high in our setting with mother's level of education, medical complications and alcohol consumption identified as risk factors significantly associated with IUGR occurrence. Most of the IUGR neonates experienced simple outcome, yet others needed advanced care and others died.

Keywords: Intrauterine Growth Retardation; Prevalence; Risk Factors; Outcome; Buea and Limbe Regional Hospital

Introduction

Foetal growth is known to be an important predictor of pregnancy outcome and it reflects the interaction between physiological and pathological factors influencing the foetus [1]. Therefore, Intrauterine Growth Retardation (IUGR), also known as "intrauterine growth restriction" or "Foetal Growth Restriction" (FGR), is a term applied to a condition of poor growth of foetus

in utero. This condition results in an "infant small for gestational age" (that is, infants who are smaller or less developed than normal for gestational age and sex). They are also classified as "dysmature infants," a term used to describe a baby born with characteristics indicating delayed growth within the womb.

Intrauterine growth retardation is the most common cause of low birth weight [2]. The "normal" neonate is one whose birth weight falls on the growth curve between the 10th and 90th percentile as per the gestational age, sex and race. As such, IUGR is present in a neonate when birth weight is less than the 10th percentile of the average for a given gestational age, with clinical features of in utero growth retardation [3]. This refers to the classification of a newborn's weight in relation to the average weight of infants at a given gestational age and sex. Thus, the definition of Intrauterine Growth Restriction (IUGR) refers to a condition in which the foetus is unable to achieve its genetically determined potential size and it represents a deviation and reduction in the expected foetal growth pattern [4].

Intrauterine Growth Retardation (IUGR) is a public health problem that has been noted to affect approximately 10-15% of pregnant women worldwide [5]. In 2006, the World Health Organisation (WHO) estimated 95% of the 24 million annual births with IUGR occurring in developing countries, with prevalence of 10 to 20% in Africa, while in Europe it oscillates between 2 and 5% [6]. In Nigeria IUGR reports prevalence 5.5%, while Cameroon, reports a prevalence of 5% [7].

The underlying mechanism of IUGR is uteroplacental insufficiency or placental dysfunction, which is characterised by an abnormally implanted placenta or placental injury that impairs the delivery of oxygen and nutrients to the foetus during gestation [8]. During pregnancy, nutrients and oxygen act as fuel for the foetus' growth and development. As a result, inadequate nutrient supply to the foetus in utero causes growth retardation.

Potential causes of IUGR include fetal factors such as chromosomal abnormalities, multiple pregnancies, in-born error mechanisms and maternal factors, which include the age of the mother, maternal health, behavioural habits such as smoking and alcohol consumption, nutritional deficiencies and maternal infections [3]. Therefore, there are predominately two types of IUGR, namely asymmetrical IUGR (malnourished babies) and symmetrical IUGR (neonates smaller than expected for their gestational age due to underdeveloped or smaller organs and body parts) [3]. The identification of IUGR is commonly made during the antenatal period; however, some of these foetuses, especially if unscreened during pregnancy, may be detected only in the newborn period immediately after delivery by using clinical examination and anthropometry parameters [9,10].

Neonates with IUGR face several complications, such as intrapartum asphyxia, hypoglycemia, low Apgar scores, growth delay, neurological impairment and respiratory distress [11]. Intrauterine growth retardation is a significant public health concern because of its association with numerous health complications for infants and long-term implications for growth and development. Research has shown that IUGR is an important contributor to neonatal morbidity and mortality, as it increases the risk of neonatal complications and stillbirth [12]. The Limbe and Buea regional hospitals indicate the occurrence of IUGR, but little is documented. However, it is necessary that further studies be carried out on this subject with objective of determining the prevalence, risk factors and hospitalisation outcome of intrauterine growth retardation in neonatal units of the Limbe and Buea regional hospitals. With the aim of proposing basic preventive strategies against IUGR, thus reducing neonatal morbidity and mortality.

Materials and Methods

A hospital-based cross-sectional descriptive and analytical study design, carried out at neonatal units of the Buea and Limbe Regional Hospitals (BRH and LRH) from December 2023 to May 2024. The prospective study permitted us to determine the associated risk factors and its subsequent hospitalisation outcome of IUGR in the neonatal units. These regional hospitals are the main referral secondary care centres found in the fastest-growing towns in the South-West Region. Buea is the regional headquarters of the southwest region. These hospitals serve as valuable study sites due to their regional representation, access to a diverse patient population and availability of healthcare services to newborns. Therefore, this makes it an ideal area to study the prevalence, risk factors and outcome of IUGR.

With an estimated sample size of 73 neonates with IUGR, a consecutive sampling method was used to include all postpartum mothers and their babies who gave consent to participate in the study and mothers who were critically ill were excluded. After

ensuring that the mothers understood the study purpose, procedures and confidentiality measures. A pretested data collection form was used to collect basic Information. The data collection form consisted of the following sections: Section A: Neonatal information (Age, gender, weight, length, head and arm circumference at birth) and maternal information (Gestational age, Body Mass Index (BMI) address, occupation, education, marital status, pregnancy duration, delivery mode, pregnancy complications, labor complications, smoking, alcohol, any known chronic diseases). Section B: Prevalence of IUGR and types of IUGR using anthropometric measurements. Section C; Mothers past medical history and Section D: Hospitalization outcome of IUGR (Progressive weight gain, discharge, complication or death). The collected data was exported to the Statistical Package for the Social Sciences (SPSS) software, version 25, for analysis. Bivariate analysis was performed using the chi square test to examine associations between the independent and dependent variables. Multivariate analysis using the logistic regression model and the odds ratio to identify the risk factors for intrauterine growth retardation was also done. All statistics were tested at the 95% confidence level and statistical significance was set at $p<0.05$.

Results

The total numbers of neonates recruited in this study were 260, of which 80 were from Buea Regional Hospital and 180 were from the Regional Hospital Limbe. Out of these 260 neonates, 91(35%) of them were diagnosed of IUGR, that is, 40 from BRH and 51 from LRH respectively as seen in Fig. 1.
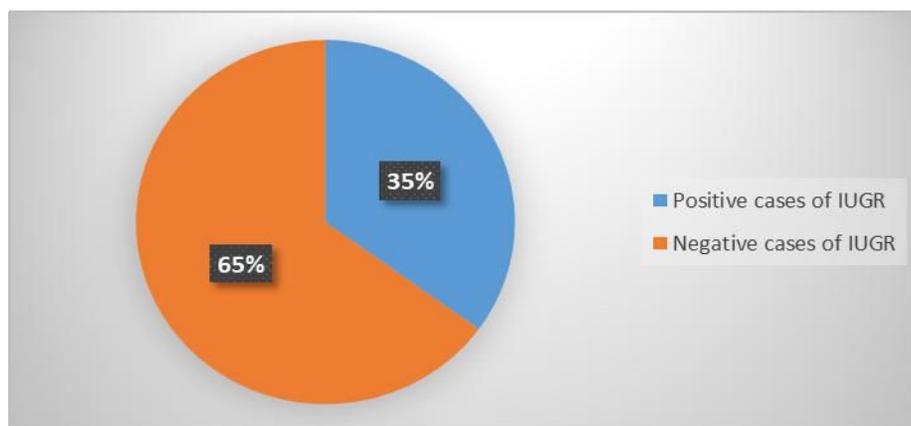

Figure 1: Prevalence of IUGR.

Using the anthropometric measurements of the newborns, the types of IUGR were identified. Out of these 91 cases of IUGR (n= 40; 44%) of them were at the Buea Regional Hospital of which (n=18;45%) were identified with the Assymetrical type of IUGR and (n=22; 55%) were identified with the Symmetrical type of IUGR as illustrated in Fig. 2. The numbers of cases with IUGR at the Regional Hospital Limbe were (n=51; 56%) of neonates out of 91, of which (n=30; 59%) were identified with the Asymmetrical IUGR and (n=21; 41%) were the Symmetrical type IUGR as shown in Fig. 2.
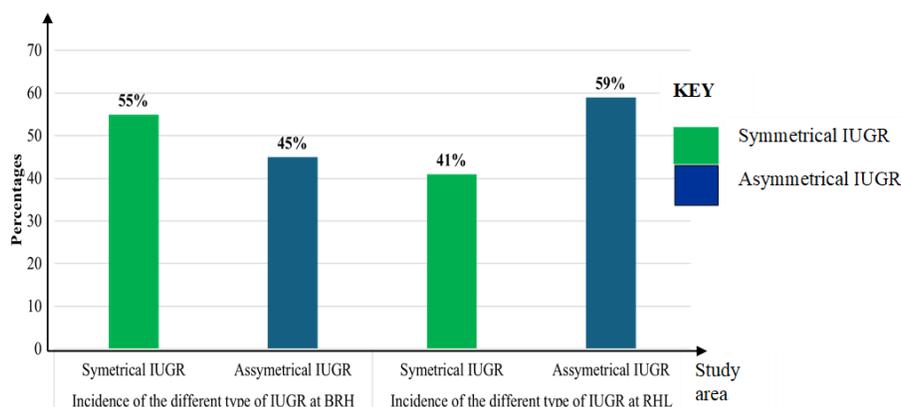

Figure 2: Different types of IUGR at Limbe and Buea regional hospitals.

Amongst the mothers (n = 85; 33.7%) were aged between 20 and 29 years. Those below the age of 20 accounted for (n = 46;15.7%). More than half of the women were married (n = 158; 60.8%). In terms of their occupation (n = 137; 52.7%) were self-employed and with respect to their educational level (n = 118; 45.4%) mothers, ended up at the secondary level, majority were Christians (n = 231; 88.8%) and resident in urban areas (n = 209; 80.2%) of the 91 neonates with IUGR, a greater proportion were females (n = 51; 56%), while 44% (n=40) were males. In terms of gestational age at birth (n = 48; 55.9%), were born at term whereas preterm babies were (n = 41; 45.1%). The most common mode of delivery was vaginal delivery (n = 51; 56%), followed by caesarean sections (n = 40; 44%). Upon admission (n = 45; 49.5%), were less than 7 days old.

On bivariate analysis, the relationship between IUGR in neonates and mothers' sociodemographic characteristics revealed a statistical significance between the mothers' address, level of education, occupation, marital status and religion. This was because the probability value for each of these factors was less than 0.05 (0.043, 0.035 and 0.022, respectively). The association between IUGR in neonates and the obstetric or medical history of mothers revealed associations with medical conditions during pregnancy, screening for intrauterine growth and labour complications, with P-values of 0.031, 0.037 and 0.013, respectively. The social history (alcohol consumption) of mothers and IUGR in neonates was significant with a P-value of 0.001. On the multivariate analysis, the risk factors significantly associated with IUGR in neonates were the mother's residents (rural), level of education, medical condition during pregnancy, screening for intrauterine growth, labour complications and alcohol consumption (Table 1). Probability of having babies with IUGR was about 6.264 times higher in women who took alcohol during pregnancy, 2.988 times higher in women who had medical conditions during pregnancy and 2.918 times higher in women who had labour complications, 1.739 times higher in women who lived in rural areas, 2.227 times higher in mothers who did not go for IUGR screening.

Variable	Category	IUGR Positive (%)	COR	95% CI for COR Lower	Upper	p value
Address	Rural	41	1.739	0.003	0.301	**0.031**
	Urban	50	1			
Education	No formal education	10	2.333	0.009	1.610	**0.042**
	Primary	21	1.913	0.004	1.980	**0.017**
	Secondary	35	1.562	0.019	1.765	**0.024**
	Tertiary	25	1			
Occupation	Employed	10	1.333	0.069	1.610	0.172
	Housewife	21	1.313	0.049	1.980	0.217
	Self Employed	35	1			
	Students	25	1.500	0.125	1.999	0.327
Medical Condition during Pregnancy	Yes	60	2.988	0.005	1.534	**0.040**
	No	31	1			
Screened for Intrauterine Growth	No	21	2.277	0.003	1.055	**0.042**
	Yes	70	1			
Labor Complications	Yes	61	2.918	0.005	1.534	**0.002**
	No	30	1			
Alcohol Consumption	No	71	1			
	Yes	20	6.264	0.007	1.214	0.027

Table 1: Factors associated with the occurrence of IUGR in neonates on multivariate analysis.

Regarding the hospitalisation outcome of neonates with IUGR, 79.1% of them were discharged from the hospital, 11% died and 9.9% were referred to another hospital due to some major complications. The majority of the neonates spent 7-21 days in hospital, while neonatal complications were as follows: sepsis (n = 25; 27.5%), followed by neonatal jaundice (n = 22; 24.2%), birth asphyxia (n = 18; 19.8%), hypoglycaemia (n = 12; 13.1%), spina bifida (n = 2; 2.1%), congenital heart defect (n = 2; 2.1%), club foot (n = 3; 3.2%) and (n = 1; 1%) neuroblastoma (Fig. 2, Table 2).

Variables	Categories	Frequency(n=91)	Percentage (%)
Duration of Hospitalization (in days)	<7	19	20.9
	Jul-21	48	52.7
Neonatal complications	>21	24	26.3
	Birth asphyxia	18	19.8
	Hypoglycemia	10	11
	Neonatal Jaundice	22	24.2
	Respiratory distress	8	8.7
	Sepsis	25	27.5
	Spina bifida	2	2.1
	Congenital Heart defect	2	2.1
	Club foot	3	3.2
	Neuroblastoma	1	1.1
Discharged	Yes	72	79.1
	No	19	20.9
Dead		10	11
Referred		9	9.9

Table 2: Hospital outcomes.

Discussion

This study revealed that most of the mothers were aged between 20 and 29, married, self-employed, educated to secondary level, Christians and residents of urban areas. These findings were like a study in India, where the prevalence of IUGR in the study population was seen in age-group mothers between 20 and 29 years [13]. This illustrates a complex interplay of age, social, economic and educational background as contributing factors for IUGR. However, this was contrary to the previous Cameroonian study, where the study population was mothers less than 20 years old [7]. Among the IUGR cases in our study, we found out that more females, born at term, were affected by IUGR than males. Reasons for this gender disparity could be multifactorial, including differences in genetic and hormonal influences that may predispose females to IUGR more than males. This was contrary to a study by Evenly, et al., whose ffindings revealed more males born with IUGR [7] and with a study carried out by Eman, et al., whose findings reported both male and female newborns equally affected by IUGR [14].

Overall, more cases of IUGR babies in our study were delivered by the normal vaginal method of delivery than by a caesarean section. This could be justified by inadequate prenatal care attendance during pregnancy for early identification and interventions because regular prenatal check-ups and early screening for IUGR helps in identifying potential risk factors and make informed decisions about the mode of delivery, thus reducing foetal distress and, hence, neonatal complications and mortality. This is similar with the study of Shavit, et al., while it disagrees with an Indian study in which, caesarean section delivery predominated over normal vaginal delivery in IUGR-affected neonates [13,15].

Intrauterine growth retardation refers to a condition in which the foetus is unable to achieve its genetically determined potential size and it represents a deviation and reduction in the expected fetal growth pattern [4]. Therefore, the prevalence of IUGR in this study was analysed based on the anthropometric parameters of neonates. Critically taking into consideration birth weights less than 10 percentile for gestational age.

Our study found a 35% prevalence of IUGR among neonates admitted to the neonatal units of the Buea and Limbe regional hospitals. This rate is significantly high compared to global averages, which typically range between 10% and 15% in developing countries.

In a previous Cameroonian study, conducted by Evelyn, et al., on the frequency of Intrauterine Growth Retardation (IUGR) and its associated risk factors at the neonatology unit of the Yaoundé Gyneco-Obstetric and Paediatric Hospital (YGOPH) from

January 2009 to December 2013, the prevalence was 5% [7]. This discrepancy can be explained by the differences in methodology and location of study. This was a prospective cross-sectional study that took place in the neonatology units of the Buea and Limbe regional hospitals, where anthropometric parameters of neonates admitted were recorded, while that of Evelyn, et al., was a retrospective study carried out using neonatal files from past archives. In a study in Ethiopia the prevalence of IUGR was 23.5% with similar reports in Karachi, with prevalence of 24.4% and Malawi 20.3% prevalence of IUGR [5,16,17]. The higher prevalence in this study area may reflect underlying socioeconomic and healthcare disparities, as similar trends have been observed in a study in Nigeria, which found a 22% prevalence of IUGR, closely linked to maternal malnutrition and a lack of antenatal care [18]. These studies highlight the multifaceted aetiology of IUGR and the need for comprehensive maternal health strategies.

Usually, IUGR is categorised into two types, namely the asymmetrical and the symmetrical. The asymmetrical IUGR is typically characterised by normal anthropometric characteristics but a reduction in weight, often due to placental insufficiencies that occur in later stages of gestation, while the symmetrical IUGR, on the other hand, involves a uniform growth restriction in all parameters, often results from early gestation and involves pregnancy issues like maternal infections or chromosomal abnormalities. Results from the Buea Regional Hospital reveals that 40 out of 91 IUGR recorded cases constituted 44%. Of these, 55% were identified as the symmetrical type of IUGR, against 45% identified as the asymmetrical type of IUGR. This contrasted with results from Regional Hospital Limbe, where 56% accounted for the total IUGR cases. Of which, the asymmetrical type IUGR (59%) predominated against the symmetrical type IUGR (41%). This could be justified by the variations in health care practices, screening protocols and prenatal care services between the two hospitals. In our study, it was revealed that LRH focuses more on detecting and managing conditions like maternal malnutrition and chronic diseases early in pregnancy, which may result in detecting the asymmetrical type of IUGR more frequently. In contrast to BRH, which emphasises other aspects of prenatal care and has differences in population health characteristics where, the symmetrical IUGR is often detected.

These results align with findings from Nigeria with an overall IUGR prevalence of 22%, with 60% being asymmetrical and 40% symmetrical, reflecting similar trends in the asymmetrical dominance observed in Limbe [1]. This also agrees with a Cameroonian study with similar trends in India emphasising the influence of regional health practices and maternal conditions [7,13].

Living in rural areas was associated with a higher risk of IUGR (COR: 1.739). This finding was consistent with a study in rural India indicating inadequate healthcare infrastructure and maternal education as key factors influencing the occurrence of IUGR, indicating that rural residence are often associated with limited access to healthcare, poor nutrition and higher rates of maternal infections, all contributing to IUGR [19]. Low educational levels among mothers was significantly associated with higher IUGR rates. Education influences health behaviours, access to healthcare and nutritional knowledge, all of which are crucial during pregnancy. These results are in line with a study in Nigeria that reported that maternal education significantly impacts neonatal outcomes, including the risk of IUGR [20]. Maternal medical conditions and labour complications were risk factors for IUGR in our study. This aligns with findings from various studies, such as those in Brazil, where maternal medical issues significantly increased the likelihood of IUGR [9]. Mothers who did not undergo IUGR screening were 2.227 times more likely to have neonates with IUGR. Early detection through routine screenings can lead to timely interventions, reducing the risk and severity of IUGR.

In our study, mothers who consumed alcohol during pregnancy had a 6.264 times higher probability of having neonates with IUGR. Alcohol interferes with placental function and foetal development, as evidenced by the studies of Jose, et al., who reported alcohol consumption as a major risk factor for IUGR and women who excessively consumed alcohol during pregnancy are 4.21 times more likely to have complications [21].

The discharge rate of 78.6% is relatively high, suggesting that the majority of IUGR cases and their complications were managed effectively enough to allow the neonates to go home. This aligns with findings from a study conducted in South Asia, which reported a discharge rate of approximately 75% for IUGR neonates, where appropriate medical interventions, including nutritional support, temperature regulation and infection control, significantly improve the chances of discharge for IUGR neonates [22]. The mortality rate of 11% minimises the severe risks associated with IUGR. Neonates with IUGR are at higher risk of mortality due to complications such as hypoxia, hypoglycaemia and infections. This rate is consistent with a study in Nigeria,

where the mortality rate was 12% among IUGR neonates [20]. Therefore, IUGR significantly increases neonatal mortality rates, emphasising the critical need for early detection and intensive care for these infants. A systematic review on mortality and morbidity of IUGR carried out by Anouk, et al., reported 8% neonatal death [23]. Conversely, in rural areas of sub-Saharan Africa, where healthcare resources are limited, mortality rates can exceed 20% for IUGR neonates, highlighting disparities in healthcare access and quality [11].

Conclusion

Our findings revealed a high burden of IUGR in both Buea and Limbe hospitals, with varying distributions between asymmetrical and symmetrical types. Risk factors for IUGR included inadequate levels of a mother's education, maternal medical pathology during pregnancy, labour complications and alcohol consumption. Although the majority of IUGR neonates were discharged from the hospital alive, a significant proportion experienced severe outcomes, including mortality and hence the need for advanced care.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Data Availability Statement

Not applicable.

Ethical Statement

The project did not meet the definition of human subject research under the purview of the IRB according to federal regulations and therefore, was exempt.

Informed Consent Statement

Informed consent was taken for this study.

Authors' Contributions

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