Research Article

ISSN 2689-1085

Journal of Pediatrics & Neonatology

Factors Associated with Postnatal Growth Retardation in Neonates Born Preterm at the Yaoundé Gynaeco-Obstetric and Paediatric Hospital (YGOPH) in Cameroon

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Received: 29 Nov 2023; **Accepted:** 15 Feb 2024; **Published:** 24 Feb 2024

Citation: Mekone Nkwele I, Ndeh-Fofang N, Kago T, et al. Factors Associated with Postnatal Growth Retardation in Neonates Born Preterm at the Yaoundé Gynaeco-Obstetric and Paediatric Hospital (YGOPH) in Cameroon. J Pediatr Neonatal. 2024; 6(1): 1-4.

ABSTRACT

Introduction: *Premature newborns suffer from a variety of complications including postnatal growth retardation (PNGR). PNGR predisposes preterm infants to unfavourable neurodevelopmental growth and increased mortality and morbidity in adulthood.*

Materials and Methods: *This was a descriptive and analytical cross-sectional study with retrospective data collection at HGOPY over 8 months for premature newborns born in the January 2020 - April 2023 window. Sociodemographic and clinical data from birth and during follow-up were collected. SPSS version 23.0 was used for data analysis. Multivariate analysis using the logistic regression model established associated factors with an Odd Ratio interval of 95% and a significant value of p< 0.05.*

Results: *228 preterm neonates were included with a median corrected gestational age of 32 [31-34] weeks of amenorrhoea. The mean birth weight was 1547 ± 362.84 g. The main route of initial nutrition was enteral (65.4%). At 40 weeks' gestation, the mean weight was 2909.85 ± 735.17 g. The prevalence of postnatal growth retardation was 46.9%. The most significant factors associated with growth retardation were low birth weight [OR: 3.71 (95% CI: 1.82-7.51); p<0.001] and birth weight less than 1500 g [OR: 2.22 (95% CI: 1.30-3.80); p= 0.002].*

Conclusion: *The burden of postnatal growth retardation was significant in our study. Risk factors associated with this condition included low birth weight and birth weights below 1500g.*

Keywords
Preterm birth, Postnatal growth retardation, Prevalence, Risk factors.

Introduction
Preterm births (PTB) according to WHO, are all births before 37 completed weeks of gestation or fewer than 259 days since the first day of a woman's last menstrual period and are a public health problem accounting for over 15 million births born annually before term. Prematurity, to this day, is the leading cause of neonatal morbidity and mortality [1,2]. Despite recent improvements in infrastructure for more adequate healthcare and management, the risk of neonatal demise is still significant in certain countries [3], especially in critical patients such as infants with low birth weight

or associated comorbidities in preterm [4]. Postnatal growth retardation is defined as a dip in weight of a preterm neonate >1 standard deviation (SD) between birth and discharge [5] or a weight beneath the 10th percentile or less than -1.28SD on intrauterine growth curves at discharge [6]. Postnatal growth restriction is common in preterm neonates and if poorly managed, can contribute to serious health concerns such as long-term neurodevelopmental impairment [7]. Our study aims at determining the prevalence of postnatal growth retardation and identifying factors associated with, it to propose preventive measures and contribute to intact survival of Low-Birth Weight (LBW) preterm infants.

Materials and Methods

The study was a descriptive and analytical cross-sectional study with retrospective and prospective data collection. It was carried out at the neonatology unit of the Yaoundé Gynaeco-Obstetric and Paediatric Hospital (YGOPH) over eight months precisely from November 1st, 2022, through June 1st, 2023. Recruitment of data covered 52 months from January 1st, 2019, through April 30th, 2023. The study population was preterm infants (22≤ Gestational Age (AG) <37 weeks) born between January 2019 and April 2023 at the YGOPH. Consecutive and exhaustive data sampling was used according to the gestational ages of the neonates at birth. To estimate the sample size, the following equation was used $n = \frac{p(1-p)Z^2}{e^2}$ where p was estimated at 0.73 giving us a minimum sample size of 75 [8]. 228 neonates were included in this study. After securing administrative authorisation and ethical clearance from the Institutional Ethical Review Board of the University of Yaounde I (Ref N° 0109/UY1/FMSB/VDRC/DAARC/CSD of 12 May 2023) data was collected using a collection sheet filled by the investigator. Data collection was done in compliance with ethical considerations and confidentiality. Verbal consent was obtained from parents and guardians preceding data collection in prospective cases. Data analysis was done using SPSS version 23 and logistic regression was used to establish association between variables. The Odd Ratio was calculated within a confidence interval of 95% and a value of P< 0.05 was considered significant.

Results

The median corrected gestational age was 32 weeks of amenorrhea, with extremes of 25 and 36 weeks of amenorrhea. Female neonates were the majority (60.5%), with a sex ratio of 0.65 (Table 1). The Apgar score of the neonates born preterm was ≥ 7 in 85.1% of the cases. The mean birth weight was 1547.98 ± 362.84 g, with extremes of 750 and 2480 g. Small for gestational age, and respiratory distress were common in 20.2%, and 28.5%, of the population respectively (Table 2). Enteral feeding was the main route of nutrition, accounting for 65.4% of cases. The time to switch to enteral feeding was less than or equal to 48 hours in most cases (77.2%) and breast milk was the most common milk used (Table 3). The mean weight at 40 weeks corrected gestational age was 2909.85 ± 735.17 g, with extremes of 1290 and 4950 g. Postnatal growth retardation was prevalent in 107 neonates representing 46.9% of the population (Table 4). Significant risk factors identified included birth weight below 1500g and being small for gestational age at birth, increasing the risk of PNGR by 2 and 4 times respectively (Table 5).

Table 1: Sociodemographic Characteristics of the Population.

Variables	Numbers (N=228)	Percentages (%)
Corrected gestational age at birth (weeks)		
< 28*	6	2.6
[28-32[**	68	29.8
[32-35[***	124	54.4
[35-37[****	30	13.2
Gender		
Male	90	39.5
Female	138	60.5

*Extreme prematurity; **Very preterm; ***Moderate preterm; ****Late prematurity

Table 2: Population Distribution by Clinical Characteristics at Birth.

Variables	Frequency (N=228)	Percentages (%)
Apgar score at 5th minute		
< 7	34	14.9
≥ 7	194	85.1
Birth weight (g)		
< 1000	10	4.4
[1000-1500]	88	38.6
[1500-2000]	97	42.5
[2000-25000]	33	14.5
Small for GA		
Yes	46	20.2
No	182	79.8
Respiratory distress		
Yes	65	28.5
No	163	71.5

Table 3: Population distribution by mode of nutrition.

Variables	Numbers (N=228)	Percentages (%)
Mode of initial nutrition (N=228)		
Enteral	79	34,6
Parenteral	149	65,4
Type of feeds (N=228)		
Breast milk	185	81,1
Breast milk substitute	43	18,9

Table 4: Weight Distribution at 40 weeks of Corrected Gestational Age (GA).

Variables	Numbers (N=228)	Percentages (%)
Weight at 40 weeks corrected GA (g)		
[1000-1500]	3	1.3
[1500-2000]	15	6.6
[2000-2500]	49	21.5
[2500-3000]	57	25.0
[3000-3500]	60	26.3
[3500-4000]	23	10.1
≥ 4000	21	9.2
Postnatal growth restriction		
Yes	107	46.9
No	121	53.1

Table 5: Factors Associated with Postnatal Growth Retardation.

Variables	Postnatal growth retardation		OR [CI at 95%]	p-value
	Yes N=107; n (%)	No N=121; n (%)		
Gender				
Male	46 (51.1)	44 (48.9)	1.32 (0.78-2.25)	0.188
Female	61 (44.2)	77 (55.8)	0.76 (0.45-1.29)	
Birth Weight				
<1500g	57 (58.2)	41 (41.8)	**2.22 (1.30-3.80)**	**0.002**
≥1500g	50 (38.5)	80 (61.5)	1	
Types of prematurity				
Extreme prematurity	5 (83.3)	1 (16.7)	5.88 (0.68-51.17)	0.080
Very preterm	27 (39.7)	41 (60.3)	0.66 (0.37-1.17)	0.100
Moderate preterm	57 (46.0)	67 (54.0)	0.92 (0.55-1.55)	0.427
Late preterm	18 (60.0)	12 (40.0)	1.84 (0.84-4.01)	0.090
Neonatal Comorbidities				
Resuscitation	50 (52.1)	46 (47.9)	1.43 (0.84-2.42)	0.116
Small for GA	33 (71.7)	13 (28.3)	**3.71 (1.82-7.51)**	**< 0.001**
Post natal complications				
Respiratory distress	34 (52,3)	31 (47,7)	1.35 (0.76-2.41)	0.189
Neonatal sepsis	91 (47.2)	102 (52.8)	1.06 (0.51-2.18)	0.512
Jaundice	18 (41.9)	25 (58.1)	0.78 (0.39-1.52)	0.285
Neonatal asphyxia	15 (55.6)	12 (44.4)	1.48 (0.66-3.32)	0.226
Hypoglycaemia	1 (50.0)	1 (50.0)	1.13 (0.07-18.32)	0.719
Mode of initial nutrition				
Enteral	38 (48.1)	41 (51.9)	1.08 (0.62-1.86)	0.452
Parenteral	69 (46.3)	41 (51.9)	1	
Type of feeds				
Breast milk	84 (45.4)	101 (54.6)	0.72 (0.37-1.41)	0.215
Breast milk substitute	23 (53.5)	20 (46.5)	1	

Discussion

This was a retro-prospective, cross-sectional study aiming to describe the sociodemographic and clinical profile, calculate the prevalence of postnatal growth retardation in neonates born preterm at the YGOPH, and identify associated risk factors. The bulk of our population was made of moderate neonates born preterm representing approximately 55% of the total patient population and with a median age of 32 weeks of corrected GA. This is similar to the results published in Uganda and Morocco, which had a mean corrected GA of 31 weeks [9,10]. This may be because, given the low resource setting in Africa, very few neonates born before 32 weeks of GA survive beyond the neonatal period. There was a marked disparity in the genders of the preterm population, with a total female percentage of 61%. From these results, we can either deduce that there were more female preterm births or that female preterm neonates survived longer. As expected, on further investigation more female neonates had PNGR (57%) when compared with their male counterparts. The gender profile closely resembles that in publications from Senegal with a ratio of 60% [11] and from Brazil with 51% [12]. The mean birth weight was 1547.98 ± 362.84 g and 20.2% of the population were small for the corresponding gestational age. This result correlates with the findings of previous studies carried out in this hospital in 2016 with a mean weight of 1390g [13] and in 2022, with a mean of 1469g [14]. Very few neonates either with APGAR scores <7 (14.9%), SGA neonates (20.2%), or respiratory distress at birth (28.5%) survived till 40 weeks of gestation. This can be expected, given the lack of adequate resources to enhance survival in this group. Concerning nutritional practices, initial nutrition was done enterally by NGT with breastmilk in 34.6% of the population. Those who initially started with parenteral nutrition accounted for 65.4% (N=149) of the population. From this number, 77.2% were introduced to enteral feeds in the first 48 hours whilst 22.8% were started after 48 hours. Exclusive breast milk was provided as enteral feed in 81.1% (N=185) of our population and 18.9% (N=43) were on either a breast milk substitute or mixed feeding. Of 228 preterm neonates, 107 were born with PNGR giving us a prevalence of 46.9%. Studies in Uganda reported having 80% of their population initiated on enteral feeds in the first 48 hours [9] while others had an average initiation time beyond 48 hours [15]. The absence of complete parental nutrition may explain the urgency for enteral nutrition in our context.

The risk for PNGR was multiplied by as much as 4 when the neonates were SGA at birth and doubled when the infant was less than 1500g. We hypothesised various reasons for this. Firstly, the intersecting point between SGA neonates and neonates <1500g is the time to reach full enteral feeding (180-200ml/kg/day). These neonates generally require longer periods of parenteral feeding with enteral feeds starting as low as 10ml/kg/day, and heavy supplementation intravenously. In our context, parenteral nutrition is mainly made of glucose, and virtually no proteins and lipids. This means that these neonates may have been exposed to malnutrition during the first weeks of life, which might have had a detrimental effect on their growth. Moreover, SGA neonates equally have organs that mirror their state of being small for gestation and as such, the burden of prematurity, which on its own is a risk for growth failure, is multiplied. On the maternal side, we may suggest that conditions predisposing the newborn to hypotrophy at birth may be indirect prenatal causes of PNGR. They can be sociodemographic causes (Low social and economic status, single motherhood, and genetic predisposition to small sizes) as well as medical (anaemia and other haemoglobinopathies, toxaemia and hypertensive disorders in pregnancy, substance abuse and other systemic disorders). Our results are not isolated, as various studies have shown. The results of the study published in Senegal closely resemble the results in our study, with a significant correlation between birth weight <1643g (P=0.04) that is very close to 1500g in value and intra-uterine growth retardation (IUGR) (P=0.003) [11,14]. These studies further ascertained that IUGR was the most significant risk factor associated with PNGR with a p<0.001[11]. A study in Spain equally shows that all but one of the neonates with IUGR eventually developed PNGR [15]. In another study carried out in China, SGA was equally found to be an independent risk factor for PNGR. They even suggest further that, an LBW with a greater GA, male gender or associated BPD may even worsen PNGR [16]. On adjusted analysis, the study in Brazil equally reported having SGA as the variable with the greatest impact when it comes to PNGR in neonates born preterm [12]. Given the results from other authors, we can conclude that SGA has a significant role to play when it comes to postnatal growth. However, various study types must be tried in our setting to confirm the findings of our study.

Conclusion

The prevalence of PNGR in this study was 46.9%. Being small for gestation (SGA) and having a birthweight < 1500g were significant risk factors for PNGR. Through this study, we can see that PNGR is common in the preterm population and various preventive measures have to be put in place to prevent this condition.

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