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Incidence And Factors Associated With Extra Uterine Growth Restriction In Preterm Infant On 4 Weeks Follow Up At Neonatology Unit Of Cmh Rawalpindi

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Abstract

Background: Extra Uterine Growth Restriction (EUGR) is an important problem in preterm infants because their developmental and metabolic processes are not fully developed. EUGR which is failure to grow appropriately after birth is associated with such later adverse consequences as developmental impairments and health problems.

Objectives: This study is to identify the incidence of EUGR in premature infants and determining the risk factors that lead to it based on assessment done after 4 weeks of follow up at the Neonatology Unit of CMH Rawalpindi.

Study design: A prospective study.

Palace and duration of study: Department of Neonatology CMH Rawalpindi from March 2024 to Jan 2024

Methods: Out on 150 preterm infants of gestational age of less than 37 weeks in CMH Rawalpindi. Growth parameters were taken at birth and thereafter at 2 and 4 weeks of age. EUGR was defined as weight below tenth percentile for corrected gestational age at four weeks. Regression analysis was then performed in order to determine the variables affecting EUGR.

Results: Among 150 preterm infants, 52 (34. 7%) infants were observed to have EUGR at 4 weeks of post birth. The incidence of bronchopulmonary dysplasia in premature babies was higher than in full-term babies, and was significantly higher in infants with low birth weight (< 1500g) (p = 0. 02, SD = 2. 8). Sepsis was also found to predict EUGR with the probability of 0. 03. Exclusive breast feeding was found to have a lower rate of EUGR compared to infants fed with formulas with the difference being statistically significant at p = 0. 04.

Conclusion: 150 preterm neonates showed that the overall prevalence of EUGR was 34. 7%. All the premature infants weighing ≤1500 grams, septic infants and those on formula feeding were found to be at higher risk of EUGR. Nutrition and infection control interventions in the initial phase of infants' lives could prevent early umbilical graft rejection and better results in preterm children.

Keywords: British Journal of Nutrition, EUGR, Preterm Infants, Growth Failure, Neonatology

Introduction

Apart from low birth weight, preterm birth, which is delivery that occurs before 37 completed weeks of gestation is responsible for a lot of morbidity and mortality among neonates globally. Technical prophylactic developments in neonatal health as well as obstetrics have contributed a lot to increased survival of preterm neonates especially the ELBW ones. However, these infants are still at risk of experiencing some health issues among which is the Extra Uterine Growth Restriction (EUGR) or Extra Uterine Growth Failure (EUGF). EUGR is defined as growth rates of below the 10th centile for weight for gestational age that occurs after birth especially for preterm infants [1]. Use of EUGR is equally a big risk among preterm infants and the findings revealed that EUGR is directly associated with poor neurodevelopment, deficit in learning capacity, and impaired general health in later years of life [2]. It is common for these infants to have complications with their feeding habits and their ability to absorb nutrients because of the underdeveloped gastrointestinal tract hence increase the growth risks associated with it. Aside from these physiological factors, environmental and healthcare associated factors including feeding strategy (breast milk vs. formula) and management of other related co morbidities (sepsis, respiratory distress syndrome) also affect the postnatal growth of both preterm infants in their neonatal period [3]. EUGR is not a constant phenomenon across the globe; it ranges from 40-50 % in V L B W and E L B W infants. EUGR is usually caused by a mismatch of the nutrient requirements of an infant and the capacity of the health system to provide these requirements particularly within a developing country context. Some of the nurtitional risks that pull towards EUGR include, low caloric intake, feeding complications, and long hospital stay [5].Neonates especially preterm ones rely on intravenous support in the first few days of life and progressing to oral feeding. However, any bottlenecks or problems involved in this process can greatly cause a set back to the growth of the infant [6]. Apart from feeding practices few other conditions like the RDS, BPD and neonatal sepsis are strong predictors of EUGR [7]. These conditions place additional metabolic requirements on the infant and makes it difficult even further to ensure that adequate growth is obtained. Therefore, controlling such conditions is very important in reducing the potentiality of growth failure. Nevertheless, the avoidance of the identified risk factors requires more localized studies to take into account the nature of healthcare systems of the countries like Pakistan, such as increased rates of preterm births due to growing risks associated with maternal diabetes, hypertension etc [8]. The purpose of this study is to determine the proportion of EUGR and the risk factors for development of EUGR in preterm infants during the subsequent four weeks' follow up in the Neonatology Unit of CMH Rawalpindi. To our knowledge, the present study aims at identifying and outlining the determinants of growth failure in preterm infants so that better care strategies and management of those infants could be recommended in order to minimize the occurrences of EUGR.

Methods

The present prospective observational study was carried out from jan 2023 to jan 2024 in the Neonatology Unit of CMH Rawalpindi. One hundred and fifty, preterm infants that were born before 37 weeks of gestational age were enrolled. Newborns with problems such as congenital anomalies, chromosomal disorders or severe genetic problems were not included. The anthropometric measurements of the growth parameters such as weight, length, and head circumference were taken soon after birth as well as at 2- and 4-weeks of corrected gestational age. The first and main endpoint was EUGR, which would be weight at 4 weeks below tenth percentile of expected weight for age, corrected for gestational age. Other data collected on feeding practices included breast feeding, formula feeding, or both; other co morbidities such as sepsia, newborn RDS, and IVH were also noted.

Data Collection

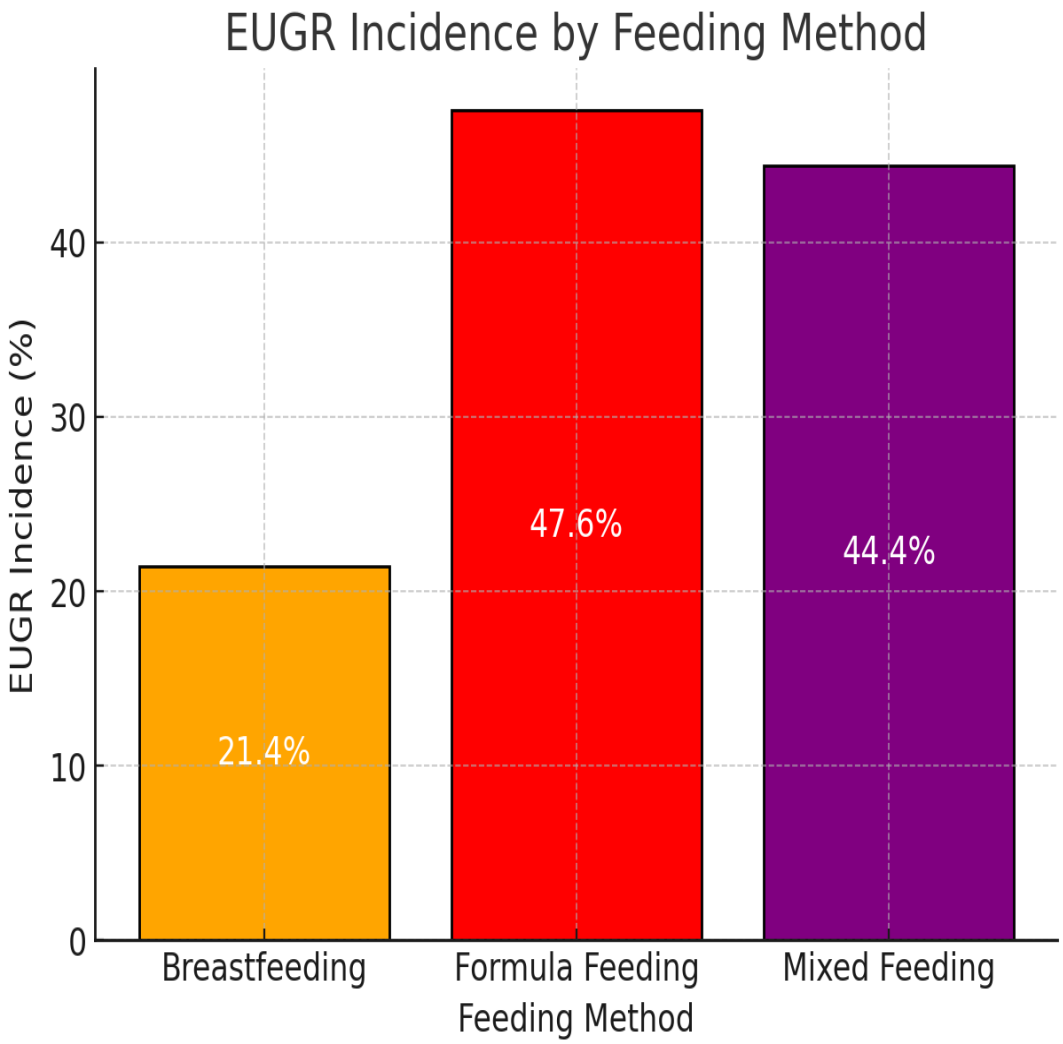
The demographic characteristics of the patients, their age, gestation period, birth weight and feeding regime as well as disease co-morbidity were obtained from their case files. Growth parameters were assessed using purchased electronic scale by the qualified healthcare practitioner at birth and subsequently at 2 weeks and 4 weeks of corrected age.

Statistical Analysis

All data were analyzed using the Statistical Package for the Social Sciences (SPSS version 24. 0). The data relating to the participants was analysed quantitative in nature and thus descriptive statistics was employed in the analysis of the data. EUGR was defined and the incidence of EUGR was calculated in percentage. Binary values were compared using Chi-square tests while independent t-tests were used in comparing two independent groups of continuous data. Confidence interval was set at 95% and p-value of < 0. 05 was adopted as significant.

Results

One hundred and fifty preterm infants were recruited for the study. EUGR was defined as weight less than the 10th percentile at 4 weeks; the EUGR rate at 4 weeks was 34. 7%, with 52 infants. The infants who eventually developed EUGR were born at a mean birth weight of 1. 35 kg (SD 0. 2) while the infants who did not develop EUGR had a mean birth weight of 1. 55 kg (SD 0. 15); p-value = 0. 01. The incidence of EUGR was higher with infants born at gestational age < 30 weeks and it was 60% (p = 0. 02) compared to infants born at 30-34 weeks (24. 6%) and > 34 weeks (14. 8%). Also, EUGR was significantly related to sepsis, 66. 7% of patients with sepsis had EUGR in comparison with 26. 7% of patient without sepsis p = 0. 03. Another factor was feeding method; the formula fed infants had a higher percentage of EUGR with 47. 6 as against the exclusively breast fed infants who had 21. 4, p = 0. 04.


EUGR Incidence by Feeding Method
EUGR Incidence (%)
0
10
20
30
40
21.4%
47.6%
44.4%
Breastfeeding
Formula Feeding
Mixed Feeding
Feeding Method

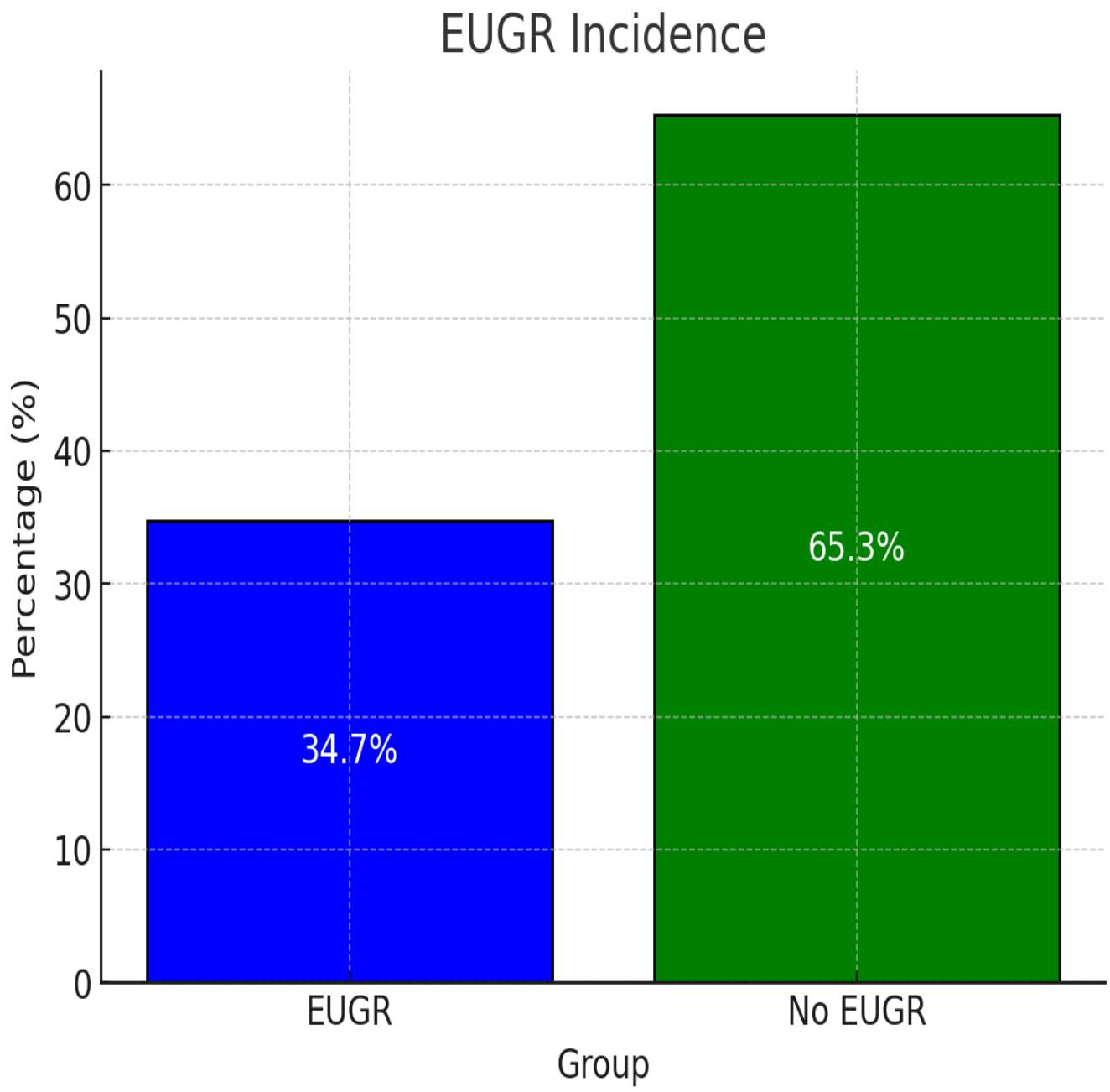


Table 1: Birth Weight and EUGR Incidence

Factor	Number of Infants	Mean Birth Weight (kg)	Standard Deviation
EUGR	52	1.35	0.2
No EUGR	98	1.55	0.15

Table 2: Gestational Age and EUGR Distribution

Gestational Age Group	Number of Infants with EUGR	Number of Infants without EUGR
<30 weeks	30	20
30-34 weeks	18	55
>34 weeks	4	23

Table 3: EUGR and Comorbidity (Sepsis)

Comorbidity	Number of Infants with EUGR	Number of Infants without EUGR	P-Value
Sepsis	20	10	0.03
No Sepsis	32	88	-

Table 4: EUGR and Feeding Method

Feeding Method	Number of Infants with EUGR	Number of Infants without EUGR	P-Value
Breastfeeding	15	55	0.04
Formula Feeding	25	28	-
Mixed Feeding	12	15	-

Discussion

As it has been established by the results of this study, Extra Uterine Growth Restriction (EUGR) is still a concern in the population of preterm neonates, since 34. 7% of the infants in this research suffered from it. These findings are similar to prior research, estimating EUGR prevalence between 25 and 50 percent — especially in VLBW and ELBW neonates [9,10] Most of the babies who developed EUGR were born preterm, with low birth weight, and those with other complications such as sepsis. This reflects the study by Ehrenkranz et al. (2016) who put it forward that, growth failure is even eminent among infants with low gestational age and birth weight since they are prone to poor absorption of nutrition and high metabolic load [11]. One of these was that the gestational age was a strong determinant of EUGR as shown in our research. Newborns born at less than 30 completed weeks of gestation had a higher proportion of EUGR than newborns >30 weeks, 60/88, (68%) vs 32, (45%), respectively. This is supported by Dusick et al (2019) who said that infants born at earlier gestational age are at a higher risk of growth failure because the immature gastrointestinal system is unable to provide enough nutrients that is required for proper growth to happen [12]. In the same vain, infants born at earlier gestational age have longer duration of PN dependency and delayed initiation of EN feeding which present growth problems. Sepsis as a co morbidity was also significantly related to development of EUGR in the present study as 66. 7% of the infants having sepsis were observed to have EUGR. This is in agreement with the literature, for instance, Stoll et al (2016) whose research showed that neonatal infections, more so sepsis, the chief cause of raised metabolic rates among preterm infants, which triggers growth failure [13]. It is known that sepsis results in hospital stays and dependent on the severity of the septic process would increase the need for ventilatory support as well as different challenges encountered in nutrition, which collectively leads to poor growth in the affected infants. Another factor that our study consequently identified was the method of feeding as the primary influential factor on the growth results. Formula fed infants had higher EUGR incidence of 47. 6% while exclusively breast fed infants had incidence of EUGR of 21. 4%. Such findings accord with Senterre and Rigo (2019) revealing that preterm infants receiving breast milk as compared to formulas exhibit improved long term growth profile when fortified [14]. Breast milk has many components and growth factors which are helpful to growing babies but not present in formula which hampers the growth and immunological development of the child. The advantages of breast feed at a younger age in preterm infants such as

improvement in growth has been affirmed and hence supports the protective impact observed in this study. Further, our findings are in concordance with previous studies showing that early nutrition and recommendations for breastfeeding among preterm infants can help to prevent EUGR. Lapillonne et al. (2018) also pointed the issue of applying individualised nutritional approaches, and Human Milk Fortifiers to adequately ensure sufficient nutrients for preterm infants and to avoid growth attenuation [15]. That our cohort of infants had a lower EUGR than previous reports and STGA further emphasises the need to continue promoting breastfeeding and achievement of good nutritional support for preterm especially the high risk infants. Therefore, it can be assumed that the results of the present study are consistent with other findings on factors determining EUGR in preterm infants such as LBW, early gestational age, sepsis, feeding practices. Efforts like enhancing infection control measures, enhancing promotion of breast feeding and enhancing nutritional support for preterm infants have a great potential in reducing EUGR incidence rates and improving the long term Growth in Preterm infants.

Conclusion

Preterm infants of low birth weight, who are borne at an early gestational age are more likely to suffer from Extra Uterine Growth Restriction (EUGR) and this is especially so in the presence of sepsis and when the infant is being fed on a formula. To improve growth outcomes of these children, there is need to identify infants who are at risk early and provide appropropriate nutritional and clinical interventional measures like promotion of breast feeding and treament of infections.

Limitations

Some of its drawbacks are that is a single-center study, therefore it can be of limited application to other people and populations. Also, the effects of growth development on preterm infants have not incorporated other features such as the socioeconomic status and health status of the mother.

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Authors Contribution

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Critical Review: **Inayat Ullah[4]**

Final Approval of version: **Rahman ullah[1]**

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