

Ponderal Index of Low Birth Weight Babies - a Hospital Based Study

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Abstract

Objective: To determine the ratio of disproportionate versus proportionate Intra uterine growth retardation among low birth weight babies using the Ponderal index.

Methods: This was a retrospective study .Medical records of babies with weight <2.5kg delivered in the Obstetric Department were reviewed. The ponderal index was calculated to determine disproportionate and proportionate intra uterine growth retardation among low birth weight babies.

Results: A total of 227 babies were included. Male and Female ratio was equal. Sixty seven percent were delivered vaginally. Only 12 mothers (5.3%) had a history of maternal illness.

Eighty nine low birth weight babies (39.9%) had a low ponderal index. Ponderal index in fullterm babies was <2.2 in 54.3% and in pre-term <2.0 in 34.9%.

Conclusion: Nearly 40% of low birth weight babies had disproportionate body proportions. This group of babies according to foetal origins of diseases may be predisposed to Diabetes, hypertension and coronary artery disease (JPMA 55:229;2005).

Introduction

The incidence of non-insulin dependent diabetes and coronary artery disease is increasing rapidly and is a global problem. One hundred and seventy million suffer worldwide from diabetes out of which 2/3rd are in developing countries. According to WHO estimates Pakistan has a high prevalence of diabetes and ranks 8th in the world but with the increasing numbers by 2025 it will rise to the 4th position.¹ The prevalence of hypertension in Asian countries is 15-35%.² Obesity and over weight in the 3rd and 4th decade of life have been reported in 6% and 15% of population in Pakistan respectively.³ This is in contrast to the high rates of malnutrition in children under 5 years of age in Pakistan. Thirty eight percent of children under 5 years of age are stunted and 13% are moderate-severely wasted.⁴ Pakistan also has very high rates of malnutrition at birth. Twenty five percent (4) of babies are low birth weight.

A lot of studies have been conducted which have highlighted the importance of decreased early fetal growth rates and subsequent development of diabetes.⁵ Several studies have documented an association between birth measurements and coronary heart diseases.^{6,7} Studies have also highlighted the association of low birth weight with hypertension during adult life.

Recently these associations have been attributed to 'thrifty phenotype' (foetal origins) hypothesis, which attribute uterine undernutrition to persistent metabolic and structural changes and subsequent development of type 2 diabetes and coronary heart disease.

Symmetric intrauterine growth retardation results from malnutrition persisting throughout pregnancy. Malnutrition in the second trimester produces a wasted infant i.e., low weight for height while a stunted infant is the result of malnutrition in the last trimester.⁸ A strong linear association of maternal wasting and all indices of foetal malnutrition at birth has been demonstrated in a community based study from Lahore.⁹

Keeping in view the high rates of low birth weight and increasing incidence of diabetes and coronary artery disease, it is important to focus on determining the patterns of body proportion in our population of small babies. Local data on this aspect is lacking.

Ponderal index is an indicator of wasting. It is determined by taking a ratio of the weight and length.

$$PI = \text{Weight (GM)} / \text{Length (CM)}^3 \times 100$$

Ponderal index values of < 2.0 between 29 and 37 weeks and <2.25 beyond 37 weeks are indicative of intrauterine fetal malnutrition.¹⁰ These babies are also known as disproportionate.

The purpose of this study was to determine the proportion of asymmetric (disproportionate) versus symmetric (proportionate) intra-uterine growth retardation among low birth weight babies using the ponderal index.

Methods

This was a retrospective descriptive study conducted by the Pediatric Department, Civil Hospital Karachi. Data from 1997-2002 was reviewed Babies delivered in the Obstetric Department are routinely examined in the first 24 hours of life. For the purpose of this study, the records of all babies with birth weight < 2.5 kg were included. The details of the maternal history and examination of the babies were recorded on a Proforma. The gestational age as determined by dates and using the Ballards scoring, was noted. By utilising the anthropometric measurements as noted in the records the ponderal index was calculated.

Low birth weight babies with low ponderal index were labeled as having asymmetrical IUGR. The ratio of disproportionate versus proportionate IUGR among low birth weights was then calculated.

Results

A total of 223 babies with birth weights <2.5 kg were included in the study. There were 107 males and 116 females. Fifty seven (25%) infants had a gestational age >37 weeks. One hundred and fifty (67.2%) were delivered by normal vaginal delivery. There was a history of maternal illness during pregnancy in 12 mothers (5.3 %). All the women belonged to a poor socio-economic class. Sixty six patients (29.5%) were primigravida while 38 (17.04%) were multigravida .

Eighty nine babies (39.9%) with low birth weight had a low ponderal index and by definition had disproportionate IUGR. The ponderal index in full term babies was <2.2 in 31 (54.3%) while 34.9% of preterm babies had a ponderal index of <2.0.

The ratio of disproportionate versus proportionate IUGR among full terms was 1.2:1 while in preterms it was 0.5:1

Discussion

Ponderal index is an effective and simple measure to identify wasting. In this study nearly 39.9% of the low birth weight babies were wasted at birth. This indicates disproportionate IUGR.

Mothers who have a poor nutritional status during pregnancy are more likely to have babies with IUGR.¹¹ Reduction in weight with preservation of length is associated with poor weight gain during pregnancy.¹² Severe nutritional insults in the last trimester also results in a low pon-

deral index.¹³ In this study the records of prepregnancy weight and weight gain during pregnancy were not available thus it was not possible to determine an association between low ponderal index and poor maternal weight gain.

Symmetric low birth weight babies accounted for 60.1% of the babies. Chronic under nutrition throughout pregnancy and intrauterine infections are largely responsible for symmetrically proportioned low birth weight babies. Proportionate LBW babies are commonly found in chronically undernourished populations.¹⁴

History of maternal illness was found in only 12 patients (0.05%). Due to the retrospective nature of the study evidence of intrauterine infection could not be documented.

The study highlights the large population of thin babies. This group of patients holds immense significance. According to the Barkers hypothesis such babies are at risk of hypertension,¹⁵ insulin resistance⁵ and coronary heart disease.¹⁶ Although no prospective studies have been done in our population of small babies, data attributes increase risk for these babies. These will add to the population of Diabetics and hypertensives in our population, which at present is 2.7 and 10.8 million respectively.¹⁷

This will not only increase the mortality and decreased lifespan but also the increased cost of care. Although we have not shown an association between nutritional status of mothers and thin babies, but given the nutritional status of our mothers and studies,¹⁸ which show relationship between maternal nutrition and infant body proportions at birth we can presume that antenatal monitoring, prepregnancy nutritional status and diet during pregnancy may influence the body proportions at birth.

Ideally prospective studies on low birth weight babies should be conducted to determine the factors operative in our babies and follow the risk of fetal origin of adult diseases.

References

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