Abstract

Objective: Fetal malnutrition is a condition that is mainly due to the poor health and nutrition of the mother during pregnancy. This condition can lead to an increase of chronic disease risk in neonates such as cardiovascular disease and diabetes in later life. Since, the prevalence of malnutrition in Iranian newborn infants has not been studied thus; this study was conducted with the aim of estimation of fetal malnutrition in Iranian neonates. Method: Length and weight of 1420802 Iranian newborn infant that born in 1393 were extracted from the Iran's Ministry of Health system. Neonates were divided into three groups, including preterm(less than 37 weeks gestational age), term (37-41 weeks gestational age) and post term (after than 41-weeks gestational age). Ponderal Index (PI) = (Weight (gr) ÷ Height (cm)^3) was calculated. Babies who PI was below 2.2 were considered as infants with fetal malnutrition. R software (Version 3.1.2) was used for statistical analysis. Results: PI of preterm, term, post term infants and total studied population was 2.43±0.613, 2.61±0.441, 2.66±0.467 and 2.56±0.458 respectively. 11% of total subjects had PI of less than 2.2. 31% preterm, 9% term and post term had also PI of less 2.2. Conclusion: Based on PI, prevalence of fetal malnutrition in Iranian neonates was 11%. The highest prevalence of fetal malnutrition was in preterm infants (31%) and the lower prevalence of fetal malnutrition was in term and post term infants (9%).

Key words: Fetal Malnutrition, Iranian Neonate, Ponderal Index

Introduction

Lack of diagnosis or proper assessment of the nutritional status of neonates at birth could lead to nutritional disorders, which adversely affect the development and health of infants (1). Anthropometric and physical indices of neonates upon birth provide an accurate evaluation of the nutritional status of newborns. On the other hand, anthropometric and physical indices could be applied in screening processes in order to determine the nutritional status of neonates (2). Calculation of PI is also simple and inexpensive method without the need for advanced medical equipment for screening of FM in neonates. Since, the prevalence of malnutrition in Iranian newborn infants has not been studied thus; this study was conducted with the aim of estimation of fetal malnutrition by PI in Iranian neonates.

Material and Methods

Length and weight of 1420802 Iranian newborn infant that born in 2014 were extracted from the Iran's Ministry of Health system. Neonates were divided into three groups, including preterm(less than 37 weeks gestational age), term (37-41 weeks gestational age) and post term (after than 41-weeks gestational age). Ponderal Index (PI) = (Weight (gr) ÷ Height (cm)^3) was calculated. Babies who PI was below 2.2 were considered as infants with fetal malnutrition. R software (Version 3.1.2) was used for statistical analysis.

Results

Results of the estimation of fetal malnutrition by PI in Iranian neonates are presented in the following Table.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>prevalence</th>
<th>PI</th>
<th>FM</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre term</td>
<td>100034</td>
<td>7.04%</td>
<td>2.43±0.613</td>
<td>31%</td>
<td>≤0.001</td>
</tr>
<tr>
<td>Term</td>
<td>1316346</td>
<td>92.64%</td>
<td>2.61±0.441</td>
<td>9%</td>
<td>≤0.001</td>
</tr>
<tr>
<td>Post term</td>
<td>4422</td>
<td>0.31%</td>
<td>2.66±0.467</td>
<td>9%</td>
<td>≤0.001</td>
</tr>
<tr>
<td>total</td>
<td>1420802</td>
<td>100%</td>
<td>2.56±0.458</td>
<td>11%</td>
<td>≤0.001</td>
</tr>
</tbody>
</table>

Based on PI, prevalence of fetal malnutrition in Iranian neonates was 11%. The highest prevalence of fetal malnutrition was in preterm infants (31%) and the lower prevalence of fetal malnutrition was in term and post term infants (9%).

Discussion

In case the gestational age and differences in the gender of neonates are not specified, standard growth curves cannot be used for the evaluation of nutritional status of infant. PI could be used in cases where data regarding the gestational age and gender of term infants are lacking (3).

Term infants with PI of <2.2 are normally diagnosed with FM. As such, specification of FM at the infant's bedside through the comparison of the PI with the standard value is considered an advantage for the accurate diagnosis of FM. As for preterm infants, some studies have considered this cut-off point for the diagnosis of FM, while some researchers have interpreted the PI of below the 10th percentile on the Lubchenco growth chart as the presence of IUGR and FM. According to the studies in which FM was diagnosed through determining PI, malnutrition had a lower prevalence compared to the standard methods used for FM calculation. This is because diagnosis of FM was based on the presence of IUGR in the infants, and in case of IUGR, the infant was diagnosed with FM. Considering that IUGR is categorized into two types of asymmetrical and symmetrical, PI could only identify neonates with asymmetrical IUGR (4). This is due to the fact that in neonates with asymmetrical IUGR, PI is lower compared to symmetrical IUGR.

Asymmetrical IUGR is the growth retardation induced by uteroplacental failure, while symmetrical IUGR is the growth retardation caused by maternal smoking, medication use during pregnancy, congenital anomalies, and intrauterine infections(5). Therefore, by using PI in preterm infants, we could infer the etiology of FM; for instance, in neonates with low PI, the occurrence of FM could be attributed to uteroplacental failure.

In newborns, PI is considered an index of weight-to-height similar to body mass index (BMI) (kg/m2). In other words, both these indices are calculated based on the weight-to-height ratio of neonates. However, use of BMI is less common in newborns. Dietitians and nutritionists have defined children with BMI of lower than the 15th percentile as thin, while 15th percentile ≤BMI<85th percentile is considered as normal weight, 85th percentile ≤BMI<95th percentile is defined as overweight, and BMI ≥95th percentile of the reference value is considered as obese. Based on the percentile of the PI, newborns are categorized as small-for-length (<10th percentile), appropriate-for-length (10th-90th percentile), and large-for-length (>90th percentile) (6). So, like BMI used for classifying children into skinny, normal, over weight and fat, PI is used for such a classification in newborns infants low PI is indicative of the low birth weight of neonates (4), which could be associated with inappropriate nutritional status.

References