

Ponderal Index

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The terms Intrauterine growth retardation (IUGR) and small for gestational age (SGA) were used interchangeably in the past. Although, related they are not synonymous. IUGR is the failure of normal foetal growth caused by multiple adverse effects on fetus, while SGA describes an infant whose weight is lower than population norms.

Ponderal index can be used to identify infants whose soft tissue mass is below normal for the stage of skeletal development. The ponderal index (PI) is arrived at by the following formula:

$$\text{PI} = \frac{\text{birth weight} \times 100}{(\text{Crown head length})^3}$$

A ponderal index below the 10th percentile may be used to identify IUGR infants correctly. This can affect the long term outcome. Thus all IUGR infants may not be SGA and all SGA infants may not be small due to growth restrictive process.¹ A low neonatal ponderal index is defined as less than 1 SD below a mean 2.0 and SGA is considered as birth weight below the 10th percentile.

Foetal ponderal index can also be calculated by ultrasound examination and compared with the neonatal PI. Foetal PI had been found to be a predictor of IUGR with the sensitivity and specificity of 76.9% and 82%.² Data suggests that foetal PI could be used to rule out IUGR with reasonable accuracy with a negative predictive value of 96.4%.³ Various studies have shown a good sensitivity and specificity of the application of intrauterine PI in the diagnosis of asymmetrical IUGR. Wider use of intrauterine and the IUGR can be used for the evaluation of fetal retardation because of the high predictable value of the negative test.⁴ In utero PI proved to be a valuable index in the prediction of foetal outcome, in those cases of IUGR in whom the in utero PI was smaller than one SD.⁵ It has also been found that foetal and neonatal well-being was clearly compromised when IUGR was associated with a low in utero PI.

Birth weight / length ratios, PI, placental weight and BW/placental weight ratios have been correlated with perinatal mortality and morbidity. But studies have also shown that except for PI, other parameters mentioned above are affected by ethnicity, gender and manner of placental preparation.⁶

However, studies have shown that the fetal PI is a poor predictor of discordant growth and should be employed cautiously in twin and triplet gestations.⁷

PI is not a superior predictor than either birth weight or body mass index for selected short term outcomes in new borns.⁸ For chronic diseases intrauterine environment seems to be important⁹, it is therefore useful to identify the babies with low ponderal index as it is a reliable predictor of long term complications including microalbuminuria, insulin resistance, high blood pressure and cardiovascular diseases.¹⁰

PI has been used to assess the asymmetrical IUGR because low birth weight and IUGR tends to reoccur in siblings and clustering of PI in sibling even persists after controlling for factors such as race, gender, maternal age, gravidity, year of birth, gestational age, pregnancy complications and poor maternal illnesses.¹¹ A hospital based study reported in this issue revealed that 40% of low birth weight babies had asymmetrical body proportion¹², which can have implications for future long term co-morbidities.

A study undertaken at Nepean Hospital showed that PI appears to be a better measure of infants with IUGR problems than birth weight percentiles.¹³ Use of PI curve for gestational age together with other growth curves improves the nutritional assessment of newborns. Further studies should be designed to develop strategies for the short, medium and long-term management of identified risk groups.¹⁴

References

1. Gomella TL, Cuningham DM. A large clinical manual neonatology. 4th ed. Prentice-Hall International Inc, 1999.
2. Vingt LAM, Lodeiro JG, Feins SJ. Value of fetal ponderal index in predicting growth retardation. *Obstet Gynecol* 1986; 67:584-8.
3. Chellani HK, Mahajan J, Batra A. Fetal ponderal index in predicting growth retardation. *Indian J Med Res* 1990;92:163-6.
4. Stoikov S, Popov I. The intrauterine Ponderal Index as a prognostic factor in fetal Retardation. *Akush Ginekol (Sofia)* 1994;33:3-5.
5. Yagel, S, Zacad D. In utero ponderal index as a prognostic factor in the evaluation of intrauterine growth retardation. *Am J Obstet Gynecol* 1987;157:415-19.
6. Dombrowski MP, Berry SM. Birth weight-length ratios, ponderal indexes, placental weights and birth weight-placental ratios in a large population. *Arch Pediatr Adolesc Med* 1994;148:508-12.
7. Blick-Stein I, Manor M. The intrauterine ponderal index in relation to birth weight discordance in twin gestations, *Int J Gynaecol Obstet* 1995;50:253-5.
8. Tamim H, Beydoun H, Intani M. Predicting neonatal outcomes: birth weight, body mass index or ponderal index?. *J. Perinat Med* 2004;32:509-13.
9. Rasmussen F, Johansson M. The relation of weight, length and ponderal index at birth to body mass index and overweight among 18-year-old males in Sweden. *Eur J Epidemiol*, 1998;14:373-80.
10. Yudkin JS, Martyn CN. Association of micro-albuminuria with intrauterine growth retardation. *Nephron* 2001;89:309-14.
11. Khoury MJ, Berg CJ. The ponderal index in term new born siblings. *Am J Epidemiol* 1990;132:576-83.

growth retardation. *Nepheron* 2001;89:309-14.

11. Khoury MJ, Berg CJ. The ponderal index in term new born siblings. *Am J Epidemiol* 1990;132:576-83.
12. Akram DS, Arif F. Ponderal index of low birth weight babies - a hospital based study. *J Pak Med Assoc* 2005;55:229-31.

13. Fay RA, Dey PL. Ponderal index; a better definition of the "At risk" group with intrauterine growth problems than birth- weight for gestational age in term infants. *Aust N Z J Obstet Gynaecol* 1991;31:17-19.
14. Caiza Sanchez ME, Diaz Rosello JL. Ponderal index to describe a term neonatal population. *An Pediatr (Barc)* 2003;59:48-53.