

Maternal anthropometry: its predictive value for pregnancy outcome

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Introduction

The Colombian study was undertaken in Cali, the third largest city in the country with a population of about 1 500 000. It has one of the best regionalized medical facilities in the country; most of our data were obtained from the tertiary-level hospital, a referral centre for most of the perinatal problems that appear in the urban area. In a sample of 5038 mothers with recorded pre-pregnancy weight and height during 1989, 1320 had information of weight gain during the pregnancy period. In addition to this sample from the high-risk hospital, a further sample from one of the six low-risk delivery hospitals was also studied for neonatal outcomes only — since by definition the later does not have maternal complications. A total of 527 mothers who had information on their pre-pregnancy weight and height during the year 1989 were chosen from this low-risk delivery group.

It is worth noting that neither the mother's weight nor height appears as a risk indicator on the clinical record proposed by CLAP (Centro Latino Americano de Perinatología y Desarrollo Humana) (1) and routinely used in these hospitals; this can result in mothers with a low pre-pregnant weight and low height appearing in either the high-risk or low-risk delivery hospitals.

Study objectives. The main objectives of the study were to investigate associations between maternal anthropometry (height, pre-pregnancy weight, and weight gain during pregnancy), and the presence of perinatal complications in the mother or neonate. Several categories of infant outcome were considered: full-term LBW infants (FT-LBW), all LBW infants, and pre-term deliveries, to see if it was possible to establish cut-off points for the anthropometric parameters in order to use them as risk indicators of the perinatal outcome.

Methodology

Since 1986 a number of workshops were held in all the hospitals in Cali to teach nurses and doctors to

fill out the CLAP medical record in the follow-up of pregnant women and their newborns. For this study all medical records at the tertiary-level hospital were searched for the data on pre-pregnancy weight and mother's height. Of the 10 332 women attending, 5038 had the relevant information and these were selected for the study. In the low-risk delivery hospital, 527 out of 1976 deliveries in 1989 met the criteria for entry into the study. Length of pregnancy was determined by the date of LMP and by the Dubowitz score and if these disagreed by more than 2 weeks, the case was dropped from the study. Pre-pregnancy weight was based on patient recall.

The definitions of study variables used here were the same as reported in the meta-analysis.

Results and discussion

Maternal anthropometry is an indicator of risk for pregnancy complications and neonatal problems when it is associated with other perinatal risk factors. Anthropometric data alone are not *per se* good risk indicators according to our findings. This hypothesis is very important from the public health point of view and will need to be further confirmed or rejected by prospective studies undertaken in communities where both high- and low-risk deliveries can be compared for maternal and newborn outcomes. As far as we know, no such study has been undertaken in developing countries where perinatal risk is high, especially in relation to IUGR.

The percentage of mothers found to be of low pre-pregnancy weight (WT_{pp}) was similar in the low-risk hospital (WT_{pp} <50 kg = 22.5%) to that in the high-risk hospital (21.5%). When the cut-off point was lowered (<45 kg), some 6.2% of the mothers in the tertiary-level hospital were in this category compared with 5.3% in the low-risk institution. When the maternal height cut-off point was set at <150 cm, 18.5% and 7.2% were below this cut-off point for the tertiary-level and primary-level hospitals, respectively. For height <145 cm the corresponding percentages were 5.6% and 1.2%, respectively.

This finding suggests that as a risk-associated factor, low maternal height was more commonly observed than low pre-pregnancy weight. For example we noted a strong association of low maternal

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height (<150 cm) with cephalo-pelvic disproportion (CPD), premature labour, and previous hypertension, especially when the cut-off point was lowered (<145 cm).

In relation to the neonatal problems, low maternal height was found to be associated with full-term LBW (FT-LBW) babies (for both cut-off points) and also with a low Apgar score (<5) at 1 minute. The mother's height (<145 cm) was protective for the appearance of hyaline membrane disease (HMD). Since HMD appears more frequently in premature babies, this finding suggests that the LBW encountered in mothers <145 cm is more frequently due to IUGR than to prematurity. When the mother is classed as high risk based on anthropometry, then any LBW outcome is more frequently due to IUGR and less often due to early delivery.

The cut-off points for WTpp (<50 kg and <45 kg) are associated with urinary tract infection (OR = 1.28) and with other infections in the mothers (OR = 1.31). Since urinary tract infection has been linked to premature labour and delivery this association may be causally linked to LBW. It is necessary to investigate the association further to confirm this possibility.

Neonatal jaundice is 2.34 times more common if the mother's pre-pregnancy weight is <50 kg. Further study of this finding would be of interest as far as the etiology of jaundice in these babies is concerned.

At a cut-off point of 145 cm for height, the association with FT-LBW becomes stronger (OR = 1.82). No association with prematurity is observed at this height. This could be interpreted as FT-LBW being associated with poor maternal nutrition. It is thought that prematurity is less linked to poor maternal anthropometry than is IUGR.

In a high-risk population of mothers it is clear that the risk for the newborn is more linked with FT-LBW or IUGR when the mother's WTpp or height is one or more standard deviations below the mean. By contrast, the incidence of preterm deliveries is higher in the group of mothers who are ≥ 50 kg for WTpp. The same is observed for mothers of ≥ 150 cm height.

Neonatal problems associated with IUGR (e.g., bronchial aspiration of meconium) are observed to be more common in the group of mothers below the cut-off points of 50 kg for pre-pregnancy weight and 150 cm for height.

For pregnancy weight gain it appears that <7 kg is the critical point associated with a greater frequency of pregnancy complications and neonatal problems. More than one third of the mothers in the high-risk group had a gain below 7 kg, suggesting acute malnutrition in the mother. A stronger association was observed in this group with preterm delivery

than with FT-LBW. Our data suggest that chronic malnutrition is probably more often linked to IUGR infants, and acute malnutrition (indicated by poor weight gain) to prematurity.

If a cut-off point of <12 kg is selected, the relative risk (RR) for FT-LBW and preterm delivery increases sharply. Thus, ideally, weight gain should exceed this value if it is assumed that it is not due to marked fluid retention. In practice, however, this cut-off point (<12 kg) would result in some 75% of pregnancies in Cali being classified as at-risk — an unrealistically high proportion. If the lower cut-off point of <7 kg is chosen, about one third of mothers will be so classified. These women are also typically found to have had a low pre-pregnancy weight (<50 kg) and are below 150 cm in height and have a higher proportion of poor neonatal outcomes. Conversely, pregnancy complications were more often found in mothers who were relatively taller and with higher pre-pregnancy weight (>50 kg).

Acute malnutrition in women who do not gain weight during pregnancy results in the appearance of complications, such as infections or anaemia.

Summary

- Our population of mothers is primarily identified as high-risk.
- The highest incidence of FT-LBW babies was observed when mothers' height was <148 cm.
- For WTpp of <48 kg the association with FT-LBW has an OR of 1.45. At a WTpp of <45 kg the OR increases to 1.64 (95% CI: 1.05–2.57).
- It can be postulated that the critical cut-off points for risk of poor infant outcome are maternal height of <148 cm and WTpp of <45 kg.
- For risk of pregnancy complications the relevant cut-off points are height of <150 cm and WTpp of <50 kg.

We recommend that the latter cut-off points be used during the perinatal period to detect mothers for referral to the high-risk hospitals. That will mean an increase in the numbers of women moved from low-risk delivery clinics to high-technology centres and, of course, more resources will be needed for the programmes to diminish perinatal complications or undesirable neonatal results.

Reference

1. **Krasovec K, Anderson MA.** *Maternal nutrition and pregnancy outcomes: anthropometric assessment.* Washington, Pan American Health Organization, 1991 (Scientific Publication No. 529).