Benefits of the scale — should we weigh pregnant women?

To the Editor: Despite the fact that systematic weighing is no longer viewed as a useful antenatal practice[1] it often remains as a standard procedure inherited from the past. Its advocates claim that insufficient maternal weight gain is likely to result in low birth weight and that excessive maternal weight gain favours macrosomia.[2-3] If the former were the case, interventions such as supplements in the case of poor nutritional state (as evidenced by maternal pre-pregnancy underweight and insufficient weight gain in pregnancy) could be expected to improve pregnancy outcomes. However this has not been shown convincingly to be the situation.[4]

This being the case, what can we learn from the practice, especially in underserved populations in developing world settings? In developing countries, pregnancy weight gain and birth weight are said to be generally lower than in the developed world.[5] Many confounding factors are known to influence birth weight: age, parity, social class, education, substance abuse, body height, pre-pregnancy weight and/or body mass index, pregnancy weight gain, nutritional status, infections, genetic factors, the woman's own birth weight, and the newborn's gender.[6] Some have claimed that the only factor that affects birth weight independently is birth order.[7,8] The aim of the present study was to investigate the link between birth order and birth weight as a possible argument against the alleged benefits of the scale.

The antenatal and maternity records of 2 038 rural pregnant women in Mpumalanga were audited. Entry criteria were the availability of the following data: age, parity, height and booking weight, last recorded weight, birth weight, gender, head circumference, and neonate's body length.

There were 916 primiparas and 1 122 multiparas, with an average parity of 3.3 (95% confidence interval (CI): 3.2 - 3.4). The booking visit was at 24 - 25 weeks and the last antenatal visit at 36 weeks on average. Booking weights were 60.5 kg (CI: 60.1 - 60.9) in primiparas and 67.8 (CI: 67.2 - 68.3) in multiparas. Weekly weight gains were 0.43 kg (CI: 0.42 - 0.45) in primiparas and 0.36 (CI: 0.35 - 0.38) in multiparas (t = 6.8; p < 0.0001) (Fig. 1). Body heights were similar: 158.2 cm (CI: 157.8 - 158.6) in primiparas and 158.7 (CI: 158.3 - 159.1) in multiparas (t = 1.6; p = 0.10). The weekly weight gain to height ratio was 2.6 (CI: 2.4 - 2.9) in primiparas and 2.2 (CI: 2.0 - 2.5) in multiparas (t = 3.4; p = 0.0001).

Neonates born to primiparas had a birth weight of 3 001 g (CI: 2 973 - 3 029), a body length of 48.9 cm (CI: 48.7 - 49.1), and a head circumference of 34.4 cm (CI: 34.2 - 34.5). The male to female ratio was 1.17. Neonates born to multiparas had a birth weight of 3 166 g (CI: 3 138 - 3194) (t = 8.5; p <0.0001), a body length of 49.2 cm (CI: 49.0 - 49.4) (t = 2.3; p = 0.023), and a head circumference of 34.7 cm (CI: 34.5 - 34.7) (t = 3.5; p = 0.0004). The male to female ratio was 1.04 (χ^2 = 1.63; p = 0.20).

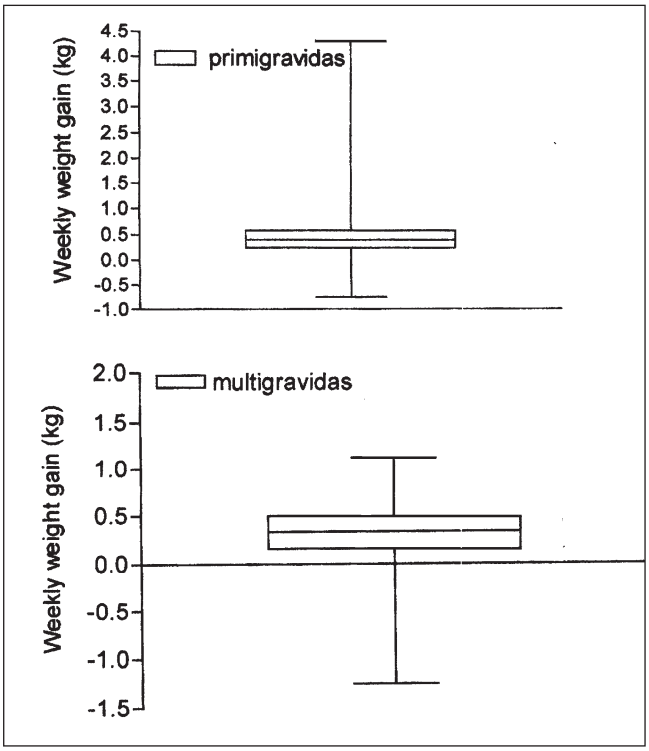

Fig. 1. Comparative weekly weight gain.

The percentage of birth weights above the hospital's 90th centile was 9.0 in primiparas and 9.1 in multiparas (χ^2 = 0.001, p = 0.97). The percentage of birth weights below the 10th centile was 9.4 in primiparas and 6.6 in multiparas (χ^2 = 6.7; p = 0.01). The percentage of low birth weights (< 2 500 g) was 11.0 in primiparas and 9.2 in multiparas (χ^2 = 2.5; p = 0.11).

Univariate regression analysis of birth weights against maternal anthropometry showed a weak correlation with weekly weight gain in primiparas (correlation coefficient r = 0.11, standard error of the estimate (SEE)= 0.3 kg, p = 0.003). In multiparas there was no correlation (r = 0.08, SEE = 1.93 kg, p = 0.23). Birth weight and parity yielded the following: r = 0.13, SEE = 1.57 kg, p < 0.0001.

Multivariate analysis of the effect of maternal anthropometry on birth weight in primiparas yielded the following: birth weight = 2 788 – 4.3 (height) + 0.63 (BMI) + 1 275 (body surface) – 1 945 (ponderal index) (R^2 = 8.0%; p < 0.0001, multiple R = 0.28, F = 12.8). None of the parameters had a significant influence. For multiparas, the result was: birth weight = 1 561 + 16.5 (height) – 2.2 (weight) + 14.9 (BMI) + 11.4 (body surface) – 3 357 (ponderal index) (R^2 = 9.5%; p <0.0001, multiple R = 0.31, F = 19.8). Only maternal height was associated with birth weight (p = 0.02). Multicolinearity made the confidence intervals very wide.

The main finding was that the third-trimester weekly weight gain was significantly higher in primigravidas, whereas they delivered lighter newborns. On the other hand, multiparas had a significantly higher booking weight; they delivered significantly heavier babies but had a significantly lower third-trimester weekly weight gain. End-pregnancy weight depends on the pre-pregnancy weight and the pregnancy weight gain. In most multiparas, the mean pre-pregnancy weight increases with age and parity. The effect of parity is attributed mainly to the retention of weight from the previous pregnancy; there could also be a general weight gain over time unrelated to pregnancies.

According to standard textbooks, the average weekly weight gain in the second half of pregnancy is around one pound (range: 0.30 - 0.49 kg).[9] A weight gain of less than 0.27 - 0.22 kg/week is considered inadequate.[10] Reports from developing countries show wide variations in pregnancy weight gain. In the Philippines, the third-trimester weekly weight gain is 0.27 ± 0.25 kg.[11] In rural Tanzania, the mean end-pregnancy weight is between 17% and 20% of the booking weight (around the 24th week) for an average birth weight of 2 920 g (range: 2 640-3 085).[12] These data and our survey contradict the statement made by Rössner[5] that in the developing world women generally gain less weight.

As expected, in our series neonates born to multiparas were significantly heavier than those born to primiparas. The correlation between third-trimester weekly weight gain and birth weight was poor (1.2 and 0.6%) and so was the correlation between birth weight and parity (1.8%). The strongest association was found between maternal booking and end-pregnancy weight and birth weight. This suggests that the link between birth weight and birth order is not independent but (at least partly) the result of a progressive maternal weight increase over time that is partly attributable to a retention of weight from the previous pregnancy. Alternative methods of assessing fetal growth, such as serial symphysis-fundus measurements, are more useful than serial weight measurements.

Louis-Jacques van Bogaert

Post Net suite 7
Private Bag x8689
Groblersdal
0470

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