

## EDITORIAL



# Pregnant women need local references for gestational weight gain – an editorial

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Recently, Ramachandran Thiruvengadam et al. described the pattern of gestational weight gain (GWG) in a prospective pregnancy (GARBH-Ini) cohort from Gurugram Civil Hospital, Gurugram, North India, and compared their findings with the INTERGROWTH-21st reference. The authors observed that GWG in Indian women was significantly less than prescribed by the INTERGROWTH-21st reference. Whereas INTERGROWTH-21st prescribes an average cumulative GWG of 7.47 kg (week 28), 9.52 kg (week 32), 11.58 kg (week 36), and 13.69 kg (week 40), normal weight Northern Indian women have an average cumulative GWG of 4.95 kg (week 28), 6.43 kg (week 32), 7.87 kg (week 36), and 8.8 kg (week 40). The cumulative GWG of obese Northern Indian women was even smaller. The study questions the primacy of western estimates of an appropriate GWG. Ethnic differences in GWG matter. Particularly in view of historic data as an additional source of information, it is highly recommended to incorporate ethnic characteristics in clinical decisions when assessing the individual weight gain of a pregnant woman. The study is a strong motivator for establishing local references for GWG.

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Recently, Ramachandran Thiruvengadam et al. [1] described the pattern of gestational weight gain (GWG) in a prospective pregnancy (GARBH-Ini) cohort from Gurugram Civil Hospital, Haryana, a district hospital in Gurugram, North India, including sociodemographic and clinical characteristics, and compared their findings with the INTERGROWTH-21st reference [2]. The authors observed that GWG in Indian women was significantly less than prescribed by the INTERGROWTH-21st reference. Nearly 26% of the Indian women stayed below the 10th centile for GWG at 18–20 weeks of gestation. This percentage increased to 45% at delivery. As the women largely belonged to the lower socio-economic strata (44%) with less than 1% being classified as upper class, the authors also selected a small subset of “low-risk” participants using similar exclusion criteria as used by INTERGROWTH-21st. Yet in opposition to common expectations, the authors failed to attribute the low GWG of their sample to any social or economic circumstances. The proportion of GWG <10th centile remained similar in both the low-risk and the unselected population. The authors then discussed GWG in the women from the central area of Nagpur, India, that were recruited by the INTERGROWTH-21st study.

Nagpur is an emerging metropolis of India and the fastest growing millionaire city also. Nagpur has been the main center of commerce in the Vidarbha region since early days and is an important trading location. The city is ranked 11th most competitive city in the country by the Institute for Competitiveness in its 2012 report [3]. One may expect that women from Nagpur with “optimal health, nutrition, education, and socio-economic status and (who) were not exposed during pregnancy to environmental hazards” [2], provide the optimum prerequisite for appropriate GWG. Yet, even in these women, GWG was lower than in the women of the other urban centers recruited by the INTERGROWTH-21st study.

It appears that Indian women in general tend to gain less weight during pregnancy than women from other parts of the globe. In fact, this does not truly surprise as also the newborn Indian babies are some 300 g lighter than WHO standards suggest quite independent of maternal wealth and caste [4].

Thus, the study of Ramachandran Thiruvengadam et al. [1] is of great importance as it questions the primacy of western estimates of an appropriate GWG in healthy women. GWG is associated with short- and long-term maternal and child health outcomes. Insufficient weight gain has been linked with increased risks of low birth weight, small for gestational age, and preterm birth; excessive gain has been linked with large for gestational age, gestational diabetes, preterm birth, cesarean section, infant mortality, postpartum weight retention, and childhood obesity [2]. Yet, the clinical cut-offs for an appropriate weight gain during pregnancy are still anything but clear. Quite in contrast, the idea of prescriptive standards for GWG rather seems to have a somewhat dubious history.

Based on an assumption published half a century ago by Habicht et al. [5] that both infant and child growth are more affected by health, socioeconomic status, and environmental conditions than by ethnic differences, international growth standards for infants and children have been developed. These standards have meanwhile been adopted by over 140 countries and they are used “as the common yardstick to assess and monitor child growth” [6] as they are supposed to assess whether children are growing and developing as they should. It was claimed that “children born in different regions of the world, when given the optimum start in life, have the potential to grow and develop to within the same range of height and weight for their age” [6]. This view “strongly supported the need to also develop international standards to assess growth patterns in the prenatal period” [7]. For analog reasons, “the World Health Organization recommended that a reference for GWG be based on prospective longitudinal studies of selected populations with a low incidence of maternal and fetal complications” [2]. These authors examined data on GWG obtained, according to WHO recommendations, “from healthy pregnant women who were free from identifiable major medical, nutritional, or social and major environmental risk

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factors". The authors reported "GWG patterns from **normal weight women**" from eight urban sites: Pelotas (Brazil), Turin (Italy), Muscat (Oman), Oxford (UK), Seattle (US), Shunyi County in Beijing (China), the central area of Nagpur (India), and the Parklands suburb of Nairobi (Kenya).

But what is "normal"? What is an "insufficient", what is an "excessive" GWG?

In this paper, I will not discuss whether the growth of infants and children are more affected by health, socioeconomic status, and environmental conditions than by ethnic differences [5], I only remind the scientific audience that first references for GWG have been published more than one and a half centuries ago. GWG has significantly increased since the mid-nineteenth century in central Europe [8]. A paper of particular interest was published in 1862 [9] in Munich including very detailed observations on GWG in 320 healthy urban women from Munich, Germany. Gassner showed weight changes of pregnant women, women in labor, and puerperal women and stated: "The weight gain of pregnant women in the last 3 months of pregnancy is directly proportional to the body mass of the pregnant woman", and: "Now, as far as the average figures for the weight gain of a pregnant woman in the last third of her gravidity are concerned, the researches in this regard have shown that on average the female gains 2.4 kilograms of body mass in the eighth month, 1.69 kilograms in the ninth month, and 1.54 kilograms in the tenth month." In those days, the average pre-pregnancy weight of healthy women was close to 55 kg. Contemporary German women aged 18–29 years are on average some 10 cm taller, and weigh 65.2 kg [10]. Yet in spite of the significant secular increase in weight and height, the historic European weight gain during pregnancy was much closer to the modern Western reference than observed in modern Indian women. INTERGROWTH-21st prescribes an average cumulative GWG of 7.47 kg (week 28), 9.52 kg (week 32, i.e., plus 2.07 kg in the 8th month), 11.58 kg (week 36, i.e., plus 2.06 kg in the 9th month), and 13.69 kg (week 40, i.e., plus 2.11 kg in the 10th month). In view of the smaller height and lower weight of mid-nineteenth century women, the differences in GWG between the historic European data and the contemporary standards appear reasonable.

The Indian data reported by Ramachandran Thiruvengadam et al. show a different picture. Normal weight Northern Indian women have an average cumulative GWG of only 4.95 kg (week 28), 6.43 kg (week 32, i.e., plus 1.48 kg in the 8th month), 7.87 kg (week 36, i.e., plus 1.44 kg in the 9th month), and 8.8 kg (week 40, i.e., less than 1 kg in the 10th month). This is significantly less than reported by Gassner in 1862 [9]. The GWG of obese Northern Indian women was even smaller.

Ramachandran Thiruvengadam et al. do not provide any conspicuous clue to what is "normal", but they certainly provide evidence that normative values for GWG obtained from a global blend of urban data are not applicable as a prescriptive standard for world-wide clinical purposes. Ethnic differences in GWG matter. Particularly in view of historic data as an additional source of information, it is highly recommended to incorporate ethnic characteristics in clinical decisions when taking care and assessing the individual weight gain of a pregnant woman. The study is a strong motivator for establishing local references for GWG.

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## DATA AVAILABILITY

The data are available from the corresponding author on reasonable request.

## REFERENCES

1. Thiruvengadam R, Desiraju BK, Natchu UCM, Wadhwa N, Sachdeva K, Misra S, et al. Gestational weight gain trajectories in GARBH-Ini pregnancy cohort in North India and a comparative analysis with global references. *Eur J Clin Nutr*. 2021. <https://doi.org/10.1038/s41430-021-01040-y>. Epub ahead of print.
2. Cheikh Ismail L, Bishop DC, Pang R, Ohuma EO, Kac G, Abrams B, et al. Gestational weight gain standards based on women enrolled in the Fetal Growth Longitudinal Study of the INTERGROWTH-21st Project: a prospective longitudinal cohort study. *BMJ*. 2016;352:i555.
3. District Nagpur. Economy. 2022. <https://nagpur.gov.in/economy/>. Accessed 8 Mar 2022.
4. Subramanyam MA, Ackerson LK, Subramanian SV. Patterning in birthweight in India: analysis of maternal recall and health card data. *PLoS One*. 2010;5:e11424.
5. Habicht JP, Martorell R, Yarbrough C, Malina RM, Klein RE. Height and weight standards for preschool children. How relevant are ethnic differences in growth potential? *Lancet*. 1974;1:611–4.
6. Zorlu G. New WHO child growth standards catch on. *Bull World Health Organ*. 2011;89:250–1.
7. Villar J, Papageorgiou AT, Pang R, Ohuma EO, Cheikh Ismail L, Barros FC, et al. The likeness of fetal growth and newborn size across non-isolated populations in the INTERGROWTH-21st Project: the Fetal Growth Longitudinal Study and Newborn Cross-Sectional Study. *Lancet Diabetes Endocrinol*. 2014;2:781–92.
8. Hermanussen M, Scheffler C. Secular trends in gestational weight gain and parity on birth weight: an editorial. *Acta Paediatr*. 2021;110:1094–6.
9. Gassner U. Über die Veränderungen des Körpergewichts bei Schwangeren, Gebärenden und Wöchnerinnen [Weight changes of the pregnant women, women in labor, and puerpera]. *Monatsschrift für Geburtskunde und Frauenkrankheiten*. 1862;19:1–68.
10. Statista. Mittelwerte von Körpergröße, -gewicht und BMI bei Frauen in Deutschland nach Altersgruppe im Jahr 2011. 2022. <https://de.statista.com/statistik/daten/studie/260916/umfrage/mittelwerte-von-groesse-gewicht-und-bmi-bei-frauen-nach-alter/>. Accessed 8 Mar 2022.

## AUTHOR CONTRIBUTIONS

MH designed and wrote the manuscript.

## COMPETING INTERESTS

The author declares no competing interests.

## ADDITIONAL INFORMATION

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