Pune Maternal Nutrition Study

Goal: to examine the relationship between maternal nutrition, physical activity and birth size.

This study takes place in six rural villages near the city of Pune, Maharashtra, India

June 1994 – April 1996: 2,675 married women of reproductive age were recruited and their anthropometry was taken.

Short-term focus: impact of maternal activity on newborn size

Long term: cardiovascular risk, glucose levels, cognitive performance and bone health.¹

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Exposures and Outcomes²

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Baseline characteristics³

- 1,102 women became pregnant during the period of recruitment
- 797 stayed in the study until delivery
- Mean height: 152 cm
- Mean weight: 18.1 kg/m²
- Mean full term birth weight: 2.7 kg
- 32% reported never having eaten meat, fish or eggs
- 40% of those reporting intake of non-vegetarian foods ate less than once a week

Key investigators
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Original goal: to describe the relationship of a mother’s physical activity to the birth weight of her infant

Methods of recruitment and enrollment: All married women who lived in the six villages between the ages of 15-40 were eligible. Of the 2,675 eligible, 92% gave consent to participate (2,466). Field workers from the study visited once a month to record the date of a woman’s last menstrual cycle. All women who reported missing a period between the dates June 1994 – April 1996 were enrolled in the study.

Baseline data collected: Pregnancy measurements were taken from 1,102 women at 18 and 28 weeks gestation – anthropometry, dietary intake, blood micronutrient concentrations, glucose tolerance, physical workload/activity and fetal ultrasonography.

Discussion: the study found that excessive physical activity, especially in early and mid gestation, during pregnancy is associated with lower birth weight.²

How the cohort was tracked and followed:
The women who got pregnant during the phase of recruitment were followed until they gave birth. Their children have been followed annually, with a focus on anthropometry. At age 6, 9, and 13 the children underwent greater investigations, including glucose tolerance testing, measurement of cardiovascular disease risk factors, bone health, body composition and cognitive performance. Parents were also measured for glucose tolerance and cardiovascular risk factors at the same time as their children.⁵

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Maternal physical activity and neonatal size: the thin-fat Indian baby

**Question studied:** how does body size and fat measurement of rural Indian babies compare with white babies born in the United Kingdom?

**Why is this important:** an improved understanding of the body composition of Indian babies at birth might help us understand why there are high rates of insulin resistance and central obesity throughout India.

**Study results:** Indian mothers had lower BMI (due to diet and physical activity) than Southampton mothers and gave birth to babies with lower birth weight. The Indian babies had small abdominal viscera and low muscle mass but held onto more body fat than their British counterparts. This body composition makes them more likely to develop insulin resistance (diabetes). 7 **Strengths:** Using a similar population in an industrial country serves as a good control group to see how environment has impacted Indian babies. **Weaknesses:** limited number of babies from the UK doesn’t make for a good control group.

Maternal intake of B12 and neonatal size

**Questions studied:** Researchers sought to explore associations between low B12 and insulin resistance and cognitive function in children between the ages of 6-9. 8 They have also used this cohort to assess how to increase vitamin B12 absorption among individuals with low plasma vitamin B12.

**Why is this important:** low levels of B12 are associated with poor outcomes for mother, fetus and child. For mothers, it increased adiposity and had higher incidence of gestational diabetes, mothers with low B12 has infants with lower birth weight and children had increased insulin resistance.

**Study results:** The study on the association between B12 and insulin resistance was looking to see if there was an association between maternal micronutrient nutrition and type 2 diabetes. Women in the study have lower levels of protein and energy intake causing poor B12 status. They found that 18 week vitamin B12 concentration was more strongly associated with insulin resistance than 28 weeks. **Strengths:** population-based study with high participation rate and good follow up rates. The assessment methods were developed for this particular population and the rural setting represents 70% of Indian women. 9 **Weaknesses:** this was an observational study so there is a greater chance for bias.

**Major contributions:**

- Strong data set from a rural population
- Created tools for measurement particularly for this population, examples that can be used for other researchers studying rural groups
- Provides strong evidence of the relationship between maternal nutrition, physical activity and infant outcomes
- Illustrates association between neonatal outcomes and type 2 diabetes, a big problem in India
Citations:


2 Ibid

3 Rao S; Kanada A; Margetts BM; Yajnik CS; Lubree H; Rege S; Desai B; Jackson AA; Fall CH. Maternal activity in relation to birth size in rural India: the Pune maternal nutrition study. *European Journal of Clinical Nutrition*. 2003; 57: 531-542.

4 Ibid


6 Ibid

7 Yajnik CS; Fall CH; Coyaji KJ; Hirve SS; Rao S; Barker DJ; Joglekar C; Kellingray S. Neonatal anthropometry: the thin-fat Indian baby; the Pune Maternal Nutrition Study. *International Journal of Obesity*. 2003; 27(2): 173-180.


9 Yajnik CS; Deshpande SS; Jackson AA; Refsum H; Rao S; Fisher DJ; Bhat DS; Naik SS; Coyaji KJ; Joglekar CV; Joshi N; Lubree HG; Deshpande VU; Rege SS; Fall CH. Vitamin B₁₂ and folate concentrations during pregnancy and insulin resistance in the offspring: the Pune Maternal Nutrition Study. *Diabeologia*. 2008; 51(1): 29-38.