



Association of maternal wellbeing in pregnancy and offspring adiposity at 5 years – findings from the ROLO longitudinal birth cohort study

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Background

The association between increased weight and later health risks begins in early life and the earliest possible timepoint in which childhood obesity and excess adiposity may be prevented is during foetal development. Emerging data suggests that maternal mental and emotional health during pregnancy may influence the offspring's risk of excess childhood adiposity.

We aimed to:

- Determine the relationship between maternal wellbeing in pregnancy and offspring adiposity at 5 years.

Methodology

Mother and child pairs (n = 338) participating in the ROLO study, a longitudinal birth cohort, had assessments performed at birth and 5-years follow-up; demographics can be seen in Table 1.

- Assessments included anthropometry and skinfold measurements.
- Infant and child body composition was assessed by circumferences such as head, neck, mid upper arm (MUA), chest, abdomen, hip, and thigh. Skinfold measurements included biceps, triceps, subscapular and thigh.
- The **WHO-5 wellbeing index (Fig. 1)** was used to measure well-being (mid-pregnancy assessment only).
- Scores were classified as high (>50%), moderate (28-50%), or low (<28%).
- Data were analysed using Independent sample t-tests, Pearson's correlations, analysis of variance (ANOVA) and multiple linear regression.
- Confounders included in regression analysis were:
 - Child age at 5-year follow-up, membership of intervention group, child sex, maternal BMI at 5-year follow-up, infant feeding, maternal education, and birthweight.

The WHO-5 questionnaire

Instructions:

Please indicate for each of the 5 statements which is closest to how you have been feeling over the past 2 weeks.

Over the past 2 weeks...	All of the time	Most of the time	More than half the time	Less than half the time	Some of the time	At no time
1 ... I have felt cheerful and in good spirits	5	4	3	2	1	0
2 ... I have felt calm and relaxed	5	4	3	2	1	0
3 ... I have felt active and vigorous	5	4	3	2	1	0
4 ... I woke up feeling fresh and rested	5	4	3	2	1	0
5 ... my daily life has been filled with things that interest me	5	4	3	2	1	0

Scoring principle: The raw score ranging from 0 to 25 is multiplied by 4 to give the final score from 0 representing the worst imaginable well-being to 100 representing the best imaginable well-being.

Figure 1. The WHO-5 Well-being Scale. Instructions, Questions, and Scoring principle.

Results

Maternal, infant, and child characteristics are displayed in Table 1.

- The mean and standard deviation (SD) well-being was 58.46 (15.16) %, and **n = 89 (26%) had a well-being below 50%** (i.e. reduced well-being).
- 55.3% of infants were born with macrosomia and the mean (SD) birthweight of the infants was 4.40 (0.45) kg.
- Mean (SD) BMI for the children at 5 years was 16.3 (1.4) kg/m². BMI z-scores showed that **74.7% of the children were of normal weight**, 20.5% had overweight, and the remaining **4.8% had obesity**.
- Mean android-gynoid ratio** was significantly different in children of mothers with low wellbeing compared with mothers who had high wellbeing (0.34 (0.07) vs. 0.27 (0.06), $p = 0.014$).
- Children born to mothers of moderate wellbeing had increased **child thigh circumference** compared to mothers of high wellbeing (33.30mm (2.86) vs. 32.59mm (2.9), $p = 0.049$).
- In adjusted analysis, an inverse association was observed between maternal wellbeing and child's thigh circumference ($B = -0.155$, 95% CI = -0.049, -0.009, $p = 0.004$).

Table 1. Maternal, infant, and child characteristics of the ROLO pregnancy & 5-year follow-up

Maternal Characteristics	n	Value
Maternal age at delivery (years)	338	33.13 (3.92)
Study group (n, % intervention)	338	173 (51.2)
Smoking (n, % current)	338	9 (2.7)
Ethnicity (n, % White Irish)	338	304 (89.9)
Education attainment (n, % complete third level)	338	208 (61.5)
Body Mass Index (kg/m ²)*	337	26.03 (23.08, 27.93)
BMI category (n, % obesity)	337	58 (17.2)
Maternal well-being (%)	338	58.46 (15.16)
Low maternal well-being (n, % <50)	338	89 (26.3)
Extremely low well-being (n, % <28)	338	11 (3.3)
Gestational Weight Gain per week 38 (kg)	280	0.50 (0.157)
Socioeconomic Advantaged (n, % advantaged) ¹	338	242 (71.6)
Infant Characteristics		
Infant sex (n, % male)	336	169 (50.0)
Birth weight (g)	338	4048.40 (445.52)
Macrosomia (n, % >4,000g)	338	187 (55.3)
Child Characteristics		
Weight (kg)* ¹¹	338	20.36 (18.4, 22.0)
Length (cm) ¹¹	337	111.75 (4.6)
BMI (kg/m ²) ¹¹	337	16.25 (1.36)
BMI SDS normal weight (n, % NW)	337	252 (74.6)
BMI SDS overweight (n, % overweight)	337	69 (20.4)
BMI SDS obesity (n, % obesity)	337	16 (4.7)

Continuous data are presented as mean ± standard deviation, unless * which is median (interquartile range). Categorical variables are presented as numbers (%). ¹ = socioeconomic status was measured through the HP index. ¹¹ = standard deviation scores (SDS) were calculated for these variables according to the WHO-growth standards. BMI = Body Mass Index; NW = Normal Weight; MUA = Mid-Upper Arm

Conclusion

- Our findings suggest that there may be a relationship between childhood adiposity at 5 years and maternal well-being in pregnancy, however further research is needed.
- Research into how the risk of higher childhood adiposity manifests in the foetus *in utero* based on epigenetic and environmental changes such as well-being fluctuations may support interventions to prevent childhood obesity, where both mother and child could benefit.