2021 Best Research Poster Award

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Maternal dysglycaemia in pregnancy and offspring bone health: the Vitamin D in Pregnancy (VIP) Study

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INTRODUCTION

- People with diabetes mellitus have poorer bone health compared to healthy populations[1].
- Bone mass increases from the intrauterine period and peaks in early adulthood, where the magnitude of peak bone mass achieved is a strong predictor of osteoporosis risk later in life[2].
- A greater understanding of the determinants of bone accrual in early life is crucial to prevent osteoporosis in adulthood.
- A maternal impaired glucose environment in utero may be a risk factor for poor bone health in the offspring.
- Studies by ultrasound conflictingly suggest infants of gestational diabetic mothers have decreased bone density[3], and no difference in bone density[4] compared to nondiabetic mothers.
- No study has examined these associations by ultrasound beyond infancy.

OBJECTIVES

- This study aimed to determine the association between maternal gestational dysglycaemia and offspring quantitative ultrasound (QUS) bone measures in childhood.

METHOD

- Pregnant women at less than 16 weeks gestation (n=475) were recruited from University Hospital Geelong antenatal clinic (2002-04) as part of the VIP study[5], which resulted in 400 mother-child pairs at birth.
- Glucose Challenge Test (GCT) at 28-32 weeks gestation was performed (n=379); result greater or equal to 8.00mmol/L blood glucose was considered high.
- At the 11-year follow-up, child bone was assessed by QUS (Achilles Insight Ultrasonometer) at the child's left heel (n=189).
- QUS measured broadband ultrasound attenuation (BUA) (db/MHz), speed of sound (SOS) (m/s) and stiffness index (SI).
- Measurements were taken twice, with the average of duplicate measurements used for analysis.
- Linear regression models assessed the relationship between normal and high GCT results and child bone measures, adjusting for potential confounders including child birthweight, child height, weight, sex and pubertal stage at 11 years, and maternal BMI and smoking status at recruitment.

Figure 1: VIP participant undergoing heel QUS scan

RESULTS

- Of the 379 women who underwent a GCT, 164 (43%) of their children returned at 11 years and had complete data for analysis.
- Descriptive characteristics of participants are presented in Table 1.
- 24 children (14.6%) had mothers with a high GCT.
- There was a weak positive trend for an association between a high GCT and child bone BUA (β: 3.80; 95%CI: -0.36,7.96) and SI (β: 3.87; 95%CI: -0.77,8.51), though significance was not reached (Table 2).
- No association was observed between a high GCT and child bone SOS (Table 2).

Table 1: Descriptive characteristics of participants

Characteristics	n %, mean (sd) or median (IQR)
Maternal	
BMI (kg/m²)	25 (22.26-28.98)
Smoker (% yes)	31 (18.90)
GCT result (% high)	24 (14.63)
Offspring	
Birthweight (kg)	3.54 (3.21-3.89)
Sex (% boys)	83 (50.61)
Height (cm)	147.45 (143.45-154.20)
Weight (kg)	40.05 (35.00-48.35)
Pubertal stage (% high)	20 (12.20)
BUA (db/MHz)	89.96 (83.31-98.00)
SOS (m/s)	1568.95 (22.98)
SI	78 (71.50-86.50)

Table 2. Linear regression of maternal GCT in pregnancy and child bone QUS

	β coefficient	95% CI	p-value
BUA (db/MHz)	3.80	-0.36,7.96	0.07
SOS (m/s)	2.17	-7.84,12.18	0.67
SI	3.87	-0.77,8.51	0.10

DISCUSSION

- Maternal gestational dysglycaemia, determined by a high GCT result, was not significantly associated with child bone measures by QUS at 11 years, however increased bone BUA and SI were trending towards significance.
- The strength of this study is that it is the first to assess offspring bone health by QUS beyond infancy in children born to dysglycaemic mothers, however is limited by the small sample size therefore may be underpowered.

CONCLUSION

- This study lays the foundation for future studies in larger populations to reassess these maternal glycaemia and offspring bone health associations, and to determine whether increased bone density measures are associated with increased fracture risk.

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