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The Influence of Paternal Height and Weight on Birth-weight

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Summary: Analysis of 5,989 couples, for whom fathers' and mothers' heights and weights were recorded, showed that paternal height had a significant influence ($p<0.0007$) on birth-weight while paternal body mass index (Quetelets Index) had no significant effect ($p>0.05$).

Depending upon mother's height, the average effect of father's height (ranging from 165 cm to 184 cm) on birth-weight was up to 152 g, with a greater effect where the mother was taller (up to 235 g) and a lesser effect where the mother was shorter (confirming the effect of maternal constraint).

The significance of these findings lies more with the need to consider this effect as an important variable in statistical analysis involving birth-weight than in its immediate obstetrical implications.

A number of factors have been shown to influence human fetal birth-weight. These have been extensively reviewed by Hytten and Leitch (1) and Hytten and Chamberlain (2) who have emphasized the prominent effect of maternal factors, such as maternal height and weight, weight increase in pregnancy, and variables such as age, socioeconomic status, parity and sex of the infant. They concluded on the basis of their review, which included some of the classical veterinary experiments (3-5) and family analysis (6-9) that 'the father has no influence on intrauterine growth'. We also have previously examined factors contributing to fetal birth-weight in our hospital population (10) and confirmed most of the above claims but were not able to address the issue of paternal effects as the data were not available. This current study was designed to determine whether or not paternal factors influence birth-weight.

The original sample consisted of 8,556 patients admitted to a study designed to examine 'The Effect of Social, Psychological and Obstetric Factors on Reproductive Outcome' of which the demographic and social characteristics have been documented by Keeping et al (11) and Morrison et al (12). The subset of the original cohort used for analysis in this study were those who had known heights and weights for both partners, had no significant medical disease, booked prior to 20 weeks' gestation and delivered the fetus after the 36th completed week of pregnancy. Stillbirths, major fetal abnormalities and chromosomal abnormalities were also excluded, leaving a residual group of 5,989 couples for analysis.

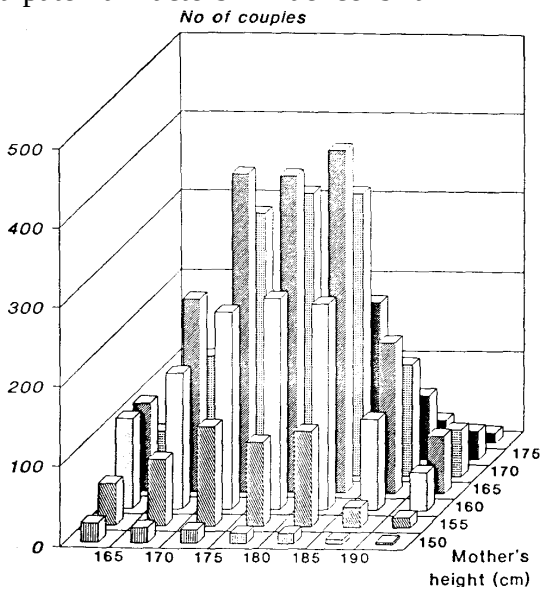

Figure 1. Association between parental heights for 5,989 couples.

METHODS

Analysis of birth-weight (g) upon gestation (in completed weeks from the 36th week) and parents' height and body mass indices (BMI) using Quetelets Index - [weight (kg) divided by height' (m2)] was performed using the statistical package SAS (Version 5). A quadratic term was included for gestation in order to account for the change in fetal growth rate in later stages of pregnancy.

For this analysis father's height, mother's height and mother's BMI were categorized in 7 divisions, and father's BMI in 6 divisions:

Father's height (cm): (165; 165-169; 170-174; 175-179; 180-184; 185-189; ≥190.
Mother's height (cm): (150; 150-154; 155-159; 160-164; 165-169; 170-174; ≥175.
Father's BMI: (20; 20-21.9; 22-23.9; 24.25.9; 26-27.9; ≥28.
Mother's BMI: (18; 18-19.9; 20-21.9; 22-23.9; 24-25.9; 26-27.9; ≥28.

Table 1. Analysis of variance of birth-weight (adjusted for gestation)

Factor	df	F value	Significance
Height			
Mother	6	14.25	p<0.0001
Father	6	3.88	p<0.0007
Interaction	36	1.23	p>0.05
Body Mass Index (quetelets)			
Mother	6	33.7	p<0.0001
Father	5	1.64	p>0.05
Interaction	30	0.68	p>0.05
Variance explained:	8.5%		
Residual S.D.	431.3	5799 df	

RESULTS

Analysis confirmed that 'like tends to marry like' with a correlation coefficient of 0.16 between parents' heights and 0.15 between parents' body mass indices (BMI). A graphic representation of the correlation between parent's heights is shown in figure 1.

Table 1 shows that paternal height had a significant effect (p<0.0007 on birth-weight although paternal BMI had no significant effect (p>0.005). It also confirmed the well established effects of maternal height and BMI on the fetal weight at delivery.

The effects of paternal height and BMI in relation to maternal height and BMI are graphically represented in figures 2 and 3 respectively with the original categories reduced to 3 for the father and 5 for the mother for ease of visual interpretation.

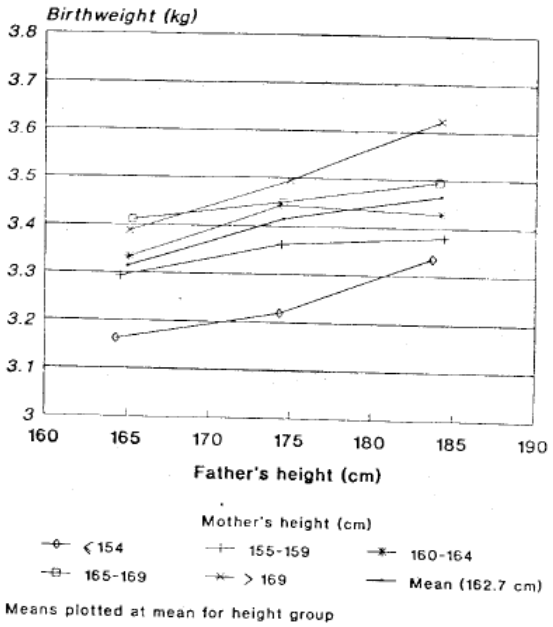

Figure 2. Association between paternal height and birth-weight.

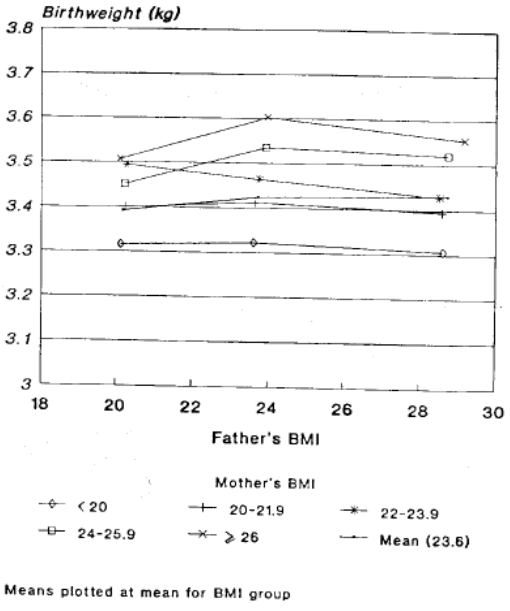

Figure 3. Association between parental BMI and birth-weight

DISCUSSION

The results clearly demonstrated that paternal height significantly affected birth-weight. The magnitude of this effect was less than either maternal height or maternal weight and was approximately a quarter of the former with an average effect over the range of father's height (from 165 cm - 184 cm) of 152 g.

Figure 2 also confirms the presence of 'maternal constraint' with the babies of shorter mothers showing a lesser increase in birth-weight of up to 130 g, while babies of taller mothers showed a much greater increase in birth-weight of up to 235 g (in relation to the height of the father).

The overall effect of paternal height on birth-weight in our population was of the same order as smoking (up to approximately 150 g) (unpublished data) and considerably more than socioeconomic status (approximately 50 g) (12). While this effect on birth-weight will probably have little impact on the management of labour or in obstetrical practice, it should be considered an important variable in any statistical analysis which involves birth-weight.

Acknowledgement

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