

MATERNAL OBESITY IS INDEPENDENTLY ASSOCIATED WITH INCREASED ANTENATAL ADMISSIONS AND HEALTH SERVICE COSTS: A POPULATION BASED STUDY

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Background

Maternal obesity is defined as a body mass index (BMI) $>30\text{kg}/\text{m}^2$. It affects more than 30% of the antenatal population in the UK and is the most common comorbidity of pregnancy.¹ Maternal obesity is associated with increased risk of maternal and offspring morbidity and mortality during pregnancy, with complications including gestational diabetes, hypertensive disorders (including pre-eclampsia), thromboembolic complications,²⁻⁴ induction of labour, operative delivery^{3,5} late stillbirth,^{6,7} birth injury⁸ and admission to the neonatal unit.⁹ Although these associations have been well reported, most studies report the consequences of maternal BMI for pregnancy in geographically confined cohorts which may not be generalisable to the population level. Furthermore, very few studies have estimated the impact that increased maternal BMI has on hospital admissions and short-term costs to the health service. The paucity of population level data about the clinical and economic burden of obesity in pregnancy limits the ability of policy makers to make informed decisions about the design and delivery of maternity services for an increasingly complex obstetric population. Furthermore, it makes evaluation of the cost-effectiveness of current public health strategies¹⁰⁻¹³ aimed at reducing the prevalence and clinical consequences of obesity in women of reproductive age very difficult.

The objective of this study¹⁴ was, therefore, to investigate the impact of maternal obesity on clinical complications and inpatient admissions and to estimate the additional short-term costs to the NHS of maternal obesity at the level of the Scottish population.

Methods

Admissions dataset

Anonymised data were retrieved on all singleton deliveries in Scotland, between January 2003 and February 2010. The following demographic information was extracted for every pregnant woman: parity, maternal age, weight, height, smoking status and deprivation category. For women with more than one pregnancy during the study period, information was recorded for each pregnancy. Maternal deprivation was categorised using the Scottish Carstairs 2001 quintiles and maternal BMI was calculated ($\text{weight}/\text{height}^2$) using maternal height and weight recorded before 16 weeks gestation.

Women were grouped according to their BMI using World Health Organisation (WHO)¹⁵ criteria into five categories: BMI $<18.5\text{kg}/\text{m}^2$ (underweight), BMI $18.5<25\text{kg}/\text{m}^2$ (normal), BMI $25<30\text{kg}/\text{m}^2$ (overweight), BMI $30<40\text{kg}/\text{m}^2$ (obese) and BMI $\geq 40\text{kg}/\text{m}^2$ (severely obese). The reference group used for all analyses was women with a normal BMI ($18.5<25\text{kg}/\text{m}^2$).

Costing admissions

Hospital and specialty specific unit costs, published by ISD¹⁶, were used to estimate the cost of each hospital admission based on the admitting hospital, type of care provided (consultant or midwifery lead) and length of stay. To calculate the total maternal inpatient and daycase costs associated with each pregnancy, the individual costs of each admission associated with each pregnancy were then summed.

Analysis of cost data

The effect of BMI on maternal admission costs was estimated by regressing total costs (per pregnancy) on maternal BMI category and socio-demographic indicators (age, smoking, deprivation, hospital of delivery and parity).

To determine whether the increased costs associated with low/high maternal BMI were attributable more to the number of admissions or longer durations of stay (per admission), incidence rate ratios for number of admissions and admission days were estimated.

Results

Clinical complications and maternal BMI

Data from the analysis showed that the risk of maternal complications increased with increasing BMI. When compared with normal weight women, women who were overweight, obese, or severely obese had a significantly increased risk of essential hypertension, pregnancy induced hypertension, gestational diabetes, and emergency and elective caesarean section. An increased risk of induced labour, iatrogenic preterm birth, and neonatal admission was also observed for underweight, overweight and obese women.

Relationship between maternal BMI, inpatient admissions and costs

Maternity admission costs, for women with high or low BMI, were higher when compared to those for women of normal BMI. Following adjustment for sociodemographic characteristics and parity, the estimated additional costs were £91.40 for underweight women, £149.97 for overweight women, £399.08 for obese women, and £754.93 for severely obese women.

When compared to normal weight women, all other BMI categories were associated with an increase in the duration and number of maternal hospital admissions required during and after pregnancy. Underweight women had an 8% increased risk of admission, while overweight, obese and severely obese women's relative increased risk was substantially greater: 16%, 45% and 88% respectively. The estimated relative increase in duration of stay (per admission) was 4%, 9% and 12% for overweight, obese and severely obese women respectively.

Discussion

Our data demonstrate that, at a population level, both high and low maternal BMI are associated with an increased risk of maternal and offspring complications during pregnancy, increased numbers and duration of maternal and neonatal admissions and increased costs to the health service. The increase in maternal inpatient costs is statistically significant after adjusting for sociodemographic factors. Increases in the frequency of admission appeared to contribute more to the observed increase in costs associated with high maternal BMI than did duration of stay per admission.

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