Best Practice & Research Clinical Obstetrics and Gynaecology 29 (2015) 438–448

Contents lists available at ScienceDirect

Best Practice & Research Clinical Obstetrics and Gynaecology

journal homepage: www.elsevier.com/locate/bpobgyn

14

Impact of Maternal Obesity on Perinatal and Childhood Outcomes

Louise Santangeli, MBChB, MRCOG [a, *], Naveed Sattar, MBChB, PHD [b], Shahzya S. Huda, MBChB, MD [c]

[a] *ST7 Obstetrics and Gynaecology Speciality Doctor, Wishaw General Hospital, Lanarkshire, Glasgow, UK*
[b] *Professor of Metabolic Medicine, Institute of Cardiovascular and Medical Sciences, RC214 Level C2, Institute of C&MS, BHF GCRC, Glasgow G12 8TA, UK*
[c] *Consultant Obstetrician and Gynaecologist and Honorary Senior Clinical Lecturer, Women and Children, Forth Valley Royal Hospital, Larbert, UK*

Keywords:
obesity
gestational diabetes
pregnancy
macrosomia
metabolic syndrome
offspring

Maternal obesity is of major consequence, affecting every aspect of maternity care including both short- and long-term effects on the health of the offspring. Obese mothers are at a higher risk of developing gestational diabetes and pre-eclampsia, potentially exposing the foetus to an adverse intrauterine environment. Maternal obesity is linked to foetal macrosomia, resulting in increased neonatal and maternal morbidity. Foetal macrosomia is a result of a change in body composition in the neonate with an increase in both percentage fat and fat mass. Maternal obesity and gestational weight gain are associated with childhood obesity, and this effect extends into adulthood. Childhood obesity in turn increases chances of later life obesity, thus type 2 diabetes, and cardiovascular disease in the offspring. Further clinical trials of lifestyle and, potentially, pharmacological interventions in obese pregnant women are required to determine whether short- and long-term adverse effects for the mother and child can be reduced.

* Corresponding author.
E-mail addresses: LouiseSantangeli@doctors.org.uk (L. Santangeli), Naveed.Sattar@glasgow.ac.uk (N. Sattar), Shahzya.huda@glasgow.ac.uk (S.S. Huda).

http://dx.doi.org/10.1016/j.bpobgyn.2014.10.009
1521-6934/

Obesity: the scale of the problem

Obesity has become an epidemic throughout the world, and is considered one of the leading causes of death and disease in the industrialised world [1,2]. Maternal rates of obesity are no different to rates of obesity in the general population doubling over a decade [3]. In some parts of the UK, >20% of women of childbearing age are obese and the prevalence of obesity amongst pregnant women is spiralling, placing an unanticipated burden on health-care resources [4]. Maternal obesity is of major consequence in obstetrics and affects every aspect of maternity care including long-term effects on the future health of the offspring (Table 1). The purpose of this chapter is to highlight some of the key impacts of maternal obesity, both short and long term, on the offspring.

Short-term impact of maternal obesity on the offspring

Birthweight and foetal macrosomia

It is well recognised that birthweight is, in part, dependent on maternal nutrition [5,6], maternal pre-gravid weight [7,8] and weight gain during the pregnancy. [9]

Studies have shown positive correlations between maternal pre-pregnancy weight and gestational weight gain with the birthweight of the neonate and associated health risks [9]. The Institute of Medicine (ISOM) published guidelines on recommended weight gain in pregnancy based on pre-pregnancy body mass index (BMI) [10] and several studies have examined the influence on maternal weight gain on birthweight. A Danish study investigated the association of maternal weight gain and birthweight in 2248 singleton term pregnancies and found that in normal-weight women there was an increased risk of birthweight <3000 g (OR 2.3 (1.5–3.7)) if the maternal weight gain in

Table 1
Summary of the complications and estimated risks associated with maternal obesity. (Values expressed OR = Odds ratio[95% confidence interval (CI)] or RR = relative risk[95% CI], obese versus lean unless otherwise stated).

Obstetric complication	Increased risk associated with obesity	References
Pre-eclampsia Systematic overview (16 studies) of rates in women categorised by prepregnancy BMI	RR 0.54% [0.27–0.80]	O'Brien et al., 2003 [48]
Gestational Diabetes Meta-analysis (20 studies) of pregnancy complications including gestational diabetes: overweight, obese and severely obese vs non obese women	OR 2.14 [1.82–2.53] (overweight) OR 3.56 [3.05–4.21} (obese) OR 8.56 [5.07–16.04] (severely obese)	Ch SY et al., 2007 [16]
Preterm labour (nulliparous elective preterm delivery)	OR R 1.15 [1.03–1.27] (overweight) OR 1.52 [1.31–1.77] (obese) OR 2.13 [1.75–2.58] (severely obese)	Smith et al., 2007 [46]
Macrosomia	OR 2.1 [1.6–2.6]	Jolly et al., 2003 [22] Usha et al., 2005 [23]
Adverse Perinatal Outcome Results from an observational based population study of 60,167 deliveries over a 9 year period.	shoulder dystocia OR 2.9 [1.4–5.8] NNU admission OR 1.5 [1.09–2.3] Birth trauma (skin grazes, bruises, fractures, nerve palsies, muscle haematomas, cephalohaematomas) OR 1.5 [1.1–2.1]	Usha et al., 2005 [23]
Miscarriage Meta-analysis (16 studies) of miscarriage rate in women who conceived by spontaneous pregnancy or assisted conception with BMI>25.	RR 1.67 [1.25–2.25] (including all miscarriages <20 weeks)	Metwally et al., 2008 [94]
Congenital anomalies Systematic review (39 studies) and meta-analysis (18 studies) of congenital anomaly rates by group and subtype: obese vs non-obese women	Neural tube defects RR 1.87 [1.82–2.15] Spina bifida RR 2.24 [1.86–2.69] Cleft lip/palate RR 1.20 [1.03–1.40] Hydrochephaly RR 1.68 [1.19–2.36] Cardiovascular anomalies RR 1.30 [1.12–1.64]	Stothard et al., 2009 [95]