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# Maternal Obesity in Europe: where do we stand and how to move forward?

# A scientific paper commissioned by the European Board & College of Obstetrics and Gynaecology (EBCOG)

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## Abstract

Paralleling the global epidemic of obesity figures in the general population, the incidence of maternal obesity (BMI>30kg/m² at the start of pregnancy) has been rising over the last world. While most European countries do not systematically report obesity figures in their pregnant population, the prevalence of maternal obesity varies from 7 to 25% and seems strongly related to social and educational inequalities.

Obesity during pregnancy represents an important preventable risk factor for adverse pregnancy outcomes and is associated with negative long-term health outcomes for both mothers and offspring. These effects are often aggravated by the high incidence of abnormal glucose tolerance and excessive gestational weight gain found in this group. The main controversies around the management of the obese pregnant women are related to (1) the value of repeated weighing during pregnancy (2) the optimal gestational weight gain to advise and the lifestyle messages to deliver in order to achieve this, (3) the optimal strategy and timing of screening for gestational diabetes (GDM), (4) the optimal timing and mode of delivery.

These controversies are reviewed in this review, with the exception of screening for gestational diabetes that is discussed extensively elsewhere in this issue (Benhalima et al.). An agenda for research is proposed with the hope that it will catch the attention of policy-makers and funders and ultimately lead to the development of European-wide evidence-based guidelines for clinicians.


**Keywords:** epidemiology, maternal obesity, prevention, preconception, lifestyle interventions, intergenerational, Europe, EBCOG

## Maternal obesity in Europe

Obesity is increasing at an alarming rate worldwide and has doubled since 1980, with a dramatic increase now also seen in low- and middle-income countries, particularly in urban settings. In 2014, worldwide 40% of adult women aged 18 years and older were overweight and 15% were obese.

Approximately 42 million children under the age of 5 were overweight or obese in 2013[1]. Despite a recent decline in the prevalence of obesity in preschool-aged children from 2 to 5 year olds in the US (from 13.9% in 2003-2004 to 8.4% in 2011-2012), obesity among children and adolescents aged 2-19 years is still too high; with a 17.7% obesity rate in 6-11year-olds and a 20.5% obesity rate among 12-19 year-olds[2]. The high prevalence of maternal and childhood obesity creates an intergenerational problem with related co-morbidities.

A 2013 National health survey in Belgium (N=10 829) reported 48% of the general population as either overweight (BMI ≥ 25 kg/m², 34%) or obese (BMI ≥ 30 kg/m², 14%), with a 3% increase in the prevalence of obesity since 1997 (11%). Not surprisingly, women of reproductive age are also affected. The distribution of obesity within this female population shows that approximately one in three obese women are between 18 and 44 years of age[3].

Most European countries do not report data on pre-gestational body mass index (BMI) and gestational weight gain systematically, so no comprehensive representative picture of the epidemic burden of maternal obesity is available. Moreover, information about pre-gestational weight and height is often based on recalled data or a measurement at the first antenatal visit. Depending on the cohorts studied and the period of evaluation, the prevalence of obesity in pregnant women ranges from 1.8% to 25.3% or even up to 40% in American cohorts [4]. A nationally representative study from 34 maternity units in the UK (N=619 323), collecting data from the first trimester maternal BMI between 1989 and 2007, showed a significant increase in first trimester maternal obesity over time, which doubled from 7.6% to 15.6% over 19 years[5] .

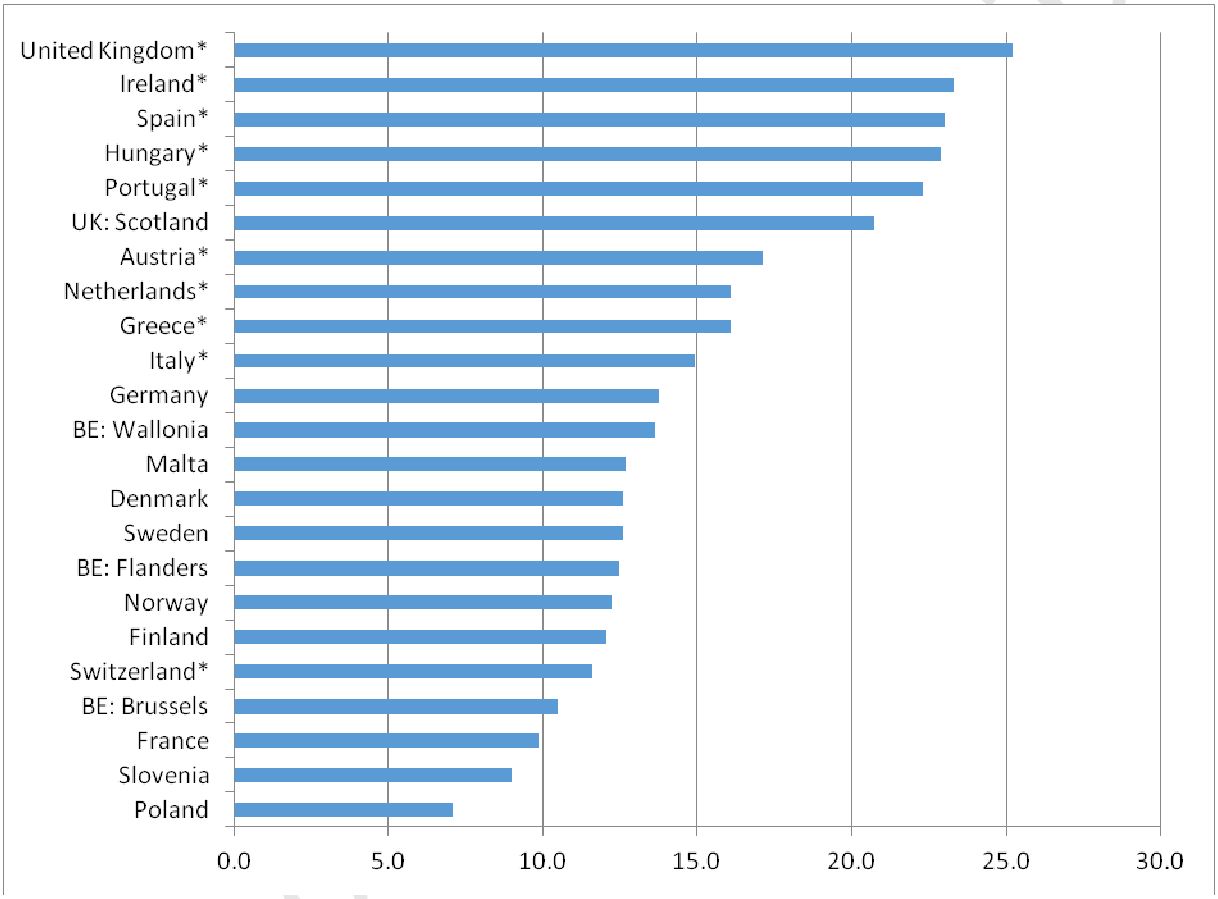
The Euro-Peristat Network started up in 1999 and aimed to analyse data about the health and health care of pregnant women and newborns. They now have official representation from 29 countries across Europe, and have developed a list of recommended indicators for perinatal health surveillance, based on a DELPHI consensus process with professionals from EU member states and Norway. These indicators for perinatal health are categorised into three sub groups: as *core* indicators – those that are essential to monitoring perinatal health – , and *recommended* indicators – those considered desirable for a more complete picture of perinatal health across the member states and finally indicators for *further development* – those that represent important aspects of perinatal health but require further work before they can be implemented within the member states.

Because of a rising incidence of obesity among women, Euro-Peristat have recently added the monitoring of mother's pre-pregnancy BMI, categorised as a *recommended* perinatal health indicator. The distribution of pre-pregnancy BMI was defined for women delivering live or stillborn babies before pregnancy or at the first antenatal visit, and data are based on existing birth registers in each country [6]. International comparisons are often complicated and biased by the heterogeneity of their regional data registers. Only a few European countries perform database linkages of maternal, fetal

and infant health determinants systematically and consequently, to improve the validity and quality of routine data. Lack of optimal linkages explains the gaps and inconsistencies in the current data availability[7].

Figure 1 shows the distribution of maternal obesity in different EU countries from the Euro-Peristat database. Prevalence of obesity in countries marked with an asterisk was retrieved from the WHO database including a general female population aged 20 years or older.

*Figure 1: Distribution of maternal obesity (BMI ≥ 30 kg/m²) from Euro-Peristat database and WHO*




Source: http://www.europeristat.com/our-indicators/euro-peristat-perinatal-health-indicators-2010.html

*from WHO database (2009) (globally higher rates due to general female population aged 20 or older)

The variation in the distribution of maternal obesity in the 3 geographical and political different regions of Wallonia, Flanders and Brussels in Belgium, indicates a socio-demographic and economic gradient, which needs further exploration. In the region of Brussels, 66% of neonates are born from a mother with another ethnicity, indicating the influence of a complex multi-ethnic diversity and different levels of welfare [6].

The Flemish Study Centre for Perinatal Epidemiology (SPE, Belgium) routinely collected data on maternal pre-pregnancy weight (kg) and height (m) as well as maternal weight at delivery (kg) since

2009. Perinatal data from all maternity units (n=65) are collated centrally, subjected to an error detection program, and checked for accuracy and completeness through feedback with the individual units and reassessment of patient records when needed[8]. This enables us to make a representative regional picture of maternal obesity and gestational weight gain (GWG) in this region. The prevalence of maternal obesity significantly increased from 2009 (10,2%) to 2014 (11,4%). In the total term population, including only singletons (N=337 590), most obese pregnant women (72%) were class I obese (BMI 30-34.9kg/m²), whereas 21% were class II obese (BMI 35-39.9kg/m²) and 7% class III obese (BMI ≥ 40 kg/m²). The mean BMI (kg/m², SD) significantly increased from 23.9 (4.5) in 2009 to 24.2 (4.6) in 2014, with a same plateau since 2012. Concurrently maternal obesity also has an ethnic and socio-economical gradient[9], which increases even more the burden of maternal obesity on public health issues.

Euro-Peristat aims to build up a sustainable and qualitative perinatal health database. This development is of great value to have common and comparable data about maternal population characteristics like pre-gestational BMI.

## Maternal obesity and short- and long-term complications for the mother and her offspring

Obesity (BMI ≥30kg/m²) during pregnancy is a major public health concern because of the increased risks for both the mother and child. The increased risks for the mother of a miscarriage, metabolic and cardiovascular dysfunctions presented as gestational diabetes and hypertension, pre-eclampsia, dysfunctional labour and cesarean section have been well described[9-15]. Complications are even higher when maternal obesity is combined with excessive gestational weight gain, especially the increased risk of caesarean section, macrosomia and postpartum weight retention [12]. For the neonate, there is an increased risk of congenital malformations[16], macrosomia and admission to a neonatal care unit[9, 12, 17]; the risk of stillbirth is also strongly related to maternal BMI[18, 19].

In the long term, children of obese mothers who were prone to metabolic dysfunctions in utero, *in utero* programming, will face further metabolic and cardiovascular problems [20, 21], as well as neurocognitive developmental problems[22]. Furthermore, maternal weight retention between the first and second pregnancy, which is often a result of excessive gestational weight gain and postpartum weight retention (PPWR), is associated with an increased risk for perinatal complications in the next pregnancy, even in underweight and normal weight women[23, 24]. Concurrently, failure to lose pregnancy related weight in an appreciable time of six months after delivery is an important indicator of obesity in midlife, and is fueling an intergenerational cycle of obesity within the female population and offspring[21, 22].

In developed countries, obesity accounts for 2-7% of the total healthcare costs[1]. A recent retrospective prevalence-based study on health service utilization and costs in obese pregnant women up to 2 months following delivery showed respectively a 23% and 37% increased mean total cost in overweight and obese women, compared with normal weight pregnant women, and this was after adjusting for maternal age, parity, ethnicity and comorbidity[25]. Moreover, gestational diabetes increases costs of care of approximately 34% compared to women without gestational diabetes[26].

## Controversies in the management of maternal obesity

*1. The value of routine weighing during pregnancy*

In the UK, routine weighing was phased out on recommendations of the National Institute for Health Care and Excellence (NICE) as it was potentially resulting in increased maternal stress without proven benefit[27]. This approach was recently supported by an Australian RCT in which 782 pregnant women were randomly assigned to systematic weighing during pregnancy versus routine care. Routine weighing at antenatal visits did not reduce total gestational weight gain, neither did it reduce the incidence of excessive gestational weight gain[28]. Unfortunately, the study was relatively small and did not report on perceived or measured stress or anxiety caused by (not) being weighed and discussing these issues during the antenatal visits.

In contrast to this, weighing in pregnancy still forms a routine part of antenatal practice in many European countries like France, Denmark, Germany, Italy and Belgium. Weighing at antenatal visits has substantial advantages: The recorded weight can initiate discussions on appropriate weight gain during pregnancy and about life-style modifications in order to achieve this. Also, many women are anxious about their weight during pregnancy. In women, weight gain can induce anxiety and stress, even when related to a “physiologic condition” like pregnancy. Adequate measurements and counseling in these situations could also have a possible stress-reduction affect.

This idea is supported by a recent RCT comparing usual care versus regular weighing, setting maximum weight gain targets and feedback by community midwives in pregnant women, irrespective of their BMI. The study showed a modest difference favoring the intervention group in the percentage of women gaining excessive gestational weight (23.5 % versus 29.4 %). More interestingly, the intervention group also consistently reported smaller increases in depression and anxiety scores throughout pregnancy compared with usual care. Most women commented the intervention was useful in encouraging them to think about their weight and believed it should be part of routine antenatal care. Community midwives felt the intervention could be implemented within routine care without

adding substantially to consultation length, thus not perceived as adding substantially to their workload[29].

From a public health perspective, there are many advantages to routine weighing and recording this in the perinatal databases. In the region of Flanders, Belgium, where patients are weighed routinely, BMI and gestational weight gain have been available for all pregnancies in the region since 2009. This has led to a better insight in the socio-demographics of gestational weight gain and maternal obesity, the related perinatal outcomes and the effects of weight fluctuation between pregnancies[9, 23].

*2. The optimal gestational weight gain and strategy for prevention of obesity related complications*

The additive effect of excessive gestational weight gain on the incidence of obesity-related complications like gestational diabetes, hypertensive disorders and caesarean birth is well established[12]. Additionally, there is increasing evidence that excessive gestational weight gain and the subsequent inter-pregnancy weight retention – which is often a result of retained weight after delivery - is associated with more complications in future pregnancy[23, 30].

Therefore it seems important to achieve a gestational weight gain in obese pregnant women that is associated with the best outcome. Recommendations for healthy weight gain in pregnancy related to the BMI at the start of pregnancy were published by the Institute of Medicine (OIM) in 1990 and revised in 2009[31]. Ideally, obese women should gain between 5 and 9 kg during pregnancy. Some have suggested that these recommendations are not strict enough and that a lower gain would lead to better outcomes, especially in obesity class II (BMI 35-40) and III (BMI>40)[32, 33]. Still about half of the overweight or obese pregnant women have gestational weight gain in excess of these recommendations. Therefore a large number of trials have conducted clinical programs to reduce gestational weight gain by promoting healthy eating, physical activity or a combination of those. While some trials were successful in reducing gestational weight gain [34, 35] or improving behavior[36], this impacted very little on relevant maternal and neonatal outcomes in meta-analyses[37, 38]. The ideal weight management in obese pregnant women therefore remains to be determined.

*3. The optimal strategy for screening for gestational diabetes GDM*

This topic has been addressed at length by Benhalima et al. in the same issue.

*4. The optimal timing and mode of delivery*

Labour is often complicated in obese pregnant women, and this in an apparently contradictory way. On one hand, a high BMI is associated with an increased risk for induced and spontaneous preterm birth[39]. On the other hand, obese women have a higher risk than overweight and lean women to progress beyond term, with a higher incidence of post-term childbirths especially when BMI reaches 35 kg/m² or more[11, 40].

Obese women tend to have higher odds for induction of labour and failure to progress during labour[11, 41]. Once labour is established, obese women are at increased risk of cesarean delivery, operative vaginal delivery, and failed trial of labour after cesarean delivery.

Most studies advocate vaginal delivery as the preferred way of delivery in obese patients. In the absence of macrosomic fetus, induction of labour is not advised. In the presence of macrosomia, a recent European multicenter trial showed that early term (37-38+6w) induction of labour for suspected large-for-date fetuses (Estimated fetal weight (EFW)>95th percentile) is associated with a reduced risk of shoulder dystocia and associated morbidity compared with expectant management. In this study, induction of labour did not increase the risk of caesarean delivery and improved the likelihood of spontaneous vaginal delivery[42]. This approach however remains debated and some guidelines advise an elective caesarean section in cases with suspected macrosomia (EFW>4500g)[43].

## Psychological and motivational components

*1. Obesity and anxiety during pregnancy and postpartum*

Obesity is increasing among women of reproductive age and adverse maternal and neonatal outcomes are well described. Concurrently, several studies have looked at evolutions of maternal anxiety and depression during pregnancy and the postpartum period, and they found that antenatal anxiety occurs frequently and increases the likelihood of antenatal and postnatal depression[44, 45]. Moreover, prospective studies have shown a link between antenatal maternal anxiety/stress and cognitive, behavioural, and emotional problems in the child, fueling the developmental origins of health and diseases' hypothesis[46, 47].

It is generally well known that obese women are more likely to suffer from higher levels of anxiety and depression, compared to normal-weight women, but these associations are less studied in pregnant women.

Psychological factors including stress and anxiety can also influence maternal weight. Pregnant women with elevated levels of stress and anxiety consume more fats, oils, sweets and snacks, have decreased intakes of vitamins and are often described as 'emo-eaters'[48]. We recently compared levels of anxiety and depressed mood during pregnancy in obese versus normal-weight women and

found higher levels of anxiety and depressive symptoms in obese women. Concurrently, lifestyle behavior (smoking) and socio-demographic characteristics as maternal education, ethnicity, living with a partner and psychological history were all related to the weight status of the pregnant women, making them even more vulnerable[49]. These associations were also confirmed in other studies[50, 51]. Although the controversies regarding the optimal starting point of initiating lifestyle coaching in obese women to attain better maternal and neonatal health outcomes [52], lifestyle coaching in obese pregnant women can increase the psychological wellbeing, with beneficial effects on healthy gestational weight gain[35]. Besides, positive associations are shown between psychological factors during pregnancy, defined as levels of anxiety and feelings of depression, and weight retention at 6 and 18 months after delivery[53, 54]. In the light of the *in utero* programming theory, the effect of the mental health of obese pregnant women should be explored further and its findings should be taken into account during the development of perinatal care programmes for pregnancy in high risk groups.

*2. Obesity and motivational coaching*

Obese pregnant women often lack knowledge about the impact of obesity during pregnancy; and communication with healthcare providers is often experienced as stressful, confusing and judgmental[55], and thus maternal expectations are often not met[56-58]. Most qualitative research concludes that improved training in communication skills with a less judgmental behavior and more sensitive interactions between healthcare providers and obese women is needed[59].

Motivational interviewing technique can be a supportive tool in the communication about health promotion and have showed promising effects in reducing weight in a non-pregnant population[60, 61]. Motivational interviewing is based on a directive method of communication with a focus on intrinsic motivation. Motivational issues focus on developing discrepancy and exploring and resolving ambivalence about making changes, without undue pressure. Women are asked to identify behaviours that need to change and set small stepwise goals from their own intention to achieve a healthy behaviour. Personal barriers to behavioural change are explored and as much as possible positive verbal reinforcement is given to increase each pregnant woman's self-confidence and self-efficacy[62].

## Topics for future research

**Table 1: Suggested topics for future collaboration and research concerning Maternal Obesity in Europe**

- Standardization of registration of BMI and GWG in perinatal databases throughout Europe and related core outcome parameters.

- Prospective controlled studies on safety of gestational weight gain below recommendations in obesity class I, II and III.
- Identification of socio-demographic determinants of obese reproductive women by geographical region to target educational and preventive campaigns for the promotion of a healthy pre-gestational BMI
- Evaluation whether an altered onset and progression of labour in obese pregnant women calls for customized labour timeframes and targeted dosages of oxytocin
- Determination of pre-conceptional needs of overweight and obese women and effects of specific and targeted lifestyle interventions to increase the likelihood of a successful pregnancy and healthy infant.
- Determination of the optimal screening strategy to diagnose and treat GDM in obese pregnant women to prevent short and long-term risks related to GDM in mother and offspring (cfr Benhalima et al further in this issue)
- Studies on adequate folic acid and vitamin D dosages to prevent neural tube defects and GDM respectively in obese pregnant women
- Studies on the effectiveness of pre-conception health programs and interventions for improving pregnancy outcomes in overweight and obese women
- Definition of modified regular physical activity exercises for obese pregnant women to maintain physical fitness, manage weight, improve psychological well-being and reduce risk for GDM
- Description of an optimal strategy for lifestyle interventions during pregnancy, including mobile health applications to improve relevant composite maternal and neonatal outcomes
- Studies on the impact of maternal diet in obese pregnant women and mothers on the volume and quality of breastmilk
- Determination of the influence of a vulnerable socio-economic gradient in obese reproductive women on adverse maternal and neonatal outcomes
- Determination of the influence of maternal pre-conceptional and prenatal environment on epigenetic modifications in the neonate
- Studies on the long-term effects of obesity surgery before pregnancy on maternal and offspring health.

## In conclusion

An integrated approach for the management of obesity in women of reproductive age who are planning a pregnancy is crucial. Management should begin before conception and continue through pregnancy and the postpartum period within a multidisciplinary team focusing on mental wellbeing, healthy eating and physical activity including weight management techniques.

Maternal obesity not only implies a personal responsibility but also infers a social environmental, political and economic responsibility. Cost-effectiveness of regulatory frameworks increasing the accessibility and availability of healthy food and drinks must be balanced against the burden of reduced quality of maternal health and related costs regarding all the co-morbidities in the mother as well as in the offspring.

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All authors contributed to the conception of the commentary. RD and AB drafted the article and all authors revised it critically for important intellectual content. All authors approved the final version to be published.

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