

Obesity in pregnancy: obstetric complications and outcomes



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ASO Northern Ireland regional group meeting

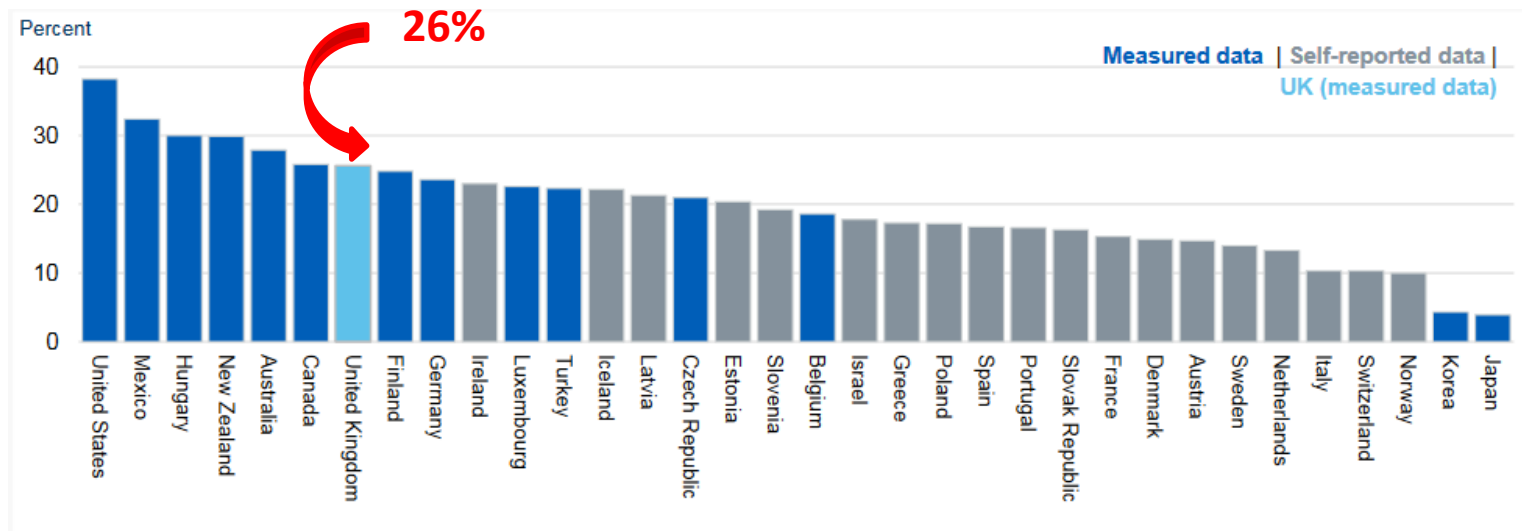
24th January 2018



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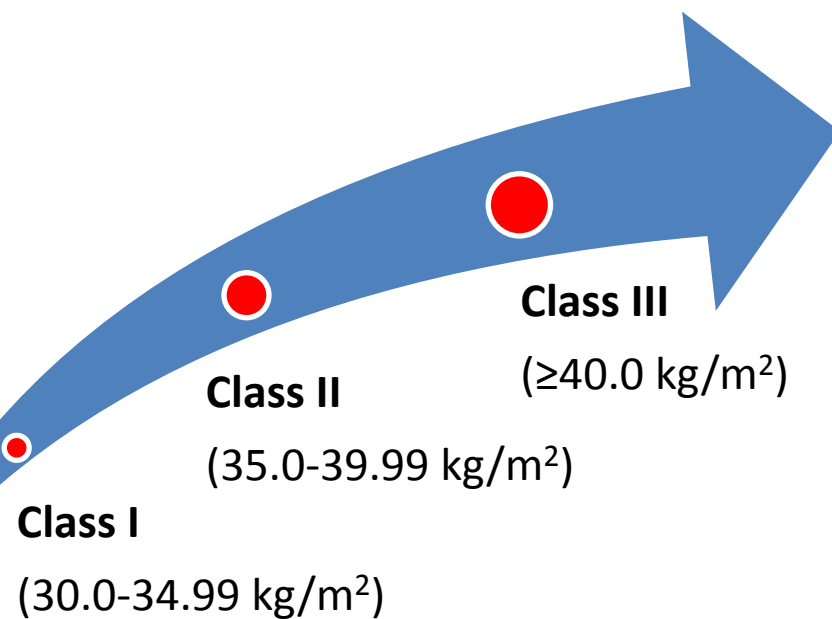
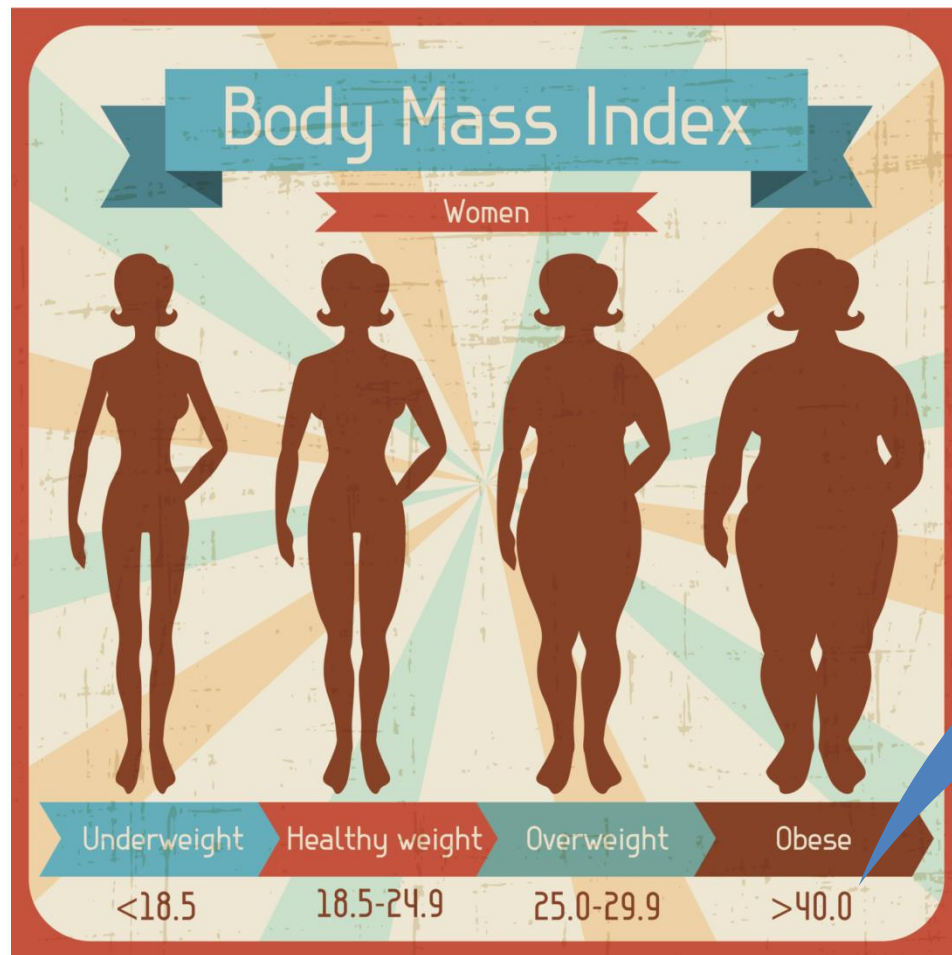
The scale of the problem

- Global issue
- Major implications for individual and public health



(National statistics: Obesity, Physical Activity and Diet: England 2017)

Classification of obesity



(World Health Organization, 2015)

Obesity in pregnancy

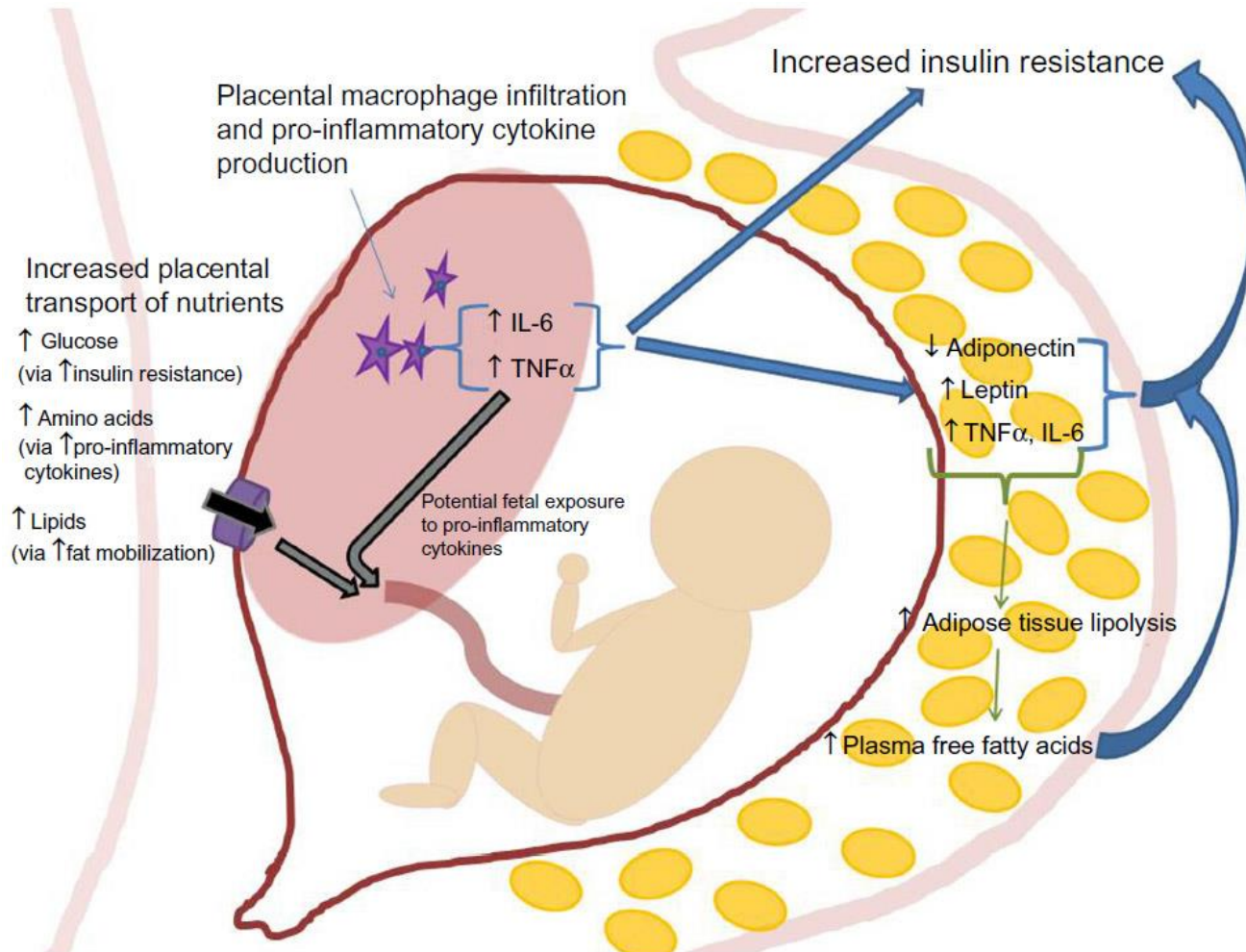
- 58% women in England are overweight / obese
- Almost 50% of pregnant women are classified as overweight or obese (Scott-Pillai *et al.*, 2013)
- 5%–6% of women are in obese classes II or III



Translates to **38,478** births annually

- 0.19% of all women giving birth in the UK are super morbidly obese (BMI ≥ 50 kg/m²) (CMACE, 2010)

Physiological changes



Stirrat and Reynolds, 2014
Reilly and Rader, 2003

Challenges facing the obstetric team

1

- Antenatal

2

- Intrapartum

3

- Postpartum

Antenatal challenges

Maternal complications

- Hypertensive disorders of pregnancy (16%)
 - ✓ Pre-eclampsia
 - ✓ Pregnancy induced hypertension
- Gestational diabetes (8%)
- Venous thromboembolism

Fetal complications

- Miscarriage
- Stillbirth (8.6 v 3.9 per 1,000 LB)
- Preterm delivery (7%)
- Congenital anomaly
- Macrosomia (23%)
- Growth restriction (4%)

Scott-Pillai *et al.*, 2013
O'Brien, Ray and Chan, 2003
CEMACE, 2010
Bhattacharya *et al.*, 2007



Modified antenatal care

Essential care

- Appropriate BP monitoring
- Aspirin (75mg, BMI>35)
- VTE risk assessment (?LMWH)
- Vitamin D (10mcg)
- High dose folic acid (5mg)
- Glucose tolerance test (BMI>30)
- Anaesthetic r/v (BMI>40)

Desirable care

- Preconception counselling
- Specialist antenatal clinic



Centre for Maternal and Child Enquiries
Improving the health of mothers, babies and children



Royal College of
Obstetricians and
Gynaecologists

Setting standards to improve women's health

CMACE/RCOG Joint Guideline

Management of Women with Obesity in Pregnancy

Fetal surveillance

- Growth monitoring
- ✓ Attendance for regular growth scans in third trimester (BMI >35 kg/m²)
- Detection of fetal anomaly
- ✓ 1-3 fold increase in risk of neural tube defects
- ✓ Increased risk of congenital heart disease (OR 1.44 for class III)

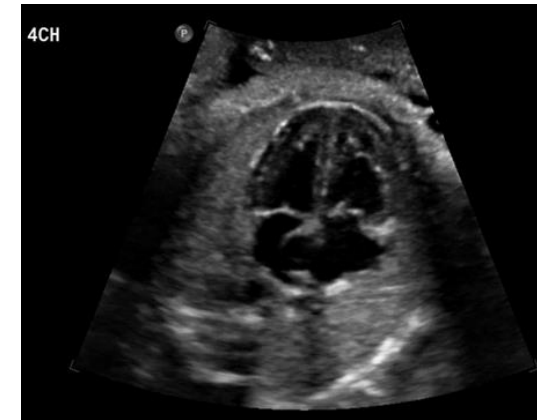
Kelly-Ann Eastwood*, Ciara Daly, Alyson Hunter, David McCance, Ian Young and Valerie Holmes

The impact of maternal obesity on completion of foetal anomaly screening

DOI 10.1515/jpm-2016-0048

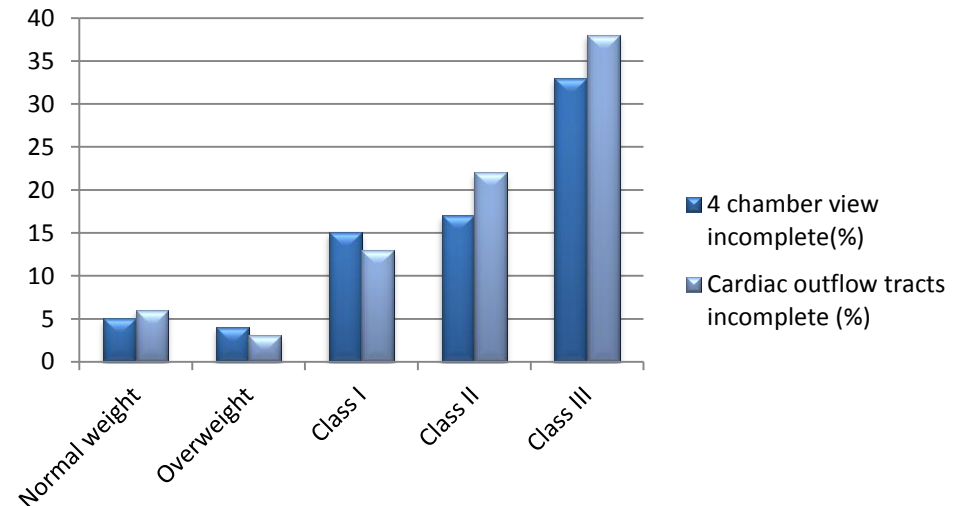
Received February 8, 2016. Accepted December 28, 2016.

Conclusion: Maternal obesity has a significant impact on completion of foetal anomaly screening.



- Retrospective cohort study
- Analysis of 500 anomaly scans
- 19+0 – 21+6 weeks gestation
- Women were categorised according to the WHO BMI classification
- Fetal anomaly imaging scoring system developed from the NHS Fetal Anomaly Screening Programme standard to evaluate scans

- 52% of scans incomplete in obese class III v 12% in normal weight class
- 33% of four chamber cardiac views and 38% of outflow tract views were not obtained in obese class III



Technicalities

- Increased depth of insonation
- Previous c/s



- Equipment
- Occupational injury
- Increased scanning time



Pai-Jong *et al.*, 2015

Paladini, 2009

Hunsley and Farrell, 2014

Intrapartum considerations

- Fetal monitoring
- Anaesthetic complications
 - ✓ Regional anaesthesia
 - ✓ Risk of failed intubation (1:3)
 - ✓ Increased risk of aspiration
- Increased likelihood of induction of labour (OR 1.4)
- Increased risk of emergency caesarean section (OR 1.8)
- Postpartum haemorrhage (OR 2.4)



Gupta and Faber, 2011
Scott Pillai *et al.*, 2010
CEMACE/RCOG, 2010

Postpartum complications

Maternal:

- Venous thromboembolism
- Wound infection / breakdown (OR 3.5)
- Increased length of hospital stay
- Independently associated with risk of dying



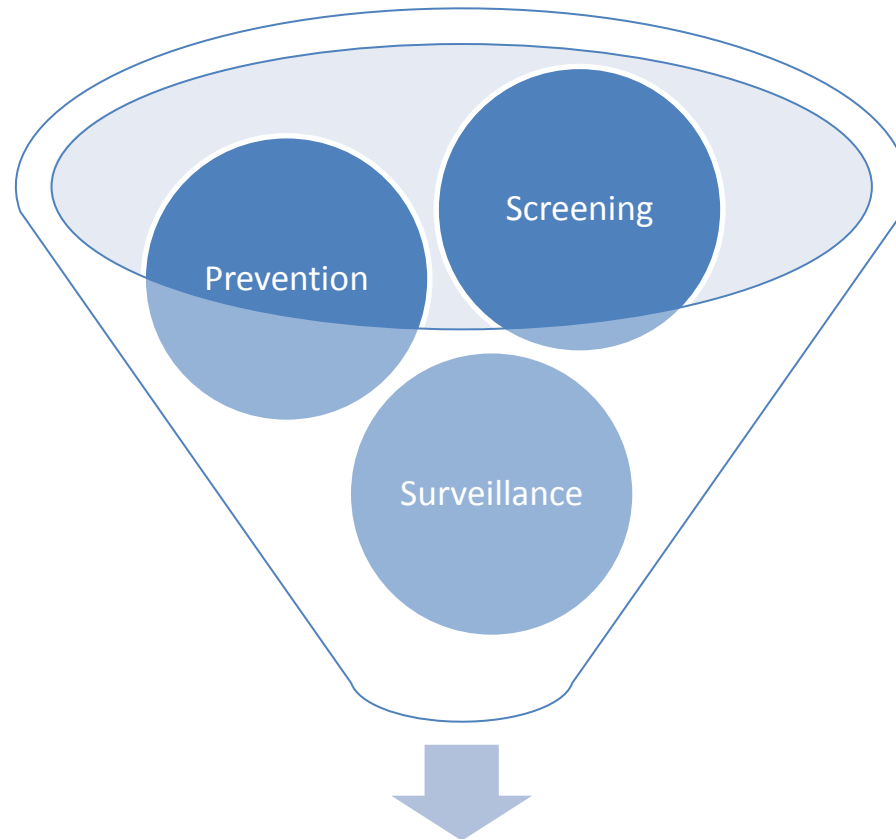
Neonatal:

- Complications of prematurity
- ICU admission
- Increased length of hospital stay
- Cerebral palsy
- Death



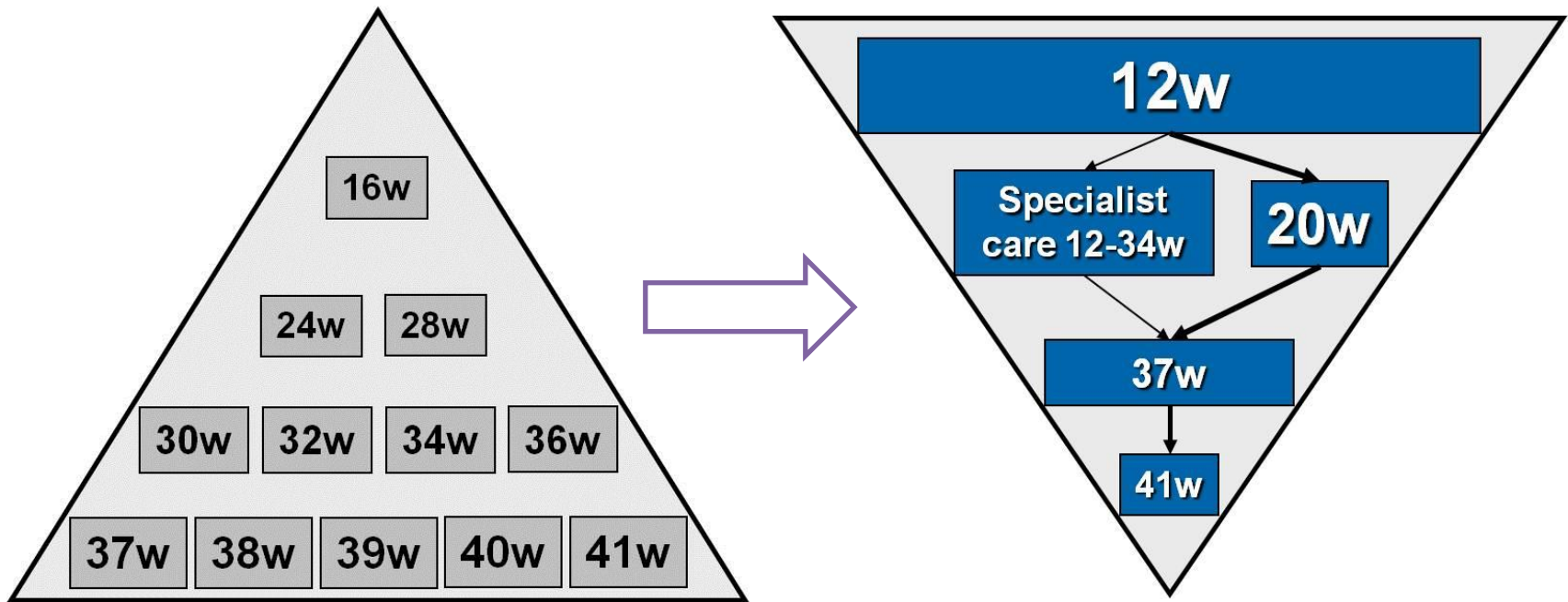
Scott-Pillai *et al.*, 2013
MBRRACE-UK, 2014
Paladini, 2009

The future



Improved maternal and neonatal outcomes

Prenatal screening



- Pyramid model of prenatal care (Ministry of Health, 1930)
- Challenging existing pathways of care (Nicolaidis, 2011)
- Combined screening tools increase predictive value of screening models (Poon *et al.* 2010, Audibert *et al.* 2010)

The PREDICT study



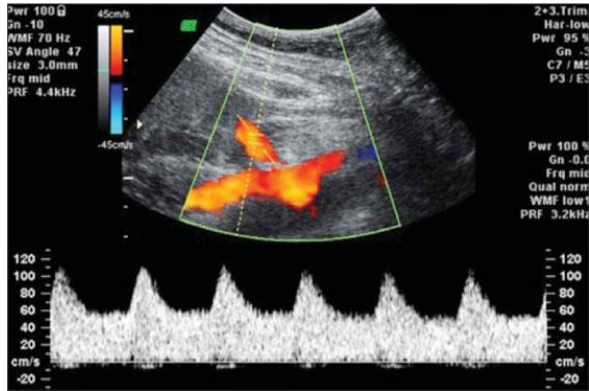
- Clinical utility of 3D Doppler ultrasound and maternal biomarkers in the prediction of pre-eclampsia in high-risk women
- Prospective longitudinal observational study
- 4 groups of high-risk women

1. Diabetes (treatment for >1 year)
2. Obesity (BMI >35 kg/m²)
3. Hypertension
(IUGR, PE, chronic hypertension, renal disease)
4. Thrombophilia / autoimmune disease

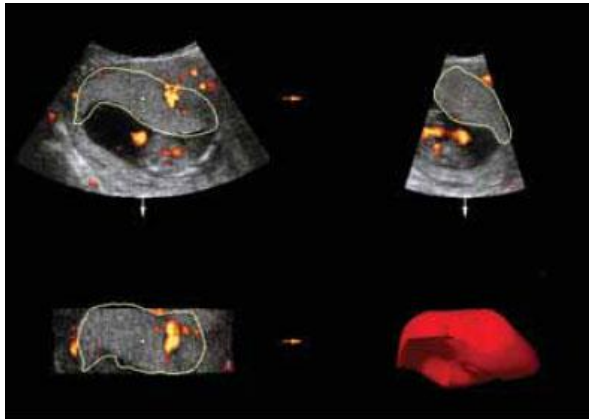
- n=232 (including 30 low risk controls)

Methodology

1. Uterine artery Doppler

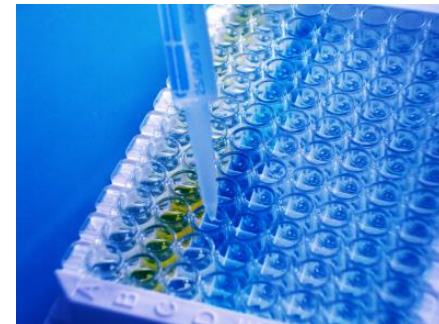


2. 3D Power Doppler placental imaging



3. Maternal serum biomarkers

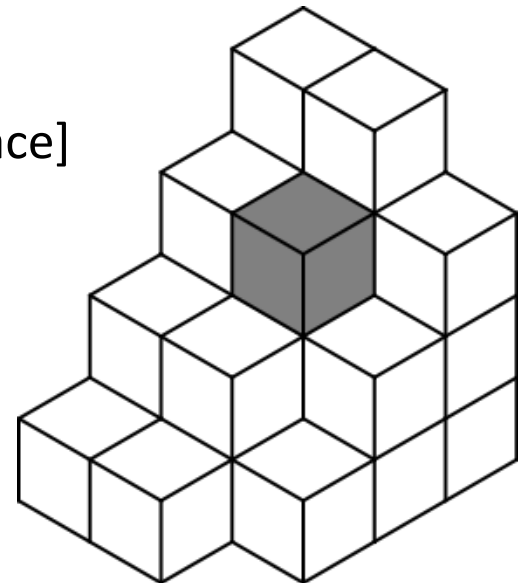
- Imbalance between circulating angiogenic & anti-angiogenic factors
- Angiogenic and anti-angiogenic markers:
[PlGF, sFlt-1, sEng]
- HbA1c, PAPP-A, FABP4



3D power Doppler

- Non-invasive means of assessing placental vascularisation and flow indices
- Whole placental volume (VOCAL- Virtual Organ Computer-aided AnaLysis) technique
- Virtually reconstructed vascular tree within a volume of interest
- Based on measurement of 'voxels'

[represents a value on a regular grid in 3-dimensional space]



What are we measuring?

1. Vascularisation index (%) (VI)

- ✓ Ratio of colour voxels to all voxels with the volume of interest (%) [number of vessels]

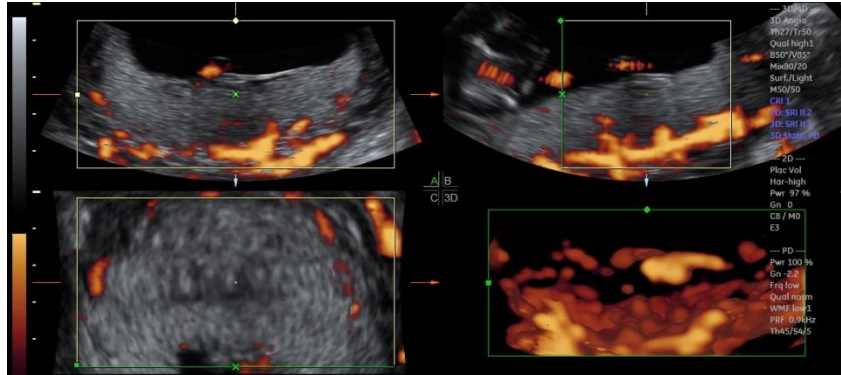
2. Flow index (FI)

- ✓ Mean power Doppler signal intensity from all colour voxels (unit-less) [intensity of flow]

3. Vascularisation flow index (VFI)

- ✓ $VI \times FI / 100$ (unit-less) [ratio of blood flow and vascularisation]

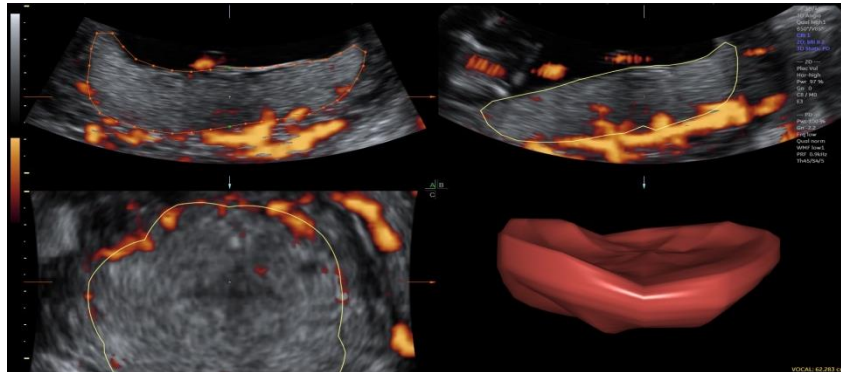
1.



Identify the placental mass using 2D greyscale imaging

Locate and position the placental mass within the image acquisition box

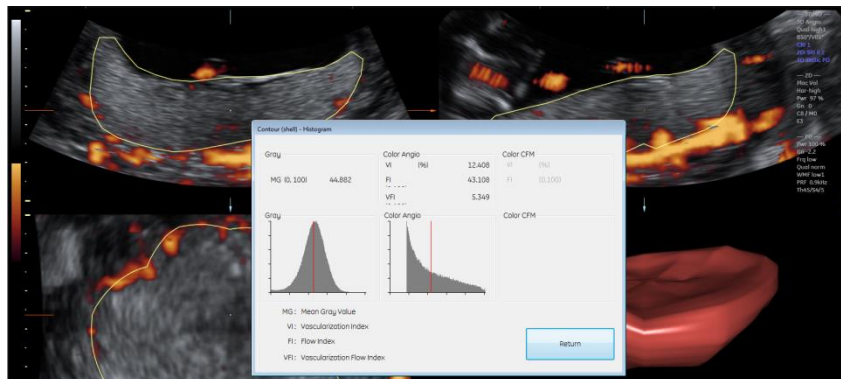
2.



Acquire placental volume image using 3D power Doppler

Proceed to volume analysis

3.

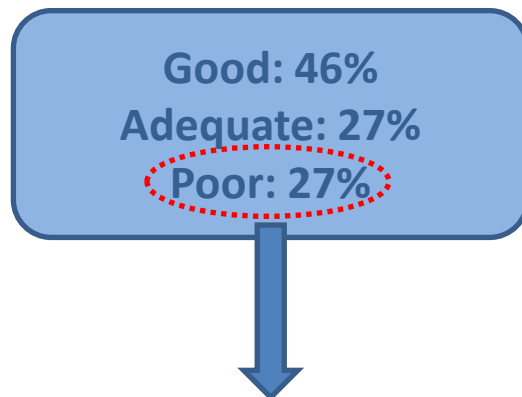


Manual tracing method of the placental border via 30⁰ rotations (6 rotations)

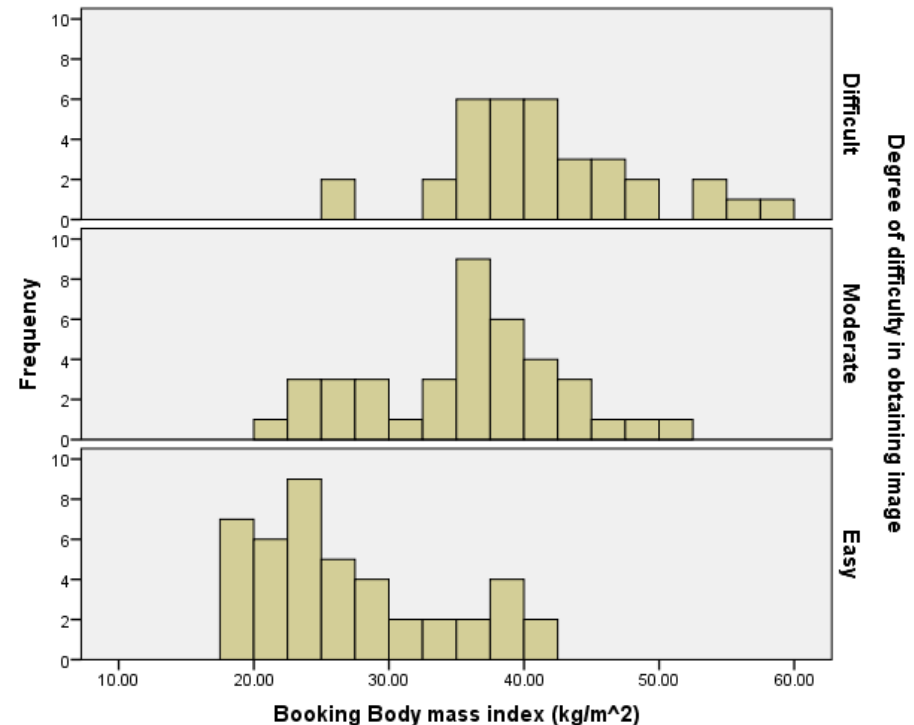
Generate a volume histogram to obtain placental vasularisation indices (VI (%), FI, VFI)

Maternal obesity and 1st trimester PVI

- n=116 (11+0-13+6 weeks)
- Complete imaging in 109 women (94%)



- Adiposity documented as a restricting factor in **97%**
- BMI had a significant negative impact on image quality and degree of difficulty (P<0.001)



- BMI had a significant impact on **FI** (P<0.001) and **VFI** (P<0.05)
- Stepwise reductions across increasing BMI categories

Acknowledgements

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The Puffin Trust

Supporting research into problems in pregnancy

