

## FETOMATERNAL BMI – A NOVEL ULTRASOUND PREDICTOR OF OBSTETRIC ANAL SPHINCTER INJURY

### Hypothesis / aims of study

Obstetric anal sphincter injury (OASIS) complicates more than 10% [1] of first vaginal deliveries. It has devastating long term effects, and constitutes the main preventable cause of anal incontinence and dyspareunia in the community. Many recognised risk factors for OASIS, including birthweight and use of instrumental delivery, are only identifiable during or after labour. Providing accurate personalised antenatal estimates of risk of OASIS is the first step towards identifying women who might benefit from intervention such as pre-labour elective caesarean [2]. This study aimed to assess whether ultrasound estimation of birthweight in the 10 days before vaginal delivery can predict OASIS.

### Study design, materials and methods

Prospective multicentre cohort study of women at 40-42 weeks gestation. Transabdominal ultrasound was used to calculate estimated fetal weight (EFW) using Hadlock's formula. Maternal height, weight, and parity were recorded. Self-reported ethnicity was coded into 5 groups (East Asian, South Asian, Black, Caucasian, Mixed/Other). The fetomaternal body mass index (BMI), a novel measure of cephalopelvic disproportion, was calculated as follows: (EFW / Maternal Height<sup>2</sup>), analogous to conventional BMI calculation. Data on perineal trauma were retrieved from maternity databases at each centre. Logistic regression was used to test the contribution of each variable, with a multivariate model constructed using backwards stepwise elimination.

### Results

1,702 women attended for ultrasound in the 10 days prior to vaginal delivery. Full data were available for 1,694 women. The overall incidence of recognised OASIS was 2.40%, with a significant difference between nulliparous and multiparous women (0.97% vs. 3.36%,  $p < .001$ ). Multiparous women were both significantly heavier (+2.86 kg,  $p < .001$ ), and had significantly larger babies (+138g,  $p < .001$ ). There were also significant differences in both maternal BMI (range of mean BMIs 21.48-26.34 kg/m<sup>2</sup>,  $p < .001$ ) and birthweight (range of mean birthweights 3.48kg-3.66kg,  $p < .0001$ ) between women of different ethnicities. EFW and actual birthweight were moderately correlated ( $r = 0.67$ , ICC=0.69,  $p < .001$ ), with a small systematic error (mean difference +23g  $p = .002$ ). 95% of EFW observations were within the range -588g to +634g of actual birthweight. The ratios of both EFW and actual birthweight to maternal height<sup>2</sup>, as defined above, were each significant predictors of OASIS both in univariate regression, and after controlling for ethnicity, parity, and study centre. Fetomaternal BMI was non-normally distributed (skewness=0.51, kurtosis=0.57, K-S=1.6,  $p = .01$ ), around a median of 1.32 kg/m<sup>2</sup> (Range 0.83-2.05, Interquartile Range 1.22-1.43). (Figure 1). The final multivariate model included only parity (adjusted OR =0.27,  $p = .002$ ), and fetomaternal BMI (adjusted OR per kg/m<sup>2</sup> 7.97,  $p < .027$ ) as significant risk factors (Homer & Lemeshow  $\chi^2$  5.28 df 8  $p < .727$ ). For fetomaternal BMI, this corresponds to an excess risk of 40.3% per standard deviation increase. This excess risk was, however, concentrated among women delivering their first baby (Figure 2).

### Interpretation of results

Estimations of fetal weight at 40-42 weeks gestation are a moderately reliable predictor of actual birthweight, in line with the best previous third trimester estimates [3]. The ratio of EFW to maternal height<sup>2</sup> is a significant predictor of OASIS. Nulliparous women with fetomaternal BMI in the highest quartile have more than double the risk of OASIS compared to women in the lower three quartiles. These estimates not only of absolute risk, but also of relative risk, might be highly sensitive to diagnostic accuracy of OASIS, and other variations in obstetric practice. Future work should reassess the relationship between fetomaternal BMI estimation at 36 to 42 weeks gestation, with other short term adverse labour outcomes including shoulder dystocia, emergency caesarean for prolonged labour, and post-partum haemorrhage; as well as with long term outcomes including anal incontinence and pelvic organ prolapse.

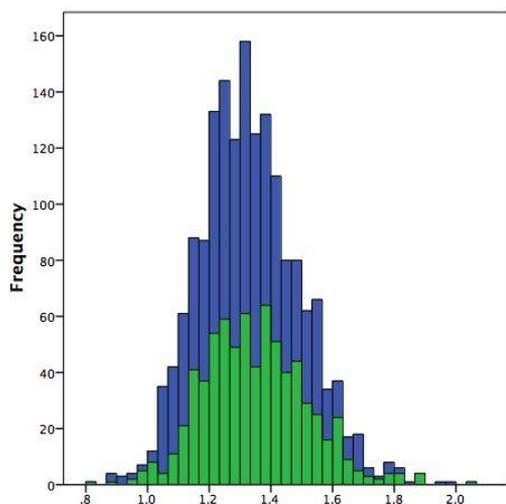


Figure 1: Distribution of fetomaternal BMI

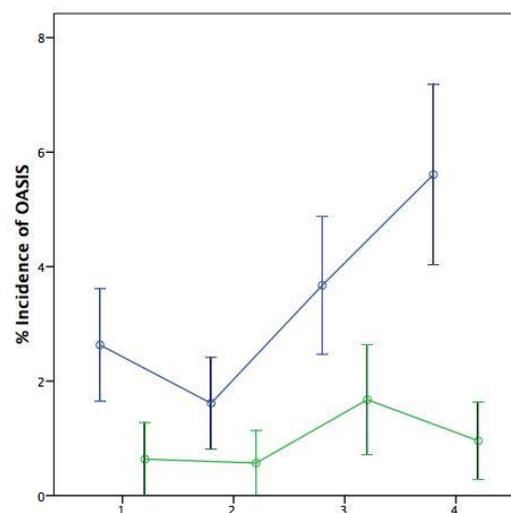


Figure 2. Incidence of OASIS across four fetomaternal BMI quartiles (mean and SE)

n=1694; blue bars represent parity=0; green bars represent parity >=1

#### Concluding message

Measurement of EFW in the post-term period, in combination with maternal height, can be used antenatally to identify women at high risk of OASIS. These estimates of fetomaternal BMI should be of particular relevance when counselling nulliparous women.

#### References

1. Ann Surg 2008;247:224-237
2. Cochrane Database Syst Rev 2010;2:CD006756
3. Eur J Obstet Gynecol Reprod Biol 2006;128:231-5

<b><i>Specify source of funding or grant</i></b>	<b>This study was supported by a grant from The Fetal Medicine Foundation</b>
<b><i>Is this a clinical trial?</i></b>	<b>No</b>
<b><i>What were the subjects in the study?</i></b>	<b>HUMAN</b>
<b><i>Was this study approved by an ethics committee?</i></b>	<b>Yes</b>
<b><i>Specify Name of Ethics Committee</i></b>	<b>King's College Hospital Research Ethics Committee Lewisham Research Ethics Committee Outer South East London Research Ethics Committee</b>
<b><i>Was the Declaration of Helsinki followed?</i></b>	<b>Yes</b>
<b><i>Was informed consent obtained from the patients?</i></b>	<b>Yes</b>