FIRST INTERNATIONAL CONFERENCE ON FETAL GROWTH

12 – 15 September 2012
Birmingham, UK

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Programme and Abstracts

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Sands, the stillbirth and neonatal death charity, was founded in 1978 and supports anyone affected by the death of a baby. We also promote and fund research to understand and prevent the loss of babies' lives. Our core aims are to:

- Offer a wide range of support services for anyone affected by the death of a baby
- Work in partnership with health professionals to try to ensure the best possible care for bereaved parents and families
- Raise awareness of stillbirth and neonatal death through public campaigns
- Promote changes in practice which could save babies' lives, and identify and fund research to further our understanding of perinatal mortality.

Welcome

Dear Delegate,

Welcome to **Fetal Growth 2012!**

We were pleased to see the response to the idea for this meeting. The number and quality of abstracts received, and the full capacity registration from ca. 30 countries, indicates an increasing, global awareness of the importance of fetal growth problems in maternity care, and the need for a dedicated conference to cover this field.

This meeting will provide opportunity to present and debate the latest available evidence on prevalence, risk factors, investigation and management, and the implications for best practice. To this end, we are keen to encourage your active participation in the open forum discussions.

We would also welcome suggestions for future meetings: when, where, and with what content. Please make sure to complete the feedback form in your conference pack.

We hope you enjoy the meeting.

Jason Gardosi
Professor of Maternal & Perinatal Health
NHS Perinatal Institute, Birmingham, UK

Lesley McCowan
Professor of Obstetrics & Gynaecology
University of Auckland, NZ

Ahmet Baschat
Professor of Obstetrics & Fetal Medicine
University of Maryland, Baltimore, USA

Contents

Presentations

Keynote	20 minutes, 5 minutes for questions / discussion
Short oral	10 minutes, 5 minutes for questions / discussion
Poster	5 minutes within respective poster walk on day 1, 2 or 3

Key to abstract numbers

K: Keynote; S: Short communication P: Poster
Day (1: Wednesday; 2: Thursday; 3: Friday)
Session number (1-9) Order within session
e.g. S242: second short communication on Day 2, Session 4)

Wednesday 12 September

Time & Session No.	Session Title	Speaker	Title of Presentation
15:00	Coffee / Tea	Registration	
16:00 **1**	**Growth standards & international perspectives**	Jun Zhang Cyril Ferdynus Leona Poon Steven Doyle Ngaire Anderson Mandy Williams	K111 Application of the global reference for fetal–weight and birthweight percentiles in predicting infant mortality S112 Customised versus non-customised birthweight standards to predict stillbirth in Reunion Island S113 Birthweight with gestation and maternal characteristics in live births and stillbirths S114 Customisation of antenatal growth charts does not improve detection of stillbirth in a Northwest England birth cohort S115 The value of maternal physiological and pathological pregnancy characteristics in customised birthweight centiles and identification of SGA infants at-risk of perinatal death S116 Customised vs uncustomised centiles to assess perinatal mortality risk in SGA pregnancies Plenary / Open Forum
18:00	**Welcome reception**		18:30-19:00: **Poster Walk 1 -** posters numbered P1xx

Thursday 13 September

Time & Session No.	Session Title	Speakers	Title of Presentation
08:00	Coffee/Tea	Registration	
09:00	Welcome		
09:10 **2**	**Fetal Growth, prematurity & childhood effects**	Eve Blair Elisa Llurba Ayesha Sania Jennifer Zeitlin	K221 Fetal growth and perinatal and paediatric outcomes S223 Childhood cognitive development after late onset fetal growth restriction S222 The contribution of prematurity and intrauterine growth restriction to childhood undernutrition in Tanzania K224 Prematurity and fetal growth restriction Plenary / Open Forum
10:45	Coffee / Tea		
11:15 **3**	**Risk factors for SGA & IUGR**	Jacoba van der Kooy Ali Khashan Ngaire Anderson Michelle Southam Lesley McCowan	S231 Improvement of the current detection of SGA by using the R4U (Rotterdam Reproductive Risk Reduction) as an adjuvant triage tool S232 The impact of maternal psychosocial stress and anxiety on fetal size in mid pregnancy and small for gestational age S233 Independent risk factors for infants who are small for gestational age by customised birthweight centiles in a general obstetric population S234 Risk Factors for IUGR in a multi-ethnic population K235 Clinical risk prediction -findings from the SCOPE study Plenary / Open Forum
13:00	Lunch		13:30-14:00: **Poster Walk 2 -** posters numbered P2xx
14:00 **4**	**Prediction of SGA & IUGR**	Kypros Nicolaides Leona Poon Elisa Llurba Samantha Benton Andrew Shennan	K 241 Combined screening for preeclampsia and small for gestational age at 11-13 weeks S242 Second-trimester uterine artery Doppler in the prediction of stillbirths S243 Emergence of late-onset placental dysfunction: relationship to change in uterine artery blood flow resistance between first and third trimesters S244 Can angiogenic factors in maternal circulation discriminate between placental intrauterine growth restriction and constitutionally small fetuses? K245 Plasma placental growth factor in the diagnosis of women with placental dysfunction requiring delivery within 14 days Plenary / Open Forum
15:45	Coffee / Tea		
16:00 **5**	**Detection of SGA & IUGR**	Karin Kallen Isabelle Monier Alphonse Roex Tomasina Stacey Jason Gardosi	S253 Detection of small for gestational age fetuses a comparison between routine 3rd trimester ultrasound examinations, and risk-based detection methods S254 Determinants and obstetrical consequences of antenatal detection of SGA infants in France S255 The introduction of serial fundal height plotting on customised charts in nulliparous women results in doubling of the antenatal detection of SGA fetuses S256 Identification of suboptimal fetal growth and risk of late stillbirth K 257 Reduction of stillbirths through improved antenatal detection of IUGR Plenary / Open Forum
18:00	Close		
19:30 for 20:00	**Gala Dinner and Dance**		

Friday 14 September

Time & Session No.	Session	Speakers	Title of presentation
08:30	Coffee/Tea	Registration	
09:00 **6**	**The Placenta**	William Clow Alexander Heazel Maryna Famina Ahmet Baschat Jan Jaap Erwich	S361 The smoking placenta S362 Quantitative assessment of placental morphology identifies specific causes of stillbirth and reduces "unknown cause" stillbirths S363 Assessment of placental vascularisation using 3D power Doppler ultrasound in determining the cause of intrauterine growth restriction S364 Haematologic consequences of placental dysfunction contribute to the rate and degree of fetal deterioration K 365 Patterns of placental disease in early and late IUGR Plenary / Open Forum
10:45	Coffee/Tea		
11:15 **7**	**Clinical features of IUGR**	Ahmet Baschat Francesc Figueras Aris Papageorghiou	K371 IUGR – early onset K372 IUGR - late onset K 373 Implications for further research Plenary / Open Forum
13:00	Lunch		13:30-14:00: **Poster Walk 3 -** posters numbered P3xx
14:00 **8**	**Clinical management of IUGR**	Julia Unterscheider Christoph Lees Sicco Scherjon Bill Martin	S381 Fetal growth restriction – definition, assessment and management: a continuing clinical dilemma K382 The TRUFFLE Trial K383 The DIGITAT Trial K384 Implications for guidelines Plenary / Open Forum
15:45			**Poster Prizes**
16:00	Coffee/Tea		
16:15 **9**	**Macrosomia**	D. Pasupathy Shareen Forbes Mahjabeen Khan Mahlatse Makgoba Esther Reid	K395 Macrosomia and adverse outcome S391 Clinical & metabolic profiles of very severely obese pregnant women & their associations with birthweight S392 Macrosomic infants of non-diabetic and diabetic mothers: challenges for obstetric practice in low resource community S393 Effect of gestational diabetes on the risk of macrosomia in women with normal body mass index S394 Macrosomia in uncomplicated pregnancies: the impact of physical activity and maternal nutrition Plenary / Open Forum
18:00	Close		
Departing 19:30	**Evening in Balti Triangle**		

Saturday 15 September

Registration: from 08:30

Workshop 1: IUGR – clinical audit and antenatal surveillance

09:00 - 16:00

Lesley McCowan, Jason Gardosi, Fiona Cross-Sudworth, Sally Clifford & Sally Giddings

a.m. Assessing adverse outcome; lessons from perinatal audit and confidential enquiries; case presentations; the 'SCOR' tool for standardised clinical outcome reviews.

p.m. Risk factors and clinical management protocols for high and low risk pregnancy. Fundal height measurement; customised growth charts; referral pathways.

Workshop 2: IUGR – investigation and management

09:00 - 16:00

Ahmet Baschat, Francesc Figueras

a.m. Ultrasound biometry; structural normality; liquor, biophysical profile; techniques, management algorithms.

p.m. Doppler parameters- uterine/umbilical/ middle cerebral/venous; practical aspects and clinical integration.

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Conference Information

Registration Desk
If you have any enquiries please make your way to the registration desk in the foyer of the conference suite.

Admission to conference sessions
Admission is by badge only. Please take your place before the start of each session and that your mobile phone is switched off.

Badges
In the interest of security please make sure that your badge is clearly visible at all times during the conference. If you lose your badge please report immediately to the registration desk.

Posters
Posters are located in the Horton Suite area and will be on display throughout the event.
Authors will be able to present their work during the scheduled poster walk.

Lunch and Refreshments
will be served in the reception and bar areas of the Horton Suite.

Hotel
The Macdonald Burlington Hotel is located at:
Burlington Arcade, 126 New Street,
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Check-out
Burlington hotel guests are requested to check out by 11 am on their day of departure.

Emergencies
In the event of an emergency please contact a member of staff from the Perinatal Institute or the Burlington Hotel.

Social:

Welcome reception – Wednesday 12 September
6.00pm in the Horton Suite.
Drinks and canapés.

Gala dinner & dance –Thursday 13 September
7:30 for 8pm, Horton Suite.
Dress: smart casual
Entrance by ticket only.
For additional tickets, ask at Registration Desk

Trip to the Balti Triangle – Friday 14 September
Meet in bar adjacent to Horton Suite, 7:30pm
Dress: casual
Entrance by ticket only.
For additional tickets, ask at Registration Desk

Oral presentations (K=keynote; S=short communication)

K111 APPLICATION OF THE GLOBAL REFERENCE FOR FETAL–WEIGHT AND BIRTHWEIGHT PERCENTILES IN PREDICTING INFANT MORTALITY

Guodong Ding, Ying Tian, Yongjun Zhang, Yu Pang, Jinsong Zhang, Jun Zhang
Shanghai Jiao Tong University, Shanghai, China

Background Abnormal fetal growth [surrogated by small- (SGA) or large-for-gestational-age (LGA)] is associated with an increased risk of complications and mortality, but an ideal definition of abnormal fetal growth remains a longstanding challenge. We aimed to determine whether the recently published global reference for fetal-weight and birthweight percentiles customized to race/ethnicity improves the definition of normal and abnormal fetal growth [SGA, appropriate-for-gestational-age (AGA) and LGA] in predicting infant mortality.

Method(s): We compared infant mortality rates including early (0–6 days), late (7–27 days) and postneonatal (28–364 days) mortality of SGA, AGA and LGA infants classified by 2 different references, the global reference and commonly used birthweight reference. The US Linked Livebirth and Infant Death data from 1995 to 2004 were used.

Result(s): Among 33,997,719 eligible liveborn singleton births (24–41 gestational weeks), 10% were classified differently for SGA, AGA and LGA by the 2 references. The global reference classified more SGA (9·7% vs 9·0%) and LGA (16·1% vs. 10·4%) infants than the birthweight reference. Yet, the infant mortality rate was also higher in SGA (15·4 vs 12·9 per 1,000) and LGA (3·5 vs 2·2 per 1,000) infants classified by the global reference. The mortality rates were much higher in infants classified as SGA or LGA by the global reference but not by the birthweight reference, compared to corresponding infants classified by the birthweight reference but not by the global reference (for SGA, 22·2 vs 5·6 per 1,000; for LGA, 5·3 vs 1·4 per 1,000).

Conclusion(s): The global reference for fetal–weight and birthweight percentiles increases identification of fetuses at risk for infant death due to improved classification of abnormal fetal growth.

S112 CUSTOMISED VERSUS NON-CUSTOMISED BIRTHWEIGHT STANDARDS TO PREDICT STILLBIRTH IN REUNION ISLAND

Cyril Ferdynus, Pierre-Yves Robillard, Silvia Iacobelli, Francesco Bonsante, Georges Barau, Patrick Gérardin, Michel Heisert, Catherine Quantin and Jean Bernard Gouyon
Centre Hospitalier Universitaire, Reunion

Objective(s): To compare the predictive values of stillbirths provided by a customised weight standard and a non-customised subpopulation-based birthweight standard estimated from births without maternal diseases.

Method(s): Newborns between 24 and 41 weeks of gestation, born between 2001 and 2011 in the south area of Reunion Island were included. We calculated the relative risks (RRs) of stillbirth among small-for-gestational-age (SGA) newborns as classified with (1) a local customised standard, (2) a French-metropolitan population customised standard, and (3) a local subpopulation birthweight standard estimated from births without maternal diseases (hypertension, diabetes and maternal smoking).

Result(s): We included 39,446 newborns with complete data on birthweight, gestational age, sex, maternal height, maternal weight and parity. Mean birthweight (g) was 3092 ± 560 and mean gestational age (weeks) was 38.4 ± 2.1. The overall proportion of stillbirths was 0.7%.

The overall RRs of stillbirth among SGA newborns as classified with the local subpopulation birthweight standard were similar to those among SGA newborns as classified with the local customised standard. Both RRs were higher than those among SGA newborns as classified by the French-metropolitan customised standard. For low preterm newborns (24-27 weeks), the RR of stillbirth among SGA newborns as classified with the local subpopulation birthweight standard was higher than the RR among SGA newborns as classified by the local customised standard. In turn, it was much higher than the RR among SGA newborns as classified by the French-metropolitan customised standard.

Conclusion(s): This study confirmed the importance of using local weight standards to improve the detection of newborns at risk of poor perinatal prognosis. Moreover, we demonstrated that a non-customised birthweight standard -estimated from births without maternal diseases - has a similar ability to predict risk of stillbirth than a local customised standard.

S113 BIRTHWEIGHT WITH GESTATION AND MATERNAL CHARACTERISTICS IN LIVE BIRTHS AND STILLBIRTHS

Leona C Y Poon, Nicola Volpe, Brunella Muto, Argyro Syngelaki, Kypros H. Nicolaides
Kings College Hospital, London, United Kingdom

Objective(s): To establish a normal range of birthweight with gestational age (GA) at delivery and examine the contribution of maternal characteristics in defining growth restriction in stillbirths.

Method(s): In 69,895 normal singleton pregnancies regression analysis was used to determine the association of birthweight with GA and maternal characteristics. The observed birthweight was expressed as Z-score and percentile for GA with and without correction for maternal characteristics. The proportion of 290 stillbirths classified as small for gestational age (SGA) depending on inclusion or exclusion of maternal characteristics was determined.

Result(s): In normal pregnancies there was a polynomial association between birthweight and GA. Birthweight increased with maternal weight, height and parity and was lower in Afro-Caribbeans and South Asians than in Caucasians. The birthweight of antepartum (open circles) and intrapartum (solid circles) stillbirths is illustrated on the 5th, 50th and 95th percentiles of the normal range in Figure 1. Compared to the normal population, the birthweight Z-scores for GA with and without correction for maternal characteristics were significantly reduced in antepartum stillbirths (n=243; P<0.0001; P<0.0001) but not in intrapartum stillbirths (n=47; P=0.334; P=0.455). There was significant association between birthweight Z-score with GA in antepartum stillbirths (open circles) but not in intrapartum stillbirths (solid circles; Figure 2). There was no significant difference in the proportion of antepartum stillbirths with birthweight below the 10th percentile when birthweight was corrected for GA only compared to correction for GA and maternal characteristics (53.1% vs. 54.3%). The birthweight was below the 10th percentile in 71.8% of antepartum stillbirths at <32 weeks' gestation, in 47.2% at 33-36 weeks and in 31.5% at ≥ 37 weeks.

Conclusion(s): The proportion of stillbirths that can be classified as SGA was not improved by adjusting the birthweight for GA percentiles for maternal characteristics.

S114 CUSTOMISATION OF ANTENATAL GROWTH CHARTS DOES NOT IMPROVE DETECTION OF STILLBIRTH IN A NORTHWEST ENGLAND BIRTH COHORT

S R Doyle, R McNamee, C P Sibley, E D Johnstone
University of Manchester, Manchester, United Kingdom

Objectives: In the diagnosis of fetal growth restriction (FGR), classification of the fetus as small for gestation age (SGA) is often used as a proxy. Customised Antenatal Growth Charts (CAGC) have been developed in order to better characterise SGA fetuses by adjusting expectations of birthweight by including the effects of maternal characteristics on mean birthweight (Gardosi et al. 1992, 1995). FGR is strongly associated with stillbirth (Bukowski, 2010) and so classification of SGA is important in its prediction. Here we examined whether a CAGC improves the definition of SGA in terms of its association with stillbirth.

Methods: Data was obtained from an archive birth record (the Northwest Perinatal Survey). 274,563 births from 2004-2008 were studied, with customised antenatal growth charts calculated for each record with complete ethnicity, parity, fetal sex, maternal height and maternal weight (n = 74,239). Risk of stillbirth was calculated for births according to an existing population growth standard (Hadlock, 1991), the customised standard (Gardosi, 1995) and a new population standard (Olsen et al. 2010). SGA was defined on each standard as a birth below the 10th centile.

Results: The existing population standard has a sensitivity of 41% against a sensitivity of 45% for the customised. Customisation shows reduced specificity of SGA identifying stillbirth compared to the existing population standard (83% vs 86%). In comparison, the new population standard has the poorest sensitivity (29%) but the best specificity (91%). The positive predictive value for all three standards is low at 1% (Table 1).

Table 1. Stillbirths and Livebirths by classification as SGA

Standard		SGA (<10th centile)	Not SGA (>10th centile)
Existing Population	Stillbirth	273	124
	Livebirth	8779	30234
Customised	Stillbirth	163	227
	Livebirth	5531	33202
New Population	Stillbirth	105	280
	Livebirth	3378	34626

*Numbers vary slightly because of missing values in the calculation of customised charts or earlier gestations that can be calculated for.

Conclusions: Compared to the existing population standard on which it is based, the customised standard classifies 14 more of the stillborn population as SGA; 146 are detected as SGA compared with 132 in the population standard. The proposed improvements of CAGCs in identifying a pathologically small fetus are not borne out in this study.

S115 THE VALUE OF MATERNAL PHYSIOLOGICAL AND PATHOLOGICAL PREGNANCY CHARACTERISTICS IN CUSTOMISED BIRTHWEIGHT CENTILES AND IDENTIFICATION OF SGA INFANTS AT-RISK OF PERINATAL DEATH

Ngaire H Anderson, Lynn C Sadler, Alistair W Stewart, Lesley ME McCowan
University of Auckland, Auckland, New Zealand

Objective: Customised birthweight centiles adjust for maternal physiological and pathological pregnancy characteristics, gestation (using an ultrasound fetal weight reference) and infant gender. It is unclear whether maternal characteristics increase detection of at-risk small for gestational age (SGA) infants over-and-above adjustment for ultrasound fetal weight and gender. We hypothesised that adding maternal variables to a birthweight customisation model that adjusted for ultrasound fetal weight and gender would better identify SGA infants at-risk of perinatal death (PND).

Method: Term singleton births from 2006–2009 in Auckland, New Zealand, n=25 976 were utilised to develop multiple linear regression analyses for full birthweight customisation (maternal characteristics, ultrasound fetal weight and gender) and ultrasound-and-gender customisation (ultrasound fetal weight and gender only). SGA_{full} was birthweight <10th full customised centile and SGA_{us} birthweight <10th ultrasound-and-gender customised centile. Comparisons of PND were made between SGA_{full} and SGA_{us}.

Results: Full customisation identified SGA infants with higher odds of PND [OR 5.6, (3.6–8.7)] than ultrasound-and-gender customisation [OR 2.1, (1.4–3.3)] P = 0.02. SGA_{full} only infants had a 4.7-fold increased risk of PND however SGA_{us} only infants were not at increased risk (Table). The population attributable risk of SGA-PND was higher for full (49.8%) than for ultrasound-and-gender (43.0%) customisation.

PND by SGA classification Data are n (%), RR (95% CI)

	Both non-SGA n=22 229		SGA_{us} only n=676		SGA_{full} only n=888		Both SGA n=2183	
Perinatal death	86	(0.4%)	3	(0.4%)	16	(1.8%)	96	(4.4%)
	ref	–	1.1	(0.4–3.6)	**4.7**	**(2.7–7.9)**	**11.4**	**(8.5–15.2)**
Stillbirth	58	(0.3%)	3	(0.4%)	10	(1.1%)	79	(3.6%)
	ref	–	1.7	(0.5–5.4)	**4.3**	**(2.2–8.4)**	**13.9**	**(9.9–19.4)**
Neonatal death	28	(0.1%)	0	–	6	(0.7%)	17	(0.8%)
	ref	–	–	–	**5.4**	**(2.2–12.9)**	**6.2**	**(3.4–11.3)**

Conclusion:The inclusion of maternal physiological and pathological pregnancy characteristics in birthweight customisation increases the detection of SGA infants at-risk of PND.

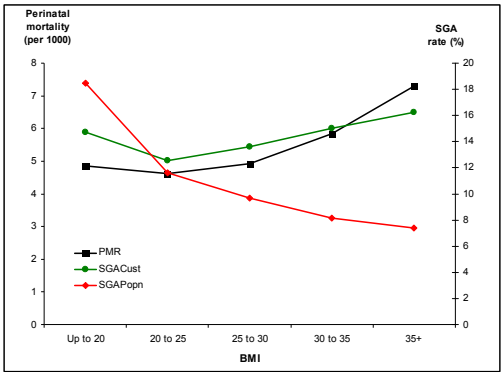
S116 CUSTOMISED VS. UNCUSTOMISED CENTILES TO ASSESS BMI RELATED PERINATAL MORTALITY RISK IN SGA PREGNANCIES

Mandy Williams, Michelle Southam, Andre Francis, Jason Gardosi
West Midlands Perinatal Institute, Birmingham, United Kingdom

Background: Maternal obesity is a risk factor for adverse pregnancy outcome. However it is also claimed to protect against the delivery of a small-for-gestational age (SGA) baby [1]. We wanted to examine the accuracy of this claim by comparing a customised vs uncustomised standard derived from the same population.

Method: Our cohort consisted of a database of 120,222 singleton, normally formed pregnancies delivered in the West Midlands between July 2009 and June 2012. SGA was defined as below the 10th centile, using 2 methods: a.) the average term birthweight in our West Midlands population, combined with the Hadlock based proportionality fetal weight curve, and adjusted for sex only (SGApop); and b). the same proportionality curve but adjusted for sex as well as maternal height, weight, ethnic group and parity, and 'optimised' by excluding pathological factors such as smoking (SGAcust). Body mass index (BMI) was examined in 5 categories (<20, 20-24.9, 25-29.9, 30-34.9, and 35+). Outcome was assessed by perinatal mortality rate (PMR).

Results: 12.5% of mothers in our population had a BMI of 30+, including 7.6 % with BMI of 35+. These groups had significantly higher relative risk of perinatal death compared to mothers with BMI (20-25): BMI 30-34.9 = RR 1.3, CI 1.0-1.6); BMI 35+: RR 1.5 (CI 1.1 – 2.0). SGAcust was strongly correlated with PMR (R=0.9). In contrast, SGApop was negatively correlated (R=- 0.6). The figure shows PMR and SGA rates for each BMI category.



Conclusions: Obese mothers have an increased risk of perinatal mortality. This risk is correlated with fetal growth restriction, as represented by babies that have not reached their growth potential (SGAcust). The link is not apparent when an uncustomised standard from the same population is used, suggesting that high BMI is not protective of pathological smallness related to perinatal mortality.

[1]. Cnattingius S, Bergstrom R, Lipworth L, Kramer MS. Prepregnancy weight and the risk of adverse pregnancy outcomes. *NEJM* 1998;338:147-52.

K221 FETAL GROWTH AND PERINATAL AND PAEDIATRIC OUTCOMES

Eve Blair, Matthew Cooper, Helen Leonard, Sarah McIntyre, Karin B Nelson, Gavin Pereira
University of Western Australia, Perth, Australia

Introduction: The proportion-of-optimal method of assessing fetal growth estimates optimal measurements (of weight, length, weight/length ratio and head circumference) using a model (in terms of available non-pathological determinants of growth: gestational duration, fetal gender, maternal height and parity) derived from birth measurements of all neonatally surviving, non-malformed Western Australian singleton births (1998-2002) of Caucasians not exposed to common causes of fetal growth anomaly [BMC Pediatrics 2005;**5**;13]. It has been validated, and, for births<30 weeks, corrected, against weights derived from serial fetometrics of term births presumed optimally grown [BMC Pediatrics 2012, **12**:73]. The resulting robust, generalizable, interval measures are used in all studies of fetal growth in our institute.

Objectives: To understand the role of fetal growth in the aetiology of a range of perinatal and paediatric outcomes.

Methods: Controlled studies using data derived from Australian state or national data sets investigated associations between outcomes and proportion of optimal birth measurements, often weight (POBW). **Result(s):** All outcomes investigated to date (intrapartum and neonatal death, neonatal encephalopathy, epilepsy, intellectual deficit, cerebral palsy, childhood cancers and literacy skills at grade three) showed dependence on abnormal fetal growth. All associated childhood cancers were associated only with accelerated growth, even compared with siblings. All other outcomes were associated with suboptimal growth, with or without a generally weaker association with accelerated growth. Poor fetal growth has much aetiology. Rational prevention requires understanding causal mechanisms; those to cerebral palsy via poor growth will be discussed.

Conclusions: Non optimal fetal growth is associated with several poor birth outcomes, many individually rare. Adoption of a robust and generalizable method of assessing appropriateness of fetal growth, based on the most precise estimate of the distribution and independent of the population-specific burden of growth affecting pathology would facilitate research collaborations necessary to effectively investigate its aetiological roles for rare outcomes.

S223 CHILDHOOD COGNITIVE DEVELOPMENT AFTER LATE ONSET FETAL GROWTH RESTRICTION

Elisa Llurba[1], Ahmet A. Baschat, Ozhan M. Turan, Jane Harding, Lesley M. McCowan
[1] Vall Dâ´Hebron University, Barcelona Spain

Objectives: To examine relationships between umbilical and internal carotid artery Doppler findings and cognitive development at 3 and 6 years in small for gestational age (SGA) children.

Methods: SGA children (birthweight <10th centile) born after 28 weeks' with umbilical artery (UA) resistance index (RI) measured within 2 weeks of delivery. Children with normal UA and internal carotid artery (ICA) Doppler indices were defined small for gestational age (SGA) and those with abnormal UA or ICA as fetal growth restriction (FGR). Cognitive ability at 3 and 6 years corrected age was assessed using the 4th edition of the Stanford-Binet Intelligence Scale (SBIS) and compared between SGA and FGR groups. SBSI scores < 85 was considered abnormal.

Results: 209 children were included in this study. Median gestational age at diagnosis of abnormal fetal growth was 36.6 (range 28-41) weeks. 87 (41.6%) children were classified as FGR and 122 (58.4%) as SGA. The mean global SBIS score at 3 years was 109.4 (±22.8). Overall, 22 (10.5%) children had severe delay (SBIS < 85).. Total SBIS scores and individual domain scores did not differ between FGR and SGA groups at 3 or 6 years and similar proportions in each group had developmental impairment.

Conclusions: Prenatal umbilical and internal carotid Doppler do not stratify risk for abnormal cognitive development in SGA children delivered in the third trimester of pregnancy.

S222 THE CONTRIBUTION OF PRETERM AND INTRAUTERINE GROWTH RESTRICTION (IUGR) TO CHILDHOOD UNDERNUTRITION IN TANZANIA

Sania A, Spiegelman D, Rich-Edwards JW, Okuma J, Kisenge R, Msamanga GI, Urassa W, Fawzi WW
Harvard School of Public Health, Boston, USA

Objective: Objectives of our research were: (1) to examine the association between risk of neonatal and infant mortality with preterm birth and intrauterine growth restriction (IUGR),and (2) To estimate the population attributable risk of neonatal and infant mortality due to preterm birth and IUGR.

Methods: From August 2001 to July 2004, we conducted a prospective study among a cohort of HIV- negative pregnant women and their infants in Dar es-Salam, Tanzania. Gestational age calculated from the date of the last menstrual period was used to define preterm (<37 weeks) and birthweight small for gestational age (SGA, birthweight < 10th percentile) was used as proxy for intrauterine growth restriction. Survival status of infants was assessed at delivery, 6 weeks postpartum, and every three months thereafter. Log-binomial regression and Cox proportional hazard models were used to estimate the associations of preterm and SGA with neonatal and infant mortality, respectively.

Results: The analysis included 7,225 singletons, of whom 15% were preterm and 21% were SGA; majority of the preterm or SGA babies had birthweight >2500g (Figure 1). Compared to term and appropriately-sized babies (AGA) relative risks (RR) of neonatal mortality among preterm-AGA babies was 2.66 (95% CI 1.79-3.99), RR among term-SGA was 2.35 (95% CI 1.63-3.37) and the highest risk was among the babies who were both preterm and SGA (RR=18.84, 95% CI 9.48-37.50). Risk associated with preterm was elevated throughout infancy, and risk associated with SGA was elevated during the neonatal period only (Table 1). The partial population attributable risk of neonatal mortality for preterm was 22% (95% CI 17%- 26%) and for SGA it was 26% (95% CI 16%- 36%).

Conclusions: Preterm and SGA birth substantially increased the risk of mortality and a large proportion of deaths were attributable to these conditions. Incorporating gestational age and gestation specific birthweight information in routine newborn assessment should be considered in resource-limited settings.

K224 PREMATURITY AND FETAL GROWTH RESTRICTION: IMPACT OF GROWTH RESTRICTION ON VERY PRETERM HEALTH OUTCOMES

Jennifer Zeitlin
INSERM, Paris, France

Objective: Assessing the impact of growth restriction on short and longer term health outcomes for preterm infants from the published literature is challenging because of the diversity of the methods used.

Methods: A review of definitions of FGR used in recent research and how these studies model pregnancy complications associated with the preterm delivery is presented along with results from the MOSAIC cohort, a population based study of births less than 32 weeks of gestation in 2003 in 10 European regions. Outcomes were mortality, intraventricular hemorrhage (IVH) grade III and IV, cystic periventricular leukomalacia (PVL) and bronchopulmonary dysplasia (BPD). Birthweight percentiles in 6 classes were analyzed by pregnancy complication

Results: Studies have used multiple definitions of growth restriction based on varying growth norms and thresholds; the choice of definition can have a substantial impact on the magnitude of the reported association and the relevant threshold can differ by health outcome. These studies do not always consider the causes of the preterm delivery and associations between pregnancy complications and health outcomes. In the MOSAIC cohort, 75% of infants with birth weights <10th percentile for gestational age were from pregnancies complicated by hypertension or indicated deliveries associated with growth restriction. However, stratifying for pregnancy complications yielded similar risk patterns.

Conclusions: It would be useful to develop common conventions for the measurement and analysis of FGR in the setting of prematurity. Current initiatives to develop better classifications of the causes of preterm birth will be helpful for refining causal models relating FGR to very preterm outcomes.

S231 IMPROVEMENT OF THE CURRENT DETECTION OF SGA BY USING THE R4U (ROTTERDAM REPRODUCTIVE RISK REDUCTION) AS AN ADJUVANT TRIAGE TOOL

J van der Kooy, K Fabricius, J P de graaf, S Denktas, E A P Steegers, G J Bonsel
Erasmus MC, Rotterdam, Netherlands

Background: In the Netherlands perinatal mortality rates exceed the European average. The highest rates of perinatal mortality and morbidity are observed in the four largest cities, in particular in deprived neighbourhoods. The prevalence of SGA (Small for Gestational Age) in assumed low-risk pregnancies starting birth in primary health care is still high, indicating that the current risk detection is not sufficient enough.

Objectives: To improve the current detection of SGA by using the R4U (Rotterdam Reproductive Risk Reduction) as an adjuvant triage tool in an assumed low-risk population starting birth in primary health care.

Methods: A prospective cohort was conducted at the Sophia birth centre Rotterdam, the Netherlands. All (n=1578) women who started birth between October 2009 and December 2011 were included.Multiple logistic regression was applied to develop a prediction model for SGA. This prediction model was evaluated by using ROC curves. Analyses were stratified for ethnicity. RESULTS The prevalence of SGA was 5,8% in Dutch and 10,4% in non-Dutch women.

Results: Factors predicting SGA among Dutch women were; being unemployed (OR 3.16; 95% CI 1.29-7.74), living in a deprived neighbourhood (OR 2.78; 95% CI 1.29-6.01), a history of preterm birth (OR 7.37; 95% CI 1.46-37.29) and a history of SGA (OR 5.67; 95% CI 1.92-16.73). Factors predicting SGA in non-Dutch women were; being single (OR 2.22; 95% CI 1.38-3.56), contact with social care (OR 3.78; 95% CI 1.40-10.22), nulliparity (OR 1.91; 95% CI 1.13-3.23) and a history of SGA (OR 5.77; 95% CI 2.94-11.30). The AUC were 0.71 and 0.70 respectively.

Conclusions: We conclude that the combination of both obstetric and social risk factors predicts the risk of having SGA, making the R4U a valuable adjuvant triage tool. Differences in ethnic groups should be taken into account.

S232 THE IMPACT OF MATERNAL PSYCHOSOCIAL STRESS AND ANXIETY ON FETAL SIZE IN MID PREGNANCY AND SMALL FOR GESTATIONAL AGE

Ali S Khashan[1], Claire Everard[1], Lesley ME McCowan[2], Gustaaf A Dekker[3], Deidre M Murray[4], Lucilla Poston[5], James Walker[6], Jenny Myers[7], Louise C Kenny[1] on behalf of the SCOPE Consortium
[1] Anu Research Centre, Department of Obstetrics and Gynaecology, University College Cork, Cork, Ireland
[2] Department of Obstetrics and Gynaecology, University of Auckland, Auckland, New Zealand
[3] Women's and Children's Division Lyell McEwin Hospital, University of Adelaide, Adelaide, South Australia
[4] Department of Paediatrics and Child Health, University College Cork, Cork, Ireland
[5] Division of Women's Health, Women's Health Academic Centre, King's College London, and King's Health Partners, United Kingdom
[6] Leeds Institute of Molecular Medicine, University of Leeds, Leeds, United Kingdom
[7] Maternal and Fetal Health Research Centre, University of Manchester, United Kingdom

Objectives: to investigate the effect of maternal stress and anxiety on fetal size in mid pregnancy and small for gestational age (SGA).

Methods: The study was conducted using data from the multi-centre international Screening for Pregnancy Endpoints (SCOPE) study (www.scopestudy.net). Participating pregnant women (n=5628) completed the Perceived Stress Scale and the State and Trait Anxiety Inventory at 15±1 and 20±1 weeks' gestation. Women were grouped according to their stress and anxiety scores as having low (reference group in all analyses), mild, moderate, high or very high scores. Estimated fetal size at the mid-trimester scan was calculated using the Hadlock formula and converted into a gestational age adjusted z-score. Small for gestational age (SGA) was defined as birthweight < 10^{th} customised percentile. Linear and logistic regression, adjusted for several potential confounders including maternal age, body mass index, smoking, ethnic origin and socioeconomic status, were used for data analysis as appropriate.

Results: Women with mild (aOR=1.33, [95% CI: 1.10, 1.62]), moderate (aOR=1.19, [95% CI: 1.10, 1.29]), high (aOR=1.33, [95% CI: 1.07, 1.64]) and very high (aOR=1.41, [95% CI: 1.13, 1.74]) stress scores at 20 week's gestation were at increased risk of SGA. Women who reported very high anxiety scores at 20 weeks' gestation had 45% increased risk of SGA (aOR=1.45; [95% CI: 1.13,1.86]). There was little evidence for an association between stress and anxiety scores at 15 weeks' gestation and the risk of SGA. There was no evidence for an association between maternal stress or anxiety and fetal size at 20 weeks' gestation.

Conclusions: The present findings suggest that high maternal stress and anxiety may affect fetal growth. However, this effect may be dependent on the type and timing of stress. Moreover the effect may be confined to certain biometric features.

S233 INDEPENDENT RISK FACTORS FOR INFANTS WHO ARE SMALL FOR GESTATIONAL AGE BY CUSTOMISED BIRTHWEIGHT CENTILES IN A GENERAL OBSTETRIC POPULATION

Ngaire H ANDERSON, Lynn C SADLER, Alistair W STEWART, Elaine M FYFE, Lesley ME McCOWAN
University of Auckland, Auckland, New Zealand

Objective: Infants born small for gestational age (SGA) by customised birthweight centiles are at increased risk of adverse outcomes compared with those SGA by population centiles. Risk factors for customised SGA have not previously been described in a general obstetric population. We therefore aimed to determine independent risk factors for customised SGA in a multi-ethnic New Zealand population.

Methods: This was a retrospective cohort analysis of prospectively recorded maternity.data from 2006–2009 at National Women's Health, Auckland, New Zealand. After exclusion of infants with congenital anomalies and missing data, our final study population comprised 26 254 singleton pregnancies. Multivariable logistic regression analysis adjusted for; ethnicity, body mass index, maternal age, parity, smoking status, social deprivation, hypertensive disease, antepartum haemorrhage, diabetes and relevant pre-existing medical conditions.

Results: Independent risk factors for customised SGA included maternal obesity (adjusted Odds Ratio 1.24, 95% CI 1.11–1.39 relative to normal weight), maternal age ≥35y (aOR 1.16, 1.05-1.30 relative to 20–29y), nulliparity (aOR 1.13, 1.04–1.24 relative to parity 1), cigarette smoking (aOR 2.01, 1.79–2.27), gestational hypertension (aOR 1.46, 1.21–1.75), pre-eclampsia (aOR 2.94, 2.49–3.48), chronic hypertension (aOR 1.68, 1.34–2.09), placental abruption (aOR 2.57, 1.74–3.78) and antepartum haemorrhage of unknown origin (aOR 1.71, 1.45–2.00). Gestational diabetes (aOR 0.80, 0.67–0.96) and Type 1 diabetes (aOR 0.26, 0.11–0.64) were associated with reduced risk of customised SGA.

Conclusion: We report independent risk factors for customised SGA in a general obstetric population. In contrast to studies of risk factors for population SGA, obesity is associated with increased risk of SGA by customised centile. Our findings may help clinicians to identify pregnancies that require increased fetal growth surveillance.

S233 RISK FACTORS FOR INTRAUTERINE GROWTH RESTRICTION IN A MULTI-ETHNIC MATERNITY POPULATION

Michelle Southam, Mandy Williams, Andre Francis, Jason Gardosi
West Midlands Perinatal Institute, Birmingham, UK

Objective: Intrauterine growth restriction (IUGR) is associated with adverse pregnancy outcome. We wanted to examine the associated factors and their relative contributions to the risk of a baby born small for gestational age within the West Midlands maternity population.
Method: Our cohort included 139,464 pregnancies delivered between July 2009 and May 2012, collected on the Perinatal Institute's regional, web based Perinatal Episode Electronic Record (PEER). Exclusion of multiple pregnancies and congenital anomalies left 117,794 cases for multivariable logistic regression, with outcome being IUGR defined as birthweight below the 10^{th} customised centile. Variables included maternal characteristics such maternal age, height, weight, parity, ethnicity, smoking and various social factors, obstetric history and complications in pregnancy. Results were expressed as adjusted odds ration (aOR) and the etiological fraction or 'population attributable risk' (PAR).
Results: The overall rate of birthweight <10^{th} customised centile in this cohort was 12.4%. The strongest risks were associated with smoking (10+ cigarettes: aOR 2.9, CI 2.6-3.1) and a previous IUGR baby (aOR 2.5, 2.3-2.8). Social deprivation (IMD quintiles 4 & 5) was also associated with SGA birthweight and contributed 10.5% of PAR. Pakistani and African women had increased risk, as did mothers with low as well as high BMI. Young mothers had reduced risk and older mothers had increased risk. Primiparity was a weak risk factor (aOR 1.1) while 3+ parity was protective (aOR 0.8). Preconception intake of folic acid had a protective effect (aOR 0.9, CI 0.8-0.9), while post-conception use had no effect.
Conclusion: This analysis highlights many risk factors for SGA and IUGR which can be noted at the beginning of pregnancy, and which need to be considered when devising management plans. Smoking and social deprivation are separate and strong factors contributing to high rates of SGA birthweight, and women with a previous IUGR baby have a significantly increased risk of recurrence.

K235 CLINICAL AND ULTRASOUND RISK PREDICTION FOR SGA INFANTS- FINDINGS FROM THE SCOPE STUDY

Lesley McCowan[1], John Thompson[2], Rennae Taylor[1], Robyn North [3], Philip Baker [4], Gustaaf Dekker [5], Nigel Simpson [6], Louise Kenny [7] on behalf of the SCOPE Consortium

[1] Department of Obstetrics and Gynaecology, University of Auckland, Auckland, New Zealand
[2] Department of Paediatrics, University of Auckland, Auckland, New Zealand
[3] Division of Women's Health, King's College London, United Kingdom
[4] The National Centre for Growth & Development, University of Auckland, New Zealand
[5] Women's and Children's Division Lyell McEwin Hospital, University of Adelaide, Adelaide, Australia
[6] Leeds Institute of Molecular Medicine, University of Leeds, Leeds, United Kingdom
[7] Anu Research Centre, Department of Obstetrics and Gynaecology, University College Cork, Cork, Ireland

Objective: To develop a predictive model for small for gestational age (SGA) infants, based on 15 week clinical and 20 week ultrasound variables and to validate the model in a separate cohort.

Methods: 5628 nulliparous participants in the international SCOPE study were interviewed at 15±1 weeks and had ultrasound measurements and Doppler studies at 20±1 weeks. The cohort was divided into training (n=3735) and validation sets (n=1871). Variables associated with SGA were identifed using logistic regression. SGA (birthweight <10th customised centile), Normotensive-SGA (SGA and normotensive mother,NT-SGA) and Hypertensive-SGA (SGA with hypertensive complications, HT-SGA) were the primary outcomes.

Results: Of 422 (11.2 %) SGA infants in the training dataset 311 (8.3%) were NT-SGA, 109 (2.9%) HT-SGA and two were unclassifiable (no end of pregnancy BP). Significant predictive variables for NT-SGA in the training dataset included: maternal birthweight <3kg, smoking, daily vigorous exercise; rhesus negative blood group, increasing random glucose and frequent recreational walking were protective. Fetal abdominal or head circumference <10th centile and increasing mean uterine artery Doppler at 20 weeks were associated with increased risk. Variables in italics also remained significant in the smaller validation dataset. The areas under the receiver operator curve for training and validation models were 0.71 and 0.69. Significant predictive variables for HT-SGA included: >12 months to conceive, family history of metabolic syndrome or coronary heart disease, low fruit consumption, maternal birthweight <3kg, overweight and obesity, systolic BP ≥ 120mmHg, diastolic BP ≥80mmHg and increasing mean uterine artery Doppler. Variables in italics remained significant in the validation dataset. The area under the curve for each HT-SGA model was 0.82.

Conclusion: Combinations of 15 week clinical and 20 week ultrasound variables enables reasonable prediction of later HT-SGA but only fair prediction of the more heterogeneous NT-SGA. Addition of biomarkers to these clinical and ultrasound models may enable reliable prediction that can be applied in clinical practice.

K241 COMBINED SCREENING FOR PRE-ECLAMPSIA AND SGA AT 11-13 WEEKS

Leona C Y Poon, Argyro Syngelaki, Ranjit Akolekar, Jonathan Lai, Kypros H. Nicolaides
Kings College Hospital, London, UK

Objective: To combine a specific algorithm for small for gestational age (SGA) without preeclampsia (PE) and another algorithm for PE in the prediction of SGA and PE.

Methods: This was a screening study of singleton pregnancies at 11-13 weeks including 1,426 (2.3%) that subsequently developed PE, 3,168 (5.1%) that delivered SGA neonates and 57,458 that were unaffected by PE and SGA. We developed a prediction algorithm for SGA requiring delivery before 37 weeks' gestation (preterm-SGA) from maternal characteristics, uterine artery pulsatility index (PI), mean arterial pressure (MAP), serum pregnancy associated plasma protein-A (PAPP-A) and placental growth factor (PlGF) multiple of the median (MoM) values. We then examined the performance of this algorithm individually and in combination with a previously reported algorithm for early-PE in the prediction of SGA and PE.

Results: The likelihood of preterm-SGA increased with maternal age and decreased with weight and height, the risk was higher in Afro-Caribbeans and South Asians compared to Caucasians, in parous women with prior SGA, in cigarette smokers, in women with a history of chronic hypertension, type 2 diabetes mellitus and systemic lupus erythematosus or antiphospholipid syndrome, and in those who conceived with ovulation drugs. In the preterm-SGA group, compared to the normal group, uterine artery PI and MAP were significantly higher, and PAPP-A and PlGF were significantly lower. When screen positivity was defined by risk cut off of 1:200 using the algorithm for early-PE and the risk cut off of 1:150 using the algorithm for preterm-SGA the false positive rate was 10.9% and the detection rates of early-PE, late-PE, preterm-SGA and term-SGA were 95.3%, 45.6%, 55.5% and 44.3%, respectively.

Conclusion: Effective first trimester screening for early-PE and preterm-SGA can be provided by the combined use of the specific algorithms.

S242 SECOND-TRIMESTER UTERINE ARTERY DOPPLER IN THE PREDICTION OF STILLBIRTHS

Leona C Y Poon, Nicola Volpe, Brunella Muto, Christina K H Yu, Argyro Syngelaki, Kypros H. Nicolaides
Kings College Hospital, London, UK

Objective: To examine the role of second-trimester uterine artery Doppler in the prediction of stillbirth.

Methods: Uterine artery pulsatility index (PI) was measured at 20-24 weeks' gestation in 65,819 singleton pregnancies. The PI was converted to multiples of median (MoM) corrected for gestational age and racial origin and compared in live births and stillbirths. Regression analysis was used to determine the significance of association between $\log_{10}$ uterine artery PI MoM with gestational age at delivery in the cases of stillbirths. The proportion of stillbirths, with or without preeclampsia (PE), birthweight below the 10^{th} percentile for gestational age (SGA) or placental abruption, with uterine artery PI MoM above the 90th percentile were determined.

Results: There were 306 (0.46%) stillbirths and in 159 (52.0%) of these there was PE, placental abruption and / or SGA (placental stillbirth). In the placental stillbirths uterine artery PI MoM was significantly higher than in live births (median 1.584, interquartile range 1.220-1.940 vs. median 1.018, interquartile range 0.862-1.210; P<0.0001) and was inversely associated with gestational age at delivery (r=-0.440, P<0.0001; Figure 1). In non-placental stillbirths uterine artery PI MoM was not significantly higher than in live births (median 1.025, interquartile range 0.877-1.280, P=0.197). The uterine artery PI MoM was above the 90^{th} percentile in 80.6% of stillbirths with PE, abruption and / or SGA delivering at <32 weeks' gestation, in 41.9% at 33-36 weeks and in 34.3% at $\geq$ 37 weeks and the respective percentages for stillbirths without PE, abruption or SGA were 15.8%, 25.0% and 12.4%.

Conclusions: Mid-trimester uterine artery PI is effective in identifying early stillbirths in association with PE, abruption or SGA but not late deaths in the absence of PE, abruption or SGA.

S243 EMERGENCE OF LATE-ONSET PLACENTAL DYSFUNCTION: RELATIONSHIP TO THE CHANGE IN UTERINE ARTERY BLOOD FLOW RESISTANCE BETWEEN THE 1^{ST} & 3^{RD} TRIMESTERS

Elisa Llurba[1], OzhanTuran, Tania Kasdaglis, Chris R. Harman, Ahmet A. Baschat.
[1] Vall Dâ´Hebron University, Barcelona, Spain

Objective: Test if emergence of third trimester (T3) placental dysfunction is related to the impedance change in uterine artery blood flow resistance between the first (T1) and third trimesters.

Study Design: Mean T1 and T3 uterine artery (mUtA) Pulsatility Index (PI) was measured in 1098 singletons. Each individual mUtA-PI change was calculated ([(T3 PI – T1 PI/interval in days)]x100; ΔmUtA-PI). This parameter and T1 and T3 mUtA-PI z-scores were related to placenta related disease (PRD) and to constitutional-small neonates (CS).

Results: 47 (5%) had PRD and 83 (8.7%) delivered a CS neonate. T1 and T3 mUtA-PI z-scores were higher with PRD (0.418 vs -0.097 and 1.06 vs -0.13, p<0.001 for all). Change in mUtA-PI (ΔmUtA PI) was similar for patients with PRD. However the prevalence of PRD doubled with rising ΔmUtA-PI (11.1% vs 5.2%, p=0.041).

Conclusions: T3 uterine artery Doppler performs significantly better in detecting patients at risk for late onset PRD than first trimester or the change in mUtA Doppler resistance. This suggests that there a proportion of late emerging placental disease that is not amenable to early screening by uterine artery Doppler. Further research is essential to identify the optimal screening strategy for late onset placental dysfunction.

S244 CAN ANGIOGENIC FACTORS IN MATERNAL CIRCULATION DISCRIMINATE BETWEEN PLACENTAL INTRAUTERINE GROWTH RESTRICTION AND CONSTITUTIONALLY SMALL FETUSES?

Samantha Benton, Yuxiang Hu, Laura Magee, Peter von Dadelszen
University of British Columbia, Vancouver, Canada

Background: Discriminating between placental intrauterine growth restriction (IUGR) and constitutionally small fetuses remains a challenge in clinical practice. Changes in angiogenic factor concentrations in maternal circulation may reflect underlying placental dysfunction associated with placental IUGR. Previously, we found low concentrations of placental growth factor (PlGF) identified placental IUGR with high sensitivity and specificity (Benton *et al*). Continuing on this inquiry, we analysed additional angiogenic factors in our cohort (soluble Fms-like tyrosine kinase-1 [sFlt-1] and endoglin).

Methods: Plasma was collected from women with suspected IUGR (fetal abdominal circumference <10th percentile on ultrasound). Placental pathology was used to confirm placental IUGR (abnormal pathology, n=9) or constitutionally small fetuses (normal pathology, n=7). Women with uncomplicated pregnancies served as controls (n=79). Analytes were quantified using the Triage immunoassay (PlGF, endoglin) or ELISA (sFlt-1) (Alere). A positive or negative test result was assigned where a positive test was defined as a concentration <5th centile (PlGF) or >95th centile (Eng, sFlt-1) for gestational age in uncomplicated pregnancy.

Results: Lower gestational age at delivery, lower birthweight and more stillbirth occurred in the placental IUGR group ($p<0.05$). PlGF was decreased in placental IUGR while Eng and sFlt-1 were increased compared with constitutionally small fetuses. PlGF had the highest sensitivity and specificity in identifying placental IUGR (Table 1).

Table 1. Performance of analytes in identifying placental IUGR (n=9) from constitutionally small fetuses (n=7)

Analyte	True positive results	True negative results	Sensitivity [95%CI]	Specificity [95%CI]	P-value
PlGF	9/9	6/7	100 [66, 100]	86 [42, 100]	<0.05
Endoglin	6/9	5/7	67 [30, 93]	71 [29, 96]	0.3
sFlt-1	5/9	4/7	56 [21, 86]	57 [18, 90]	1.0

Conclusion: Although preliminary, this data suggests angiogenic factors may identify placental IUGR and could represent a novel test for such diagnosis. Results are being confirmed in a large cohort of women with suspected IUGR.

K245 PLASMA PLACENTAL GROWTH FACTOR IN THE DIAGNOSIS OF WOMEN WITH PLACENTAL DYSFUNCTION REQUIRING DELIVERY WITHIN 14 DAYS

Lucy C Chappell[1], Melanie Griffin[1], Suzy Duckworth[1], James Maclaren[1], Paul T Seed[1], Christopher WG Redman[2], Andrew H Shennan[1]
On behalf of the PELICAN study consortium. [1]Women's Health Academic Centre, King's College London, London SE1 7EH; [2]University of Oxford, Oxford, UK

Objective: To determine the test performance statistics of PlGF in women presenting under 35 weeks' gestation with suspected pre-eclampsia or fetal growth restriction.

Methods: A prospective observational cohort study was undertaken in seven maternity units in the British Isles. Women presenting between 20+0 and 40+6 weeks gestation with suspected pre-eclampsia or fetal growth restriction (FGR) were offered study entry; those already diagnosed with pre-eclampsia or < 16 years old were excluded. After written consent, blood was drawn for PlGF measurement using Triage (Alere, San Diego). ISSHP definitions of hypertensive disease were assigned, blinded to PlGF values. Analysis of the enrolment sample was conducted to assess diagnostic accuracy for placental dysfunction requiring delivery within 14 days using gestational age-dependent cut-off equal to the 5th percentile of normal pregnancy was used. Cox proportional hazards analysis was conducted for time-to-delivery for PlGF low (<12pg/ml) and PlGF medium (>12pg/ml < 5th centile) using PlGF high (>5th centile) as the referent group.

Results: 607 women were recruited. In women presenting under 35 weeks' gestation, the test performance for predicting placental dysfunction requiring delivery within 14 days were: sensitivity 0.95 (0.86-0.98); specificity 0.56 (0.49-0.63); NPV 0.97 (0.92-0.99); PPV 0.42 (0.35 -0.51). The adjusted hazard ratio for time-to-delivery (controlling for gestational age at enrolment and final diagnosis) was 2.31 (1.68, 3.18) for PlGF medium and 10.61 (7.09, 15.89) for PlGF low.

Conclusions: In women presenting less than 35 weeks' gestation, PlGF is of value in detecting pregnancies complicated by placental dysfunction requiring delivery within 14 days. PlGF is a strong predictor of time-to-delivery, even after adjusting for gestational age at sampling and final diagnosis. PlGF may be an independent and complementary tool to assist in diagnosis and risk stratification of pregnancies complicated by placental dysfunction.

S253 DETECTION OF SMALL FOR GESTATIONAL AGE (SGA) FETUSES - A COMPARISON BETWEEN ROUTINE THIRD TRIMESTER ULTRASOUND EXAMINATIONS, AND RISK-BASED DETECTION METHODS

Karin Källén
Lund University, Lund, Sweden

Objective: To assess the SGA prediction rate using routine ultrasound third trimester examination, and to compare the rate with that obtained using risk-based methods.

Methods: A population-based perinatal register were used to identify 59,452 singleton pregnancies with routine ultrasound examination at 32-34 gestational weeks (Routine US), and 23,286 women (Population B) who lived in the catchment area of a hospital in which third trimester ultrasound examinations were performed on medical indication only. Estimated fetal weights (FW) were expressed as gestational age specific standard deviation scores (z-scores). The SGA prediction ability for Routine US was assessed by receiver operating characteristic (ROC) curves.

Results: The FW z-score obtained from the Routine US showed a high SGA prediction ability (area under the ROC-curve 0.90 [95% CI 0.89-0.91]). At the cut-off -1.0 FW z-scores, the sensitivity for SGA was 71.5% (95%CI: 69.5 – 73.7%), and the false positive rate was 11.4% (95%CI: 11.1 – 11.7%). In the whole Population B, 4,059 (17.4%) women had a medically indicated ultrasound examination at 32+0 to 35+6 weeks, and among the women whose infants were SGA at birth (n= 737), the corresponding number was 281 (38%). Using the -1 FW z-score cut-off, the sensitivity for SGA in population B could be estimated to 28%, with a false positive rate of 3%. The OR for antenatal SGA detection, Routine US versus Population B was 6.3 (95%CI: 5.2 – 7.6). Among SGA pregnancies, no significant difference regarding pregnancy outcome could be detected between the Routine US group and Population B.

Conclusions: With routine ultrasound examinations at 32-24 weeks, the detection rate of SGA is high, and significantly higher than the corresponding detection rate in populations where risk based methods are used to identify fetuses with growth retardation. The clinical importance of the high detection rate is not fully clear.

S254 DETERMINANTS AND OBSTETRICAL CONSEQUENCES OF ANTENATAL DETECTION OF SGA INFANTS IN FRANCE

Isabelle Monier, Béatrice Blondel, Anne Ego, Jennifer Zeitlin
INSERM, Paris, France

Objective: Standard prenatal care in France includes an ultrasound between 30 and 35 weeks of gestation primarily for the purpose of detecting fetal growth restriction (FGR). We aimed to assess the percent of small for gestational age (SGA) infants detected during pregnancy, factors associated with detection and consequences for obstetric management.

Methods: This study used a nationally representative sample of singleton births from the 2010 French Perinatal Survey (N=14100). SGA and severe SGA were defined as birthweight below the 10th and 3rd percentiles of French references. Antenatal detection was determined by mention of suspected FGR in medical charts. Factors hypothesized to affect detection were medical and socio-demographic risk factors for FGR (obstetrical history, pregnancy complications, maternal age, parity, education, smoking) and insufficient prenatal care. Obstetric management was assessed by rates of induction of labour, caesarean section and indicated preterm birth. A group of low-risk pregnancies was defined.

Results: 21.7% of SGA, 33.0% of severely SGA and 2.1% of non-SGA infants were detected with FGR during pregnancy; for low risk pregnancies, rates were 16.1%, 26.0% and 1.3%. Medical characteristics, female sex and low birthweight were associated with higher detection rates. Non-spontaneous onset of delivery was more common after detection. Compared with non-SGA, non-detected infants, the adjusted odds of indicated preterm delivery was 8.6 [5.8-12.8] for SGA-detected, 1.0 [0.6-1.7] for SGA-undetected and 6.6 [4.5-9.7] for non-SGA-detected. The odds of caesarean during labour were 2.1 [1.4-3.1], 1.6 [1.3-2.0] and 1.0 [0.6-1.6] respectively. Results were similar for women with low risk pregnancies.

Conclusion: Antenatal detection of SGA infants was low in France. Indicated preterm births were higher after detection, regardless of SGA status. Non-detected SGA infants had higher rates of caesarean during labour compared with non detected infants without SGA. These results underscore the need to evaluate the health impact of current screening practices.

S255 THE INTRODUCTION OF SERIAL FUNDAL HEIGHT PLOTTIING ON CUSTOMISED CHARTS IN NULLIPAROUS WOMEN RESULTS IN DOUBLING OF THE ANTENATAL DETECTION OF SMALL FOR GESTATIONAL AGE FETUS

Alphonse Roex, Payam Nikpoor, Eva van Eerd, Nicky Hodyl and Guus Dekker
Lyell McEwin Hospital, Adelaide, Australia

Objective: to investigate whether the introduction of serial plotting on customised fundal height charts (www.gestation.net) can increase the detection rate of small for gestational age (SGA) fetus in low risk nulliparous women attending antenatal clinics in a public teaching hospital in Adelaide, South Australia.

Methods: an observational study was employed to compare SGA detection rates, utilising data from an historical control group (n=1169) compared to data collected from 1550 first time mothers after the change in practice. In the control group the fundal height (FH) was measured for every antenatal visit but never plotted on a chart. The 'intervention' comprised of serial FH plotting on customised charts, combined with a dedicated clinical practice guideline and regular audits to promote clinicians' adherence.

Results: After excluding 16 cases with an inadequate number (</=2) of total FH measurements the antenatal detection rate of SGA was 24.8% (31/125) in the control group and 50.6% (44/87) in the 'intervention' group (P <0.001; OR 3.10; 95% CI 1.73-5.57).

Conclusion: Despite 34 occasions of non-adherence, serial plotting of the FH on customised charts supported by a clinical practice guideline and audits resulted in a significantly improved antenatal detection of SGA fetus.

S256 IDENTIFICATION OF SUBOPTIMAL FETAL GROWTH AND RISK OF LATE STILLBIRTH

Tomasina Stacey, Ed Mitchell, John Thompson, Lesley McCowan
St James University Hospital, Leeds, UK

Objective: Stillbirth remains an important public health problem globally. We aimed to determine the impact of small for gestational age (SGA) (especially those not recognised before birth) and frequency of attendance for antenatal care on the risk of late stillbirth.

Method: Cases were women with a singleton, late stillbirth (at or greater than 28 weeks' gestation) without congenital abnormality, in Auckland, New Zealand, born between July 2006 and June 2009. Two controls with ongoing pregnancies were randomly selected at the same gestation at which the stillbirth occurred. Data were collected through interview-administered questionnaires and from antenatal records. SGA was defined as birthweight less than the 10th customised centile. A multivariable regression model was developed which adjusted for known risk factors for stillbirth and adjusted odds ratios (aOR) and 95% confidence intervals were calculated.

Results: One hundred and fifty five of 215 (72%) cases and 310 of 429 (72%) controls consented to take part in the study. Fifty seven (36.8%) late stillbirths and 22 (7.1%) controls were SGA at birth (p<0.001). Babies that were SGA at birth had a significantly increased risk of stillbirth compared with babies that were not (aOR, 9.67; 95% CI, 4.68–19.96). In addition, SGA infants who had not been identified as such prior to birth had substantially increased risk of stillbirth (aOR, 9.46; 95% CI, 1.98–45.13) compared with SGA infants who were identified as small antenatally. Accessing less than 50% of recommended antenatal visits was also associated with a more than twofold increase in late stillbirth (aOR, 2.68; 95% CI, 1.04–6.90) compared with accessing the recommended number of visits.

Conclusion: Antenatal identification of SGA is associated with improved perinatal outcome and may be one way by which antenatal care reduces the risk of stillbirth.

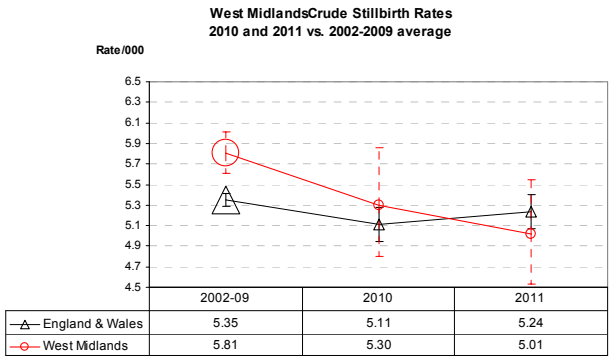
K257 REDUCING STILLBIRTHS THROUGH IMPROVED ANTENATAL DETECTION OF IUGR

Jason Gardosi, , Mandy Williams, Michelle Southam, Fiona Cross-Sudworth, Ann Tonks, Annette Williamson, Sally Clifford, Sal Giddings, Kate Morse, Andre Francis, Asad Malik, Abdel El-Sheikh.
West Midlands Perinatal Institute, Birmingham, UK

Introduction West Midlands stillbirth rates have been consistently and significantly above the national average. Epidemiogical analyses, better classification systems and confidential enquiries have found that many normally formed stillbirths at relatively mature gestations were growth restricted, and therefore potentially preventable.

Method Working with clinicians, commissioners, PCTs and the Health Authority, we implemented a regional initiative which included 1. designation of antenatal detection of SGA / IUGR as a key performance indicator; 2. benchmarking of detection rates with regular feedback to maternity units; 3. rolling programme of training in fetal growth assessment and use of customised growth charts; 4. agreed protocols for risk assessment and referral and 5. enhanced access to growth scans through provision of additional, midwifery led ultrasound clinics. Antenatal detection was defined as a recording of SGA or IUGR in the case notes, and/or a scan based estimated fetal weight below the 10th centile recorded on the customised growth chart.

Results Overall antenatal detection of babies born with SGA birthweight improved from 27.1% in 2007 to 34.7% in Q3, 2011 ($p<0.01$). Detection rates were higher within subgroups: once referred on the basis of fundal height measurement, 61.5% of SGA babies were detected on ultrasound; for women receiving serial scans, detection rates reached 57.3%. Regional stillbirth rates reduced significantly from a 2002-9 baseline average of 5.81 (CI 5.74-6.15) to 5.01 (4.67-5.71) in 2011 ($p<0.01$), thereby dropping, for the first time, below the national average (Figure). This improvement was due to fewer deaths associated with fetal growth restriction, while there was no change in stillbirth rates due to congenital anomalies or other causes.



	2002-09	2010	2011
England & Wales	5.35	5.11	5.24
West Midlands	5.81	5.30	5.01

Conclusions. Most normally formed stillbirths are potentially avoidable, and many are associated with fetal growth restriction. Better recognition of the importance of IUGR and its improved antenatal detection and referral can lead to significant advances in stillbirth prevention.

S361 THE SMOKING PLACENTA

Slatter, T; Anderson, K; Lailai-Tasmania, V; Herbison, P; Clow, W; Royds, J; Devenish, C; Hung, N
University of Otago, Dunedin, New Zealand

Objective: Smoking during pregnancy has adverse outcomes for the mother and fetus, but the molecular nature of this is still uncertain. We investigated whether a reduced birth weight from maternal smoking could be attributed to DNA damage in the placenta.

Methods: Term placentae from women who smoked during their entire pregnancy (n=52), women who had ceased smoking for at least four weeks before delivery (previous smokers, n=34), and from non-smoking women (n=150) were examined for markers of DNA damage (phosphorylated gamma H2AX), cell fate (apoptosis, cell cycle arrest, and DNA repair), and function (human chorionic gonadotropin (hCG), human placental lactogen (hPL), and glucose transporter -1 (GLUT1)). Smoking history and DNA damage were assessed according to birth weight and gross placental parameters.

Results: Marked DNA damage occurred in the villous syncytiotrophoblast in placentae from smokers compared to non-smokers ($p<0.001$). The DNA damage was associated with reduced birth weight ($p=0.002$). Microscopically the DNA damaged syncytiotrophoblast showed marked reduction in hCG, hPL, and GLUT1 expression. Previous smokers showed less DNA damage compared to smokers, and birth weight was similar to that from non-smoking mothers.

Conclusions: Smoking during pregnancy is associated with histtologically demonstrable marked DNA damage to the syncytiotrophoblast: the major source of placental hormones mediating fetal growth and homeostasis. We propose that DNA damage leads to syncytiotrophoblast dysfunction contributing to a reduced birth weight and that this effect is ameliorated if smoking is stopped for at least four weeks before delivery.

S362 QUANTITATIVE ASSESSMENT OF PLACENTAL MORPHOLOGY IDENTIFIES SPECIFIC CAUSES OF STILLBIRTH AND REDUCES THE PROPORTION OF STILLBIRTHS OF "UNKNOWN CAUSE"

Anna Smith, Ainslie Garrod, Gauri Batra, Colin Sibley, Alexander Heazell
Manchester Academic Health Science Centre, Manchester, UK

Introduction: Stillbirth is frequently the end result of a pathological process involving the placenta. Despite advances in the classification of stillbirths, a significant proportion remain "unexplained". There are few objective studies of placental phenotype in stillbirth. It was hypothesised that application of quantitative assessment of placental morphology would find specific changes of placental structure and morphology in different causes of stillbirth, and that application of placental morphological assessment to a group of stillbirths of "unknown" cause, morphological changes associated with a specific cause could be identified.

Methods: Placental tissue blocks (3 per placenta) were obtained from stillbirths with an established cause of death (cord accident n=8; diabetes n=5; hypertension n=8; infection n=9; FGR n=10) and those in which a cause of death was not identified (n=10). For comparison placental tissue from matched pregnancies with live births was used. Syncytial knots were assessed on 5µm sections stained with haematoxylin and eosin. Immunoperoxidase staining was used to identify proliferation (anti-Ki67), villous blood vessels (anti-CD31), leukocytes (anti-CD45) and trophoblast area (anti-cytokeratin 7). Five areas of each section were photographed and subjected to image analysis (ImagePro Plus, Media-Cybernetics). The median value for these indices was calculated for normal placenta, this was compared to different causes of stillbirth using Wilcoxon signed rank test.

Results: Syncytial nuclear aggregates were increased in stillbirths from cord accidents, FGR and hypertensive disorders ($p<0.05$). Proliferation was decreased in all groups of stillbirth ($p<0.05$), but was particularly reduced in cord accidents and FGR ($p<0.01$). Trophoblast area was increased in FGR and was reduced in stillbirths from infection ($p<0.05$). Villous vascularity was significantly reduced in FGR ($p<0.001$). The proportion of avascular villi was increased in cord accident ($p<0.01$), hypertension ($p<0.05$), infection ($p<0.05$) and most strongly in FGR ($p<0.001$). When these patterns were applied to stillbirths of "unknown cause", two cases had identical morphological pattern to FGR.

Conclusions: Quantitative assessment of placental morphology can distinguish between different causes of stillbirth. Therefore, applying quantitative assessment in addition to expert qualitative assessment might reduce the proportion of stillbirths classified as "unexplained". A greater proportion of stillbirths may be associated with FGR than previously thought.

S363 ASSESSMENT OF PLACENTAL VASCULARIZATION USING 3D POWER DOPPLER ULTRASOUND IN DETERMINING THE CAUSE OF INTRAUTERINE GROWTH RESTRICTION

M. P. Famina
Vitebsk State Medical University, Vitebsk, Belarus

Objective: to investigate placental vascularization using three-dimensional power Doppler (3D PD) ultrasound in determining the cause of intrauterine growth restriction (IUGR).

Methods: The study involved two groups of women with singleton pregnancies: 42 women with IUGR and 31 women with normal gestation. 3D PD indices (vascularization index (VI), flow index (FI), vascularization flow index (VFI)) of placenta and placental growth factor (PlGF) blood levels were determined in all pregnant women at 28–34 weeks of gestation. Pro-inflammatory cytokines (interleukin-6, interleukin-8) levels were measured in the amniotic fluid and umbilical cord blood at birth. All placentas were studied for histopathology.

Results: Analysis of 3D PD indices revealed 2 types of placental vascularisation in growth-restricted pregnancies: IUGR with normal values of VI, FI and VFI in placenta ($p>0.05$) and IUGR with low values of VI and VFI in placenta ($p<0.05$). IUGR with normal placental vasculature was associated with high PlGF blood levels (>1.58 MoM), a tendency to increase IL-6 and IL-8 levels in umbilical cord blood ($p>0.05$). Such IUGR was characterized by velamentous cord insertion and short umbilical cord ($p<0.05$), placental villous dismaturity ($p<0.01$), inflammatory placental lesions ($p<0.001$), a 2.5-fold increase in the frequency of infections specific to the perinatal period ($p>0.05$) (Fig A). IUGR with reduced placental vasculature was associated with low PlGF blood levels (<0.68 MoM), low IL-6 and IL-8 levels in umbilical cord blood ($p<0.05$). This type of IUGR was characterized by placental hypoplasia ($p<0.01$), intervillous space thrombosis and perivillous fibrin depositions ($p<0.05$), a 1.5-fold increase in the frequency of perinatal hypoxic-ischemic encephalopathy ($p<0.05$)

Conclusions: The type of placental vascularization detected by 3D PD may prove useful in determining the cause of IUGR (infection, placental insufficiency, umbilical cord pathology). This placental examination can optimizes a further management plan for pregnant women with IUGR (expectant management or iatrogenic premature delivery).

S364 HEMATOLOGIC CONSEQUENCES OF PLACENTAL DYSFUNCTION CONTRIBUTE TO THE RATE AND DEGREE OF FETAL DETERIORATION

A Baschat, M Kush, C Berg, U Gembruch, K Nicolaides, C Harman, O Turan,
University of Maryland, Baltimore, USA

Objective: To examine the relationship between Doppler deterioration in fetal growth restriction (FGR) and hematologic parameters at birth.

Methods: Secondary analysis of FGR patients (abdominal circumference < 5th percentile and umbilical artery (UA) pulsatility index (PI) elevation) with at least three examinations prior to delivery. Prenatal deterioration was classified based on the rate and extent of UA, middle cerebral artery (MCA) and ductus venosus (DV) Doppler abnormalities. Associations between diagnosis to delivery interval, Doppler z-scores deterioration patterns and hematologic parameters at birth were examined.

Results: Among 130 patients 54 (41.5%) had rapid, 51 (39.2%) moderate and 25 (19.2%) had slow deterioration requiring delivery within 4, 6 and 9 weeks of diagnosis respectively. Decreasing platelet count was the primary hematologic contributor to moderate deterioration (r^2 = 0.47) while rapid deterioration was primarily related to decreasing Hb concentration (r^2 = 0.75, p< 0.0001 for both). In patients with moderate deterioration a falling platelet count correlated with increasing UA PI (Spearman Rho -0.44, p=0.001) and fell furthest when end-diastolic velocity was absent. With rapid progression, decreasing platelet count correlated with increasing NRBC count (Spearman Rho -0.51, p<0.001) while the relationship with UA PI was no longer significant.

Conclusions: In FGR accelerated Doppler deterioration is more likely in patients with lower platelet counts. Initially these appear to be due to placental platelet consumption and villous occlusion. Rapid cardiovascular deterioration coincides with the onset of ineffective production of red blood cells and platelets.

K365 PATTERNS OF PLACENTAL DISEASE IN EARLY AND LATE IUGR

Jan Jaap Erwich
University Medical Center, Groningen, Netherlands

To be Small-for-Gestational-Age (SGA) or Intra-Uterine Growth Restricted (IUGR) increases the risk for perinatal mortality or morbidity. In published series on antepartum fetal deaths, around 40% are SGA and/or IUGR. In clinical practice it is still a problem to properly identify the fetus at risk. The clinical manifestations of placental disease like preeclampsia or clinical recognized IUGR, may or may not have become apparent yet.

Diverse placental pathologies are the main conditions responsible for the path to fetal demise and several patterns of placental pathology are being recognized. From a Dutch cohort of 1025 fetal deaths from 20 weeks onwards, we had 1012 placental examinations (98.7%). Placental causes for fetal death were classified according to the TULIP classification and contained 65.3% of all cases. Of SGA fetuses >24 weeks (n=279), 77.8% showed a placental cause of death; for non-SGA (>24 weeks) this was 67.1 % (371/553; 10.7% difference between proportions 95% CI: 16.9%-4.4%)

The prevalence of specific placental pathologies was dependent on gestational age. In general, placental causes increased with gestational age, although less prominent for SGA fetus. Placental abruption peaks in early pregnancy and between 32 and 37 weeks. Placental infarction has its major impact below 32 weeks. At term, both placental hypoplasia (normal histopathology, but too small placental weight for gestational age) and persistent villus immaturity are main causes of death.

For the SGA-fetus resulting in fetal death after 24 weeks, placental bed pathology with infarctions is the main cause of death and with 107 of 150 deaths with placental causes, the majority below 32 weeks. This is in contrast to the non-SGA fetal death which shows predominantly placental infarctions and abruption after 32 weeks and persistent villus immaturity and placental hypoplasia after 36 weeks.

In the total group of deaths by villus immaturity (81/1025) after 36 weeks, SGA fetuses were not overrepresented. In this study SGA was determined after delivery and IUGR or hypertensive disorders had been identified during pregnancy in less than 33% before the diagnosis of fetal death.

Conclusions: Placental infarction is the main cause of SGA related fetal death.

K371 FETAL GROWTH RESTRICTION - EARLY ONSET

Ahmet Baschat
University of Maryland, Baltimore, USA

Recent observations indicate that the clinical evolution of fetal growth restriction is determined by the onset of underlying placental dysfunction. Early-onset fetal growth restriction typically presents prior to 34 weeks gestation and has distinct cardiovascular and biophysical hallmarks. Placental blood flow resistance is elevated producing abnormal uterine and umbilical artery Doppler patterns in the maternal and fetal compartments of the placenta respectively.

Subsequently, cerebral blood flow resistance decreases – traditionally described as the “brain sparing effect”. With onset of cardiovascular deterioration abnormalities in venous blood flow patterns and central hemodynamics may develop. With worsening acid base status this is accompanied by sequential loss of fetal heart rate variability, breathing movements and finally tone and body movements as the biophysical profile becomes abnormal. In this form of FGR safe prolongation of pregnancy is a primary management goal, as gestational age at delivery, birthweight and iatrogenic premature delivery have an important impact on short term outcome and neurodevelopment.

Surveillance intervals can be adjusted based on umbilical artery and venous Doppler studies. Intervention thresholds need to be based on the balance of fetal versus neonatal risks and therefore critically depend on gestational age.

K372 FETAL GROWTH RESTRICTION - LATE ONSET

Francesc Figueras
University of Barcelona Spain

There is a growing consensus that early and late-onset forms of intrauterine growth restriction (IUGR) must be dealt with as separate conditions, both from clinical and research perspectives. Early-onset IUGR is always a severe disease, highly associated with PE and abnormal placental implantation. Late-onset IUGR is rarely associated with PE and being far more prevalent than the early-onset clinical form it is responsible of a large proportion of perinatal deaths. Furthermore, the association of late-onset IUGR with poorer outcome is now well demonstrated and consequently the importance of its detection and proper management is increasingly recognized.

Follow-up: There is good quality evidence showing that compared with every two week monitoring, twice a week monitoring results in more induction without any improvement in the perinatal outcome. However, observational studies demonstrate that umbilical artery Doppler rarely becomes abnormal in late-onset IUGR and, therefore, other US and Doppler parameters have been proposed for the follow-up, including the growth velocity, the middle cerebral artery Doppler (both individually and combined with the umbilical artery Doppler in the cerebroplacental ratio) and the uterine artery Doppler. Although evidence from observational studies accumulates, there is not solid evidence regarding the beneficial impact of these additional parameters on the perinatal outcome.

Time of delivery: There is one large randomized equivalence trial comparing the effect of induction of labor beyond 36 weeks with expectant monitoring in pregnancies with suspected IUGR. The primary outcome was a composite measure of adverse neonatal outcome, and the secondary outcome was operative delivery. No significant difference was found in either outcome between study groups. The absence of difference in outcome between the two groups supports a strategy of induction of labour or conservative management, depending on the wishes of the woman.

Mode of delivery: Late-onset IUGR fetuses are at increased risk of fetal heart rate decelerations in labor, emergency cesarean section for suspected fetal compromise and metabolic acidemia at delivery. The offer of induction of labor with continuous monitoring is reasonable in term and near term fetuses SGA fetuses. Reported rates of emergency CS for suspected fetal compromise greatly vary from 6-45%, and several ultrasound and Doppler parameters before labor has been suggested as predictors of these adverse outcomes. However, there are no RCTs of mode of delivery in late-IUGR.

K373 IMPLICATIONS FOR FURTHER RESEARCH

Aris Papageorghiou on behalf of INTERGROWTH
Oxford University, UK

Reliable ultrasound charts are necessary for the prenatal assessment of fetal size, yet there is a wide variation of methodologies for their creation. In order to evaluate methodological quality we conducted a systematic review of observational studies whose primary aim was to create fetal size charts. Studies were scored against a predefined set of independently agreed methodological criteria aimed at assessing the risk of bias.

Eighty-three studies met the inclusion criteria and these demonstrated that there is considerable methodological heterogeneity. Most common deficiencies were absence of predefined 'Inclusion/exclusion criteria', and none of the studies defined a rigorous set of antenatal or fetal conditions which should be excluded from analysis. No study demonstrated a comprehensive quality assurance strategy.

These issues will be overcome by the INTERGROWTH-21st study, a multicentre, multiethnic, population-based project, being conducted in eight health institutions (Brazil, China, India, Italy, Kenya, Oman, UK and USA). This will study growth, health and nutrition from early pregnancy to infancy, and methodological aspects and quality control measures of INTERGROWTH-21st will be presented and implications for further research discussed.

S381 FETAL GROWTH RESTRICTION – DEFINITION, ASSESSMENT AND MANAGEMENT: A CONTINUING CLINICAL DILEMMA

J Unterscheider, S Daly, M Geary, F McAuliffe, JJ Morrison, K O'Donoghue, A Hunter, G Burke, E Tully, FD Malone
Perinatal Ireland Research Consortium, Ireland

Objectives: The aim of this study is to evaluate obstetrician's opinions on the definition, assessment and management of pregnancies affected by suboptimal fetal growth.

Methods: A structured anonymous web-based questionnaire was sent out via email to 200 doctors working in obstetrics in Ireland.

Results: A total of 60 responses (30%) were received before deadline of this abstract. Most of the participants (66%) had over 5 years' experience with the majority (78%) working in hospitals over 8,000 births per annum with tertiary level neonatal care facilities. The favoured definition for IUGR and SGA were an EFW below the 5th centile (58%) and the 10th centile (68%), respectively. 70% stated that amniotic fluid and Doppler abnormalities distinguished both definitions and only 8% used the terms 'SGA' and 'IUGR' synonymously. When asked about the optimal timing of delivery of a fetus on the 6th centile with normal Doppler and liquor volume, the majority (97%) would deliver after 37 weeks; 50% would allow the pregnancy to progress beyond 39 weeks. In the evaluation of IUGR fetuses with abnormal umbilical artery Doppler, the assessment of amniotic fluid index, biophysical profile, MCA, ductus venosus Doppler and CTG is found helpful in 72%, 57%, 63%, 55% and 55% respectively. In cases of IUGR with AEDF before 34 weeks, most doctors (85%) would wait for CTG abnormalities to occur to indicate delivery, 73% are guided by ductus venosus abnormalities and 13% would deliver for AEDF alone prior to 34 weeks. The majority (78%) would implement customised centile charts if they became available and a national guideline is desired by 92% of respondents.

Conclusions: The above results confirm the many variations used for defining and managing IUGR. There is an urgent need to develop a standardised definition which will aid in the optimal management of these complicated pregnancies.

K382 TRIAL OF UMBILICAL AND FETAL FLOW IN EUROPE (TRUFFLE)

Christoph Lees
Cambridge University Hospital, UK

Objective: The primary endpoint of the TRUFFLE study is to evaluate 2 year infant neurodevelopmental outcome in fetal growth restriction where antenatal management was based on CTG or Doppler assessment. A secondary outcome, presented in this abstract in aggregate (in other words not by randomised group), is composite neonatal morbidity and mortality.

Method: Multicentre randomized study in 17 European tertiary perinatal centres. Women with growth restricted fetuses were recruited at 26-32 weeks gestation between 2005-2010 and randomized to delivery according to abnormal short term variability on CTG, early ductus venosus changes or late ductus venosus changes. Composite neonatal morbidity included intra ventricular haemorrhage (grades III or IV), respiratory distress syndrome, periventricular leukomalacia, proven sepsis, necrotising enterocolitis and mortality until discharge home.

Results: Of 509 women randomized, data from 503 were included. The mean gestation at study entry was 29 weeks and estimated fetal weight 881g. The mean gestation at delivery was 30 weeks 5 days and median birthweight 1013g. 76% of women were delivered for fetal indication and 97% babies were born by Caesarean Section. 491 babies were liveborn and 105 (21%) met the criteria for the composite neonatal morbidity endpoint.

Conclusion: The outcomes in this large prospective study of early onset fetal growth restriction are generally better than expected from previously reported studies. The majority of babies were born by Caesarean section within 1-2 weeks of randomisation; one fifth died or suffered severe sequalae. The results are generalisable for counselling as the management of these fetuses and neonates reflects contemporary clinical practice. The most important contributors to neonatal outcome were gestational age and umbilical:middle cerebral artery pulsatility ratio at study inclusion.

K383 INDUCTION VERSUS EXPECTANT MONITORING FOR INTRAUTERINE GROWTH RESTRICTION AT TERM: RANDOMISED EQUIVALENCE TRIAL (DIGITAT)

K E Boers, S M C Vijgen, D Bijlenga, J A M van der Post, D J Bekedam, A Kwee, P C M van der Salm, M G van Pampus, M E A Spaanderman, K de Boer, J J Duvekot, H A Bremer, T H M Hasaart, F M C Delemarre, K W M Bloemenkamp, C A van Meir, C Willekes, E J Wijnen, M Rijken, S le Cessie, F J M E Roumen, J G Thornton, J M M van Lith, B W J Mol, S A Scherjon[1] [1]St Lucas Andreas Hospital, Amsterdam, The Netherlands

Objective: To compare the effect of induction of labour with a policy of expectant monitoring for intrauterine growth restriction near term. **Design** Multicentre randomised equivalence trial (the Disproportionate Intrauterine Growth Intervention Trial At Term (DIGITAT)). **Setting** Eight academic and 44 non-academic hospitals in the Netherlands between Nov 2004 and Nov 2008. **Participants** Pregnant women who had a singleton pregnancy beyond 36+0 weeks gestation with suspected intrauterine growth restriction. **Interventions** Induction of labour or expectant monitoring. **Main outcome measures:** Primary outcome was a composite measure of adverse neonatal outcome, defined as death before hospital discharge, five minute Apgar score of less than 7, umbilical artery pH of less than 7.05, or admission to the intensive care unit. Operative delivery (vaginal instrumental delivery or caesarean section) was a secondary outcome. In a sub-analysis, we report neonatal morbidity between the policies based on the morbidity assessment index for newborns (MAIN). For the long term follow-up parents of 2-year old children included in the DIGITAT-trial answered the Ages and Stages Questionnaire (ASQ) and Child Behaviour Check List (CBCL). Analysis was by intention to treat, with confidence intervals calculated for the differences in percentages or means.

Results: 321 pregnant women were randomly allocated to induction and 329 to expectant monitoring. Induction group infants were delivered 10 days earlier (mean difference −9.9 days, 95% CI −11.3 to −8.6) and weighed 130 g less (mean difference −130 g, 95% CI −188 g to −71 g) than babies born to women in the expectant monitoring group. A total of 17 (5.3%) infants in the induction group experienced the composite adverse neonatal outcome, compared with 20 (6·1%) in the expectant monitoring group (difference −0.8%, 95% CI −4.3% to 3.2%). Caesarean sections were performed on 45 (14.0%) mothers in the induction group and 45 (13.7%) in the expectant monitoring group (difference 0.3%, 95% CI −5.0% to 5.6%). There were no differences in mean MAIN scores, nor in MAIN morbidity categories. We found that neonatal admissions are lower after 38 weeks gestational age compared to 36 and 37 weeks in both groups. Results of the ASQ and the CBCL for the two policies were comparable. Low birth weight, positive morbidity assessment index (MAIN score) and admission to intermediate care, increased the risk of an abnormal outcome of the ASQ.

Conclusions: In women with suspected intrauterine growth restriction at term, we found no important differences in adverse outcomes between induction of labour and expectant monitoring. The incidence of neonatal morbidity in IUGR at term is comparable and relatively mild either after induction or after an expectant policy. However, neonatal admissions are lower after 38 weeks of pregnancy, so if induction to pre-empt possible stillbirth is considered, it is reasonable to delay until 38 weeks, provided watchful monitoring. In women with IUGR at term, both a policy of induction of labour and expectant management do not affect developmental and behavioural outcome when compared to expectant management. However, severe growth restriction (< p 2.3) and neonatal admission seem to be the most important predicting factors for neuro-developmental problems at 2-years of age in children born after suspected IUGR at term. As induced babies are admitted more frequently, but more babies become severely growth restricted after expectant management the challenge determining the optimal time to deliver remains.

K384 IMPLICATIONS FOR GUIDELINES

Bill Martin on behalf of the RCOG Guidelines group
Birmingham Women's Hospital, Birmingham, UK

The Royal College of Obstetricians and Gynaecologists produces evidence based peer reviewed guidelines **(Green Top Guidelines - GTG)** to help clinicians in the management of various conditions within the specialty. The GTG for Management of IUGR was first written in 2002 and currently is being updated, a considerable task after 10 years. Within the current draft, the recommendations on monitoring and management of the SGA fetus are as follows: (Evidence levels A, B, and GPP - good practice point)

Monitoring

- as umbilical artery Doppler has been shown to reduce perinatal morbidity and mortality in a high risk population, it should be the primary surveillance tool in the SGA fetus [A]
- if UAD is normal repeat surveillance every 14 days [B]
- more frequently if severe SGA [GPP]
- when UAD is abnormal but delivery is not appropriate, repeat surveillance twice weekly if positive EDF, or daily if AREDF [GPP]
- CTG should not be used as the only form of surveillance in SGA fetuses. [A]
- STV should be used to interpret the CTG [A]
- amniotic fluid volume should not be used as the only form of surveillance in SGA fetuses [GPP]
- middle cerebral artery Doppler has limited accuracy to predict acidaemia and adverse outcome in preterm SGA fetuses [B] thus should not be used to time delivery
- ductus venosus Doppler has moderate predictive value for acidaemia and adverse outcome. [A] and should be used for surveillance in the preterm SGA fetus with abnormal UA Doppler and to time delivery. [GPP]

Timing of delivery

- Preterm SGA fetus with UA AREDV detected prior to 32 weeks deliver when DV Doppler becomes abnormal or UV pulsations appear, provided the fetus is considered viable and after completion of steroids;
- If venous Doppler remains normal, delivery is recommended by 32 weeks of gestation. [GPP]
- SGA fetus detected after 32 weeks with normal UA Doppler - delivery should be offered at 37 weeks [A].
- SGA fetus detected after 32 weeks with an abnormal UA, delivery no later than 37 weeks recommended [GPP]

It should be noted that the GTG is still under review. There have been a large number of responses to the consultation, not least this aspect of the guideline, and thus recommendations may be altered following comprehensive peer review.

K395 MACROSOMIA AND ADVERSE OUTCOME

Dharmintra Pasupathy
St Thomas' Hospital, London UK

Pregnancies complicated by higher than normal birth weight are associated with adverse outcomes causing significant short and longer term maternal and fetal morbidity. The population prevalence of macrosomia and large for gestational age (LGA) infants is increasing, primarily driven by rising rates of maternal obesity and impaired glucose tolerance. Adverse consequences of macrosomia are many and diverse, which include operative delivery, traumatic vaginal delivery, post-partum haemorrhage, neonatal mortality, severe neonatal morbidity and childhood metabolic syndrome.

Antenatal prediction of macrosomia using clinical and ultrasound measurements has limited accuracy and interventions aimed at reducing perinatal complications are not cost effective, especially in women without gestational diabetes (GDM), who contribute significantly to the proportion of macrosomic infants (>80%). These limitations may be due to the current definitions of macrosomia and LGA which do not distinguish between infants who are appropriately grown for maternal constitution with normal growth velocity from those which have exceeded their growth potential.

This presentation will focus on current evidence, methods to improve characterisation and antenatal prediction of excessive fetal growth associated with adverse outcomes. Some of the findings have the potential for impact in clinical management in an area of increasing relevance in obstetrics.

S391 CLINICAL AND METABOLIC PROFILES OF VERY SEVERELY OBESE PREGNANT WOMEN AND THEIR ASSOCIATIONS WITH BIRTH WEIGHT

Shareen Forbes, Rebecca M Reynolds, Graham Harold, Forbes Howie, Fiona Denison and Jane E Norman.
University of Edinburgh, Edinburgh, UK

Objective: During gestation diminished maternal insulin sensitivity (IS) increases the availability of fuels allowing fetal growth. Class III obesity (OB; BMI≥40kg/m2) is associated with reduced IS but it is not known how nutrient availability differs and how this impacts on birth-weight versus normal pregnancies.

Methods: 235 OB (median(interquartile range) 43.2(41.1-46.3)kg/m2) and 111 CON (BMI 22.6(21.2-23.5)kg/m2) pregnant Caucasians had maternal anthropometrics, fasting glucose, NEFA and insulin concentrations recorded at ~16, 28 and 36 weeks(wk). Premature births and women with pre-existing Type 2 diabetes were excluded.

Results: Weight gain (WG) was greater in CON vs. OB (10.4(7.6-13.0)kg vs. 5.2(2.4-8.3)kg; p<0.0001; 16-36wk). Glucose, NEFA and insulin were higher in OB vs. CON throughout pregnancy (p<0.0001). IS was lower in OB vs. CON (p<0.0001), decreasing with gestation (all p<0.02). Glucose peaked at 28wk: OB (16wk 4.5(4.2-4.7)mmol/l; 28wk 4.6(4.3-4.9)mmol/l; 36wk 4.5(4.1-4.8)mmol/l; p=0.05) and CON (16wk 4.2(4.1-4.4)mmol/l; 28wk 4.2(4.0-4.5)mmol/l; 36wk 4.1(3.9-4.3)mmol/l; p=0.0003). NEFA troughed at 28wk: OB (16wk 0.49(0.41-0.60)mmol/l; 28wk 0.44(0.37-0.55)mmol/l; 36wk 0.50(0.39-0.61)mmol/l; p=0.005) and CON (16wk 0.31(0.25-0.40)mmol/l; 28wk 0.29(0.22-0.36)mmol/l; 36wk 0.33(0.27-0.46)mmol/l; p=0.03). Birth weights after adjusting for gestational age, gender, parity, smoking and social-class were greater in OB 3610(3280-3980)g vs. CON 3600(3260-3860)g (p=0.03). In multivariate regression, 36wk glucose in OB (p=0.03) versus 28wk NEFA, BMI and WG in CON were associated with birth-weight (all p<0.05).

Conclusions: OB women were more insulin resistant vs. CON during pregnancy, with greater glucose, NEFA and insulin concentrations and greater adjusted birth-weights. Glucose was associated with birth weight in the OB and NEFA in the CON which may indicate altered fetal preference for metabolites during these pregnancies. The influence of increasing BMI in the CON group only was associated with increased birth weight, whereas further increases in the severely obese cohort did not increase birth weight further.

S392 MACROSOMIC INFANTS OF NONDIABETIC AND DIABETIC MOTHERS: THE CHALLENGES FOR OBSTETRIC PRACTICES IN A LOW RESOURCE COMMUNITY

Mahjabeen Khan
Dow University of Health Sciences, Karachi, Pakistan

Objective: To estimate and compare the obstetric outcome of fetal macrosomia in both diabetic and non-diabetic mothers as challenges in obstetrics practice Karachi, Pakistan.

Study Design: comparative cross sectional; June 2008-May 2009.

Study population: All singleton pregnant women Sample size: 229.

Neonates with birth weight of 3,500gms or greater born to diabetic or non-diabetic mother. Babies with 3,500 Gms birth weight and more were considered as macrosomic. The major outcome measures were obstetrics outcome: live births, perinatal mortality, mode of delivery and APGAR scores of both groups. The demographic, obstetric and neonatal outcomes on diabetic and non-diabetic mothers delivering macrosomic babies were compared. Data were entered and analyzed using SPSS windows version 15. Significance of difference was calculated using t test, Chi square test as applicable.

Results: There were 72 diabetic and 157 non-diabetics pregnant women. Uncomplicated diabetic and non-diabetic women of single index pregnancy had age range of 19–35 years. Overall incidence of macrosomia (≥3,500 Gms) in this study was 72(31.4%). In this study there were significantly more macrosomic new-borns in diabetic women; (52.8%) compared to (47.2%). Fetal macrosomia in our study was 31.4% in both diabetic and non-diabetic mothers.

Conclusions: The obstetric challenges of diagnosis and management of fetal macrosomia in low resource country like Pakistan require screening for macrosomia as an integral part of antenatal care.

S393 EFFECT OF GESTATIONAL DIABETES ON THE RISK OF MACROSOMIA IN WOMEN WITH NORMAL BODY MASS INDEX

Mahlatse Makgoba, Makrina D Savvidou, Philip J Steer
Imperial College London, Chelsea and Westminster Hospital, London, UK

Objective: It is well established that among pregnant, obese women those with gestational diabetes (GDM) are more likely to have a mascrosomic baby than women without GDM. The aim of the current study was to investigate the effect of GDM on the risk of macrosomia (birthweight >90th percentile) among women with normal body mass index (BMI) and whether this effect is altered according to the maternal racial group.

Methods: This was a retrospective analysis of prospectively collected data on over half a million pregnancies attending for antenatal care and delivery at 15 maternity Units in North West London from 1988-2000. We only included women in their first pregnancy that had complete information on maternal age, racial group, development of GDM and birthweight that delivered between 34 and 42 weeks of gestation and had a booking BMI between 18.5 and 24.9 before 20 weeks of gestation. The gender and race specific percentile birthweight for gestational age was calculated from our population in the three main maternal racial groups; White Europeans, Blacks and South Asians.

Results: The study included 87,273 pregnant women of which 72,336 (82.9%), 4,046 (4.6%) and 10,891 (12.5%) were White European, Black and South Asian respectively. White European women were older than Black or South Asian women (27.35±5.06 years vs 25.59±4.88 years and 25.84±4.54 years, overall p<0.01). GDM was more common in women of non-white racial origin (p<0.01). Macrosomia developed in 8.3%, 7.9% and 8.6% of White European, Black and South Asian women respectively that did not develop GDM. However, macrosomia developed in 17.9%, 34.3% and 24.8% of White European, Black and South Asian women respectively that developed GDM (p<0.01 for comparisons within all racial groups between non-GDM and GDM).

Conclusions: In women with normal BMI, development of GDM increases the risk of macrosomia especially in women of non-white racial origin.

S394 MACROSOMIA IN UNCOMPLICATED PREGNANCIES: THE IMPACT OF PHYSICAL ACTIVITY AND MATERNAL NUTRITION

Reid EW, McNeill JA, Alderdice FA, Holmes VA
Queens University, Belfast, UK

Objective: To explore physical activity and maternal nutrition as potentially modifiable risk factors for fetal macrosomia.

Methods: The study was a prospective cohort design. Low risk pregnant women predicted to deliver macrosomic babies (study group) or appropriate for gestational age (AGA) babies (control group) were recruited from antenatal clinics in Northern Ireland. Participants wore a SenseWear® physical activity armband and completed a food diary (four consecutive days) in the third trimester of pregnancy. Demographic and obstetric data were collected from maternity records.

Results: Of the 158 eligible referrals, 112 women participated in the study (71%). There was no significant difference in energy balance between groups. Women predicted to and who delivered macrosomic babies (≥4000g) spent significantly more time at very low levels of physical activity (<1 MET) than other women (p=0.007). Intake of PUFA n-3 was significantly higher in women who were predicted to deliver macrosomic babies but who subsequently delivered AGA babies at full term of this pregnancy (p=0.015). Women predicted to deliver macrosomic babies were more likely to be overweight (BMI> 25 kg/m²) at booking (p =0.017) and have attained third level education (p= 0.024). Predicted macrosomia was strongly associated with Caesarean section (p =0.010) compared with the control group (43% vs 22%).

Conclusions: Findings from this study provide evidence that a more sedentary maternal lifestyle during the third trimester of pregnancy is associated with macrosomia. Further research is required to determine if adopting a diet high in PUFAs reduce the risk of macrosomia in low risk pregnancies. The evidence from this study suggests that professionals caring for women during pregnancy have an important role in promoting more active lifestyles amongst women who are predicted to deliver a macrosomic infant given the known associated risks.

P110 NUTRITION ASSESSMENT OF OBSTETRIC OUTCOME IN A DEPRIVED COMMUNITY IN KARACHI

M Khan, P. Baillie
Baqai Medical University, Pakistan

Objective: The implications for obstetrics of nutrition in deprivation.

Methods: A random sample of 1200 houses out of 2000 in 3 union councils of Gadap, a deprived periurban area of Karachi. Women were seen preferably pre pregnancy and at least 3 times during pregnancy. High risk pregnancies were referred to a tertiary hospital and all other deliveries occurred at home. Obstetric outcome gestational age and birth weight were measured by 33 lady health workers with 3 supervisors after training. Nutritional assessment was carried out by a validated 7 day food dairy and an in depth food frequency questionnaire. This deprived population had a mean daily income of 66 cents, 68% were illiterate and 27% ever had meat.

Results: 1039 pregnancies studied 61 patients left the district prior to delivery and 125 patients were referred to a tertiary hospital. Four maternal deaths occurred – 2 from sepsis and 2 from ectopic pregnancies. The 125 referred patients had a reproductive loss of 75 fetuses. 1039 deliveries resulted in 701 surviving neonates, 209 abortions, 33 macerated stillbirths, 62 fresh stillbirths and 34 neonatal deaths. The birth weight of surviving infants was 2009 ± 900gms and gestational age was 31.9 ± 5.6. Deliveries of 648 were between 37 and 41 weeks. Low BMI, initial weight and weight gain with haemoglobin and above all nutrition performed poorly in pregnancy. A continuum of reproductive loss with abortions dominant.

Conclusions: The total reproductive loss was over 30% dominated by abortions. The WHO guidelines did not prevent either maternal deaths or stillbirths.A modern nutritional approach is required.Translational science is needed. Studying perinatal deaths and maternal mortality should assist prevention. Deprived countries need a different approach.

P111 CHALLENGES OF TRACKING STILLBIRTHS

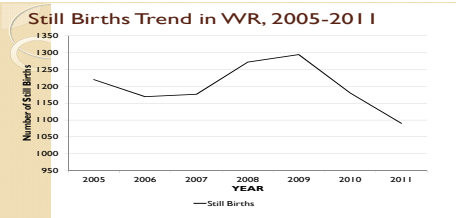
Linda Amarkai Vanotoo, Emmanuel Badiena, Ken Gaisie
Ghana Health Service, Ghana

Objectives:

- To document the feasibility of using auditing to track stillbirths.
- To assess proportion of audit forms filled out completely.

Methods: An audit form to record information on stillbirths was developed by the presenter. Midwives were trained in its use and their views were solicited on the suitability of the form. Five hospitals were purposefully selected to pilot its use for three months. The filled forms were analysed using SPSS.

Results: 87 filled forms were received and analysed; in 14 cases (16%) antenatal attendance was not recorded; 5 (5.7%) no records on use of IPTp for malaria prevention. In 13 (15%) there was no indication of maternal illness, gestational age was not recorded in 3 case; in 9 (10.3%) cases there was no indication of whether it was singleton or multiple pregnancy, 41 (47%) did not record use or non use of herbs during pregnancy. The sex of 2 babies was not recorded. In 39 (44.8%) cases there was no indication of whether midwives had been trained in essential newborn care and in 10 (11.5%) neonatal resuscitation.



Conclusions: In the absence of technology to support in-depth assessment of causes of stillbirth, resource constrained facilities could use auditing to identify possible causes of stillbirths and develop interventions to reduce the huge numbers. However, this research showed that this may be far from the reality; just about 50% of the stillbirth audit forms had all fields completely filled.

P112 INCREASE OF PRETERM LIVE BIRTHS AND THE DECLINE OF FETAL AND NEONATAL MORTALITY IN SÃO PAULO STATE, BRAZIL

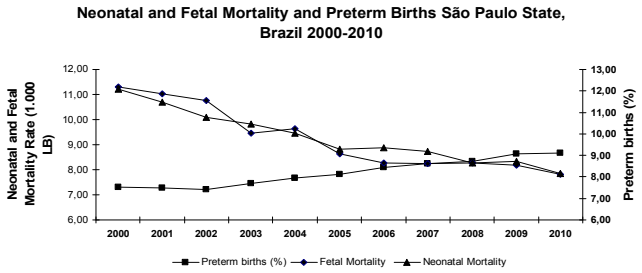
Almeida MF; Nascimento F; Silva ZP; Alencar GP; Santos PCT
University of Sao Paulo, Sao Paulo, Brazil

Introduction: There is a decline of neonatal and fetal mortality and an increase of preterm live births (PTB) in the state of São Paulo, Brazil.

Objective: to evaluate time trend of neonatal and fetal mortality, preterm births and associated variables.

Methods: Data on live births, fetal and neonatal deaths was obtained, from 2000-2010. Gestational age (GA) was grouped into <32, 32-36 and 37-41 weeks; mother's poor schooling (<8 years); inadequate prenatal care (<4 appointments), multiple births and fertility rate >35 years were also analyzed. A multivariate linear regression was employed.

Results: Neonatal mortality showed a significant decline (3.7% yearly). There was a significant increase of PTB, mainly in GA group of 32-36: 2.2% yearly; the group <32 showed less increase: 1.1%. Fetal mortality showed a higher decline in GA <32: 7.1%; than in the GA of 32-36 (5.8%). Term fetal deaths did not show a significant time trend.



Multivariate linear regression analysis was performed: PTB = 19.9 + 0.347 % <4 prenatal appointments 0.191 %mothers <8 years of schooling - 59.5 fertility rate >35 year. Fetal mortality and multiple births were not retained in the model. Fetal mortality and PTB showed a Pearson correlation coefficient of 0.95.

Conclusion: The PTB increase may affect neonatal mortality decline and will impact in the costs of neonatal services. The high correlation between fetal mortality and PTB suggests that the reduction of fetal mortality may contribute to the increase of PTB. Decrease of inadequate prenatal care can contribute to reduce fetal mortality. The increase of PTB was associated with the decline of both mother's poor schooling and inadequate prenatal care and with the increase of mature women fertility rate. The decline of women poor schooling is associated to changes in its reproductive profile, which can play a role in the increase of PTB.

P113 THE IMPACT OF INTRAUTERINE GROWTH RESTRICTION ON EARLY NEONATAL DEATH WITHIN THE IMPLIMENTATION OF CONFIDENTIAL ENQUIRY OF PERINATAL DEATHS

Petru Stratulat, Ala Curteanu, Tatiana Caraus
Health Protection Research Institute, Chisinau, Republic of Moldova

Introduction: Accurate evaluation of intrauterine growth is one of the key tasks of perinatal care. Intrauterine growth restriction (IUGR) is a major cause of perinatal death and during the early neonatal period (24-40%). The interest to IUGR is appreciated by the variation of incidence with which it occurs (3-7% of cases in industrialized developed countries vs. developing countries - 24-30% of cases). Remote prognosis is severe and depends on IUGR degree and on the association of fetal distress.

Objective: use individualized growth curves for detecting IUGR after the newborns' birth within the group of died newborns and within the group of those survived and the assessment of IUGR impact in early neonatal death.

Method: The study included 347 cases in total, of which 106 newborns died in early neonatal period and 212 have survived. For each newborn there it was built an individualized curve of intrauterine growth. Each case of death was discussed in the frame of the meetings of the National Panel for Confidential Enquiry of Perinatal Deaths (NPCEPD).

Results: The IUGR incidence has made up in the group of dead newborns 21 cases (19.8%) and in the group of survived newborns - 14 (6.6%) of cases. Following discussions and analysis of death cases due to IUGR in the NPCEPD, it has been stated that these newborns received suboptimal care (94%).

Conclusion: The implementation of the Confidential Enquiry for the analysis of early neonatal deaths in NPCEPD has allowed highlighting errors in nursing newborns, especially those with IUGR. Using individual curves for fetal growth allowed the three times increase of IUGR cases detection and confirmed that IUGR is a major risk factor for early neonatal death.

P114 GROWTH CHARTS OF FETAL BIOMETRY: A LONGITUDINAL STUDY

Shama Munim, Tim Morris, Nilofer Baber, Yasmeen Ansari, Syed Iqbal Azam
Aga Khan University Hospital, Karachi, Pakistan

Objective: The aim of this study is to construct reference charts for fetal biometry in Karachi,Pakistan.

Methods: This is a prospective longitudinal study involving 1228 women with singleton pregnancies. Biparietal diameter, head circumference, abdominal circumference and femur length were measured repeatedly until delivery. Regression analysis and multilevel modeling was used to construct charts.

Results: The mean age of the women in this study was 28.0 years with standard deviation of 4.6. For each gestational age percentiles were calculated and charts were then constructed.

Conclusion: Our reference percentiles for fetal biometry measurements are the first of their kind in Karachi, Pakistan. They will not only help us in the diagnosis and management of fetal growth restriction but will provide the basis to develop charts at the national level.

P115 CORRELATIONS BETWEEN THE TYPES OF INTRAUTERINE GROWTH RESTICTION AND THE MATERNAL AND PLACENTAL RISK FACTORS

Petru Stratulat, Ala Curteanu, Tatiana Caraus
Health Protection Research Institute, Chisinau, Republic of Moldova

Objective: of the study was to identify the correlations between the type of IUGR and maternal and placental risk factors.

Methods: 83 obstetrical and neonatal files were analyzed. Newborns were divided into two groups according to the type of IUGR: asymmetric - 51 (61.4%) and symmetric - 32 (38,6%). The placentas were examined macroscopically and histologicaly.

Results: For the asymmetric type of IUGR the following correlations with maternal risk factors were statistical significant: anemia (RR 1,49; CI 1,08; 2,06; p=0,003), complicated obstetrical history (RR 1,46; CI 1,05; 2,02; p=0,003), placental insufficiency (RR 3,1; CI 1,89; 5,07; p=0,0001) and for that symmetric type - CMV infection and chlamydiosis (RR 1,33; CI 0,83; 2,13; p=0,017). The correlation of pathological signs within macroscopically examination of placenta (placental weight, true knot of umbilical cord, retroplacental hematoma, pathological cord insertion, extended placental infarcts) with IUGR didn't reveal any statistically significant associations. Among placental vascular lesions there has been determined a statistically significant correlations between IUGR, asymmetric type and placental micro- and infarctions (RR 0,56; CI 0,38; 0,83; p=0,007) and between symmetric type and coagulation disorders (RR 0,41; CI 0,19; 0,91; p=0,015). We have established the correlations between neonatal pathological conditions associated with IUGR and histological type of placental lesions: in premature newborns - between neonatal jaundice and inflammatory lesions (RR 16,0; CI 2,25; 113,6; p<0,05), between HIE and pathological placental immaturity (RR 2,92; CI 1,31; 6,48; p<0,05), between IVH and placental insufficiency (RR 5,5; CI 1,28; 23,63; p<0,05), and in term newborns - between congenital pneumonia and placental inflammatory lesions (RR 3,17; CI 1,30; 7,74; p<0,05) and jaundice related to the immaturity of hepatobiliary system and pathological placental immaturity (RR 5,55; CI 1,93; 15,94; p<0,05).

Conclusion: Maternal and placental pathological conditions are associated with IUGR, as well as some neonatal pathologies with histological placental lesions.

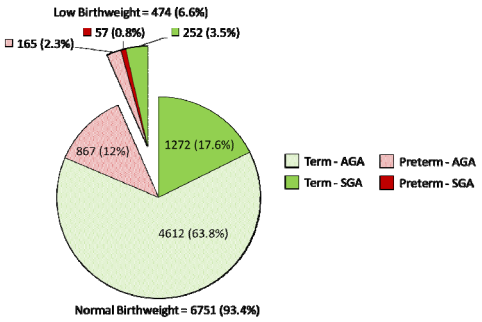
P116 THE CONTRIBUTION OF PRETERM BIRTH AND INTRAUTERINE GROWTH RESTRICTION TO INFANT MORTALITY IN TANZANIA

Sania A, Spiegelman D, Rich-Edwards JW, Okuma J, Kisenge R, Msamanga GI, Urassa W, Fawzi WW
Harvard School of Public Health, Boston, USA

Objective(s): Objectives of our research were: (1) to examine the association between risk of neonatal and infant mortality with preterm birth and intrauterine growth restriction (IUGR),and (2) To estimate the population attributable risk of neonatal and infant mortality due to preterm birth and IUGR.

Method(s): From August 2001 to July 2004, we conducted a prospective study among a cohort of HIV- negative pregnant women and their infants in Dar es-Salam, Tanzania. Gestational age calculated from the date of the last menstrual period was used to define preterm (<37 weeks) and birthweight small for gestational age (SGA, birthweight < 10th percentile) was used as proxy for intrauterine growth restriction. Survival status of infants was assessed at delivery, 6 weeks postpartum, and every 3 months thereafter. Log-binomial regression and Cox proportional hazard models were used to estimate the associations of preterm and SGA with neonatal and infant mortality, respectively.

Result(s): The analysis included 7,225 singletons, of whom 15% were preterm and 21% were SGA; majority of the preterm or SGA babies had birthweight >2500g. Compared to term and appropriately-sized babies (AGA) relative risks (RR) of neonatal mortality among preterm-AGA babies was 2.66 (95% CI 1.79-3.99), RR among term-SGA was 2.35 (95% CI 1.63-3.37) and the highest risk was among the babies who were both preterm and SGA (RR=18.84, 95% CI 9.48-37.50). Risk associated with preterm was elevated throughout infancy, and risk associated with SGA was elevated during the neonatal period only. The partial population attributable risk of neonatal mortality for preterm was 22% (95% CI 17%- 26%) and for SGA it was 26% (95% CI 16%- 36%).



Distribution of gestational age and size at gestation

Conclusion(s): Preterm and SGA birth substantially increased the risk of mortality and a large proportion of deaths were attributable to these conditions. Incorporating gestational age and gestation specific birthweight information in routine newborn assessment should be considered in resource-limited settings.

P117 ULTRASOUND ESTIMATION OF FETAL WEIGHT: A FORMULA FOR A PAKISTANI POPULATION

Shama Munim, Francesc Figueras, Saima Malik Shah, Farah Khan, Jason Gardosi
Aga Khan University Hospital, Pakistan

Objectives: To assess and validate the best model for fetal weight estimation in the Pakistani population.

Prospective study within a Fetal Medicine Unit, The Aga Khan University Hospital, Karachi, Pakistan.

Methods: The cohort included 178 women with singleton pregnancies at term (37-41 weeks) who had an ultrasound scan within 7 days of delivery. A proportionality formula was used to compensate for the fetal weight gain between the scan and the delivery. Data points from 119 pregnancies were used to derive the fetal weight formula, which was subsequently tested on the remaining 59 pregnancies. The best model for fetal weight estimation from ultrasound biometric parameters was selected.

Results: The selected model showed an interclass correlation coefficient with birth weight of 0.89. The systematic and random errors were -10 and 250g, respectively. This validity assessment compared favorably with the performance of the more commonly used formulae when applied to our population.

Conclusions: We describe a new model for fetal weight estimation in a Pakistani population which produces more valid and reliable estimates than currently used models derived from other populations.

P118 CHARACTERIZATION OF ABNORMAL FETAL GROWTH PATTERNS IN RELATION TO PREGNANCY COMPLICATIONS USING DATA FROM THE US NICHD FETAL GROWTH STUDY

Katherine Laughon
Eunice Kennedy Shriver National Institute of Child Health and Human Development, Bethesda, MD, USA.

Objective: To evaluate fetal growth patterns in pregnancies with medical and obstetrical complications and compare them to the standard.

Method: The multicenter NICHD Fetal Growth Study is recruiting 2,400 low-risk, non-obese gravidas, 600 each into self-identified African-American, Asian, Caucasian, and Hispanic cohorts, to establish a standard for fetal size-for-gestation and growth velocity. Additionally, 468 obese women have been recruited. Following a 10-13 week sonogram, gravidas are randomized to one schedule of five follow-up sonograms for biometry, Doppler and 3D volume acquisition. Maternal lifestyle factors, dietary assessments, and blood specimens are collected longitudinally, along with medical history and course, maternal and neonatal anthropometry, and outcome data. We will examine how well a fetal growth velocity standard can identify both fetal growth restriction and overgrowth and whether abnormal growth should be defined in terms of deviations from trajectories, as opposed to size.

Results: We estimate 30% of women will have pregnancy complications, including preterm delivery, gestational diabetes and hypertensive disorders. Their data will not be used in construction of the standard. With those data, along with data from obese women, we will compare the fetal growth velocity in estimated weight and/or other biometric dimensions to those of the standard. We will also explore whether growth estimation is improved in these complicated pregnancies by the inclusion of 2D- and 3D-specific measures of body composition (from head, abdomen and limb volumes) and whether the value of these measures is gestation- or ethnic-specific.

Conclusion: We hypothesize that fetal growth trajectories will differ for medically or obstetrically complicated pregnancies. We also speculate that critical gestational ages and time between sonograms can predict abnormal birth weight and adverse neonatal outcomes. If we can identify profiles for fetal growth, future applications could include risk stratification of pregnancy conditions, establishment of appropriate scanning intervals, and delivery of individualized care.

P119 INTRAOBSERVER AND INTEROBSERVER AGREEMENT OF AMNIOTIC FLUID INDEX AND SINGLE DEEPEST VERTICAL POOL MEASUREMENT

Joyce Sande, Christos Ioannou, Ippokratis Sarris, Eric Ohuma, Paul Chamberlain, Aris T Papageorghiou
Aga Khan University Hospital, Nairobi, Kenya

Objective: To assess the intraobserver and interobserver agreement of measurement of amniotic fluid index (AFI) and single deepest vertical pool (SDVP) throughout gestation.

Method: 175 fetuses were evaluated at a gestational age of 14 - 42 weeks. For each fetus, two observers acquired a duplicate set of AFI and SDVP each. Measurement differences were expressed as actual and percentage values. For all comparisons, Bland-Altman plots were used to visually compare differences and limits of agreement were calculated.

Results: Intraobserver and interobserver agreement remained fairly constant with gestation, both for AFI and SDVP. The intraobserver limits of agreement for AFI were -5.2cm to +5cm or -39% to +37%; whilst for SDVP these were -2.6cm to +2.4cm or -52% to 48%. The interobserver limits of agreement for AFI measurement were -7.3cm to +7.1cm or -54% to +53%; and for SDVP measurement -2.5cm to +2.5cm or -51% to 52%.

Conclusion: The limits of agreement for both methods are wide. In percentage form, interobserver agreement for AFI and SDVP are comparable. The choice of method should therefore be dictated by clinical considerations. other than method reproducibility.

P120 FIRST STUDY OF UTERINE ARTERY DOPPLER SCREENING IN THE SECOND TRIMESTER FOR PREDICTION OF ADVERSE PREGNANCY OUTCOME IN HIGH-RISK PAKISTANI WOMEN

Nuruddin Mohammed, Rahat Qureshi, Rozina Nuruddin, Lumaan Sheikh
Aga Khan University Hospital, Karachi, Pakistan

Objective: The aim of this prospective study was to assess the role of uterine artery Doppler (UtAD) studies in high-risk pregnancies in the second trimester for prediction of adverse pregnancy outcomes such as intra-uterine-growth-restriction (IUGR), gestational hypertension (GH), pre-eclampsia (PE), stillbirth and placental-abruption.

Methods: UtAD studies were performed between 16-23 weeks of gestation in singleton high-risk pregnancies. Each woman had only one UtAD ultrasound. Pregnancies with diagnosed fetal abnormalities were excluded. Data from 219 high-risk women were evaluated.

Results: Mean maternal age was 29 years (SD 5.1). Mean gestational age for UtAD and for delivery was 20 weeks (SD 2.43) and 37 weeks (SD 2.85), respectively. Average birth-weight was 2.63kg (SD 0.72). The estimated prevalence of adverse pregnancy outcome was 45%. For all outcomes, the test positive and negative predictive values were 59% (95%CI: 51%, 66%) and 96% (95%CI: 86%, 99%) respectively and the test sensitivity and specificity were 98% (95%CI: 92%, 99%) and 44% (95%CI: 35%, 53%), respectively. Sixty-nine women (32%) had IUGR, 15 (7%) and 28 (13%) developed GH and PE respectively. There were two (1%) placental abruptions and stillbirths, respectively. The conventional positive and negative likelihood ratios were 1.75 (95%CI: 1.49, 2.06) and 0.05 (95%CI: 0.01, 0.18).

Conclusion: Uterine artery Doppler studies are a useful tool in the second trimester for prediction of adverse outcomes in at-risk pregnancies with high negative predictive values.

P121 INTEGRATING FETAL GROWTH RESTRICTION INTO THE HIERARCHY FOR ASSIGNING CONDITIONS OF STILLBIRTH: THE EXAMPLE OF RECODE

Anne Ego, Christine Cans, Jennifer Zeitlin
CHU Grenoble, France

Objective: The ReCoDe classification for stillbirths is based on related conditions rather than cause of death. The hierarchy starts with fetal conditions and moves outward in 9 anatomical groups. Fetal growth restriction (FGR) is included as the last condition in the fetal complications group. This allows for the reduction of the proportion of unexplained stillbirths, but may override important information about other causes. Our objective was to apply ReCoDe to a French population-based sample of stillbirths, and to compare it with an alternative hierarchy (ReCoDe-Revised).

Method: In the Rhône-Alpes region, all stillbirths (>=500g or >=22 completed weeks of gestation) were registered from 1988 to 2010 in 3 counties covering 30 000 annual births. Information from medical records was used to assign ICD codes. Small for gestational age (SGA) was defined as a birthweight (BW) below the 10th percentile according to sex adjusted intrauterine references. We applied ReCoDe and then modified the hierarchy so that FGR was placed after the other anatomical groups and just before the “unclassified” category.

Results: 741 out of 1612 (46%) stillbirths were SGA. The proportions of deaths due to lethal congenital anomalies and those that were unexplained were the same in the two classifications (16 and 17% respectively). Stillbirths attributable to FGR decreased from 35% to 14%, leading to a lower rate of all fetal conditions (from 60 to 26%). Inversely, deaths related to anomalies of umbilical cord, placenta, or amniotic fluid, nearly doubled from 21 to 40%. ReCoDe-R reclassified 341 cases or 46% of all SGA stillbirths.

Conclusion: The placement of FGR in the Related Conditions hierarchy has a major impact on the main conditions associated with death. Recode-R makes it possible to illustrate the diversity of death related conditions for small fetuses, but calls less attention to the problem of FGR.

P122 VALIDATION, FOR BIRTHS OF MORE THAN 30 WEEKS GESTATION, AND CORRECTION, FOR BIRTHS BELOW 30 WEEKS, OF EQUATIONS FOR OPTIMAL BIRTH WEIGHT IN WESTERN AUSTRALIA

Eve Blair, Gavin Pereira, David Lawrence
University of Western Australia, Perth, Australia

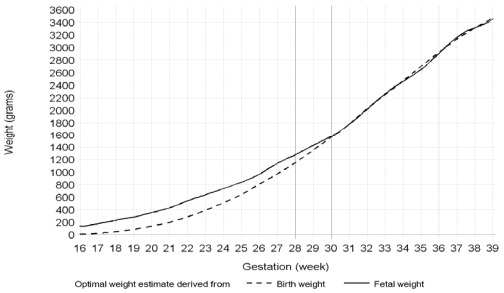
Introduction: The proportion-of-optimal assessments of appropriateness of fetal growth uses optimal measurements estimated by a model derived from birth measurements of all neonatally surviving non-malformed Western Australian Caucasian singleton births (1998-2002) not exposed to the most common causes of fetal growth anomaly: birth defects or maternal smoking, vascular disease, diabetes or TORCH infection. [http://www.biomedcentral.com/1471-2431/5/13] This continuous interval measure of appropriateness of growth allows the use of parametric statistics.

Objective: To validate the model for optimal birthweight.

Methods: Fetal weight was estimated using Scott's formula at gestations prior to 27 weeks and Hadlock's at gestations of 27 or more weeks, from serial ultrasound fetometry (n=2,848) and combined with birthweight for 691 healthy Caucasian, singleton term births that had not been exposed to common causes of fetal growth anomaly cited above. A generalised linear longitudinal growth model for optimal weight was derived, including terms for gestational duration, infant sex and maternal height and parity. This model was compared with that previously published.

Results: For births at 30 weeks gestation or more the 2 models were indistinguishable. For births prior to 30 weeks the previous model gave weights systematically lower than the current model.

Replacing Scott's with Hadlock's formula for all fetometrically weight estimates resulted in clinically insignificant differences.



Conclusion: The original model is validated for births at 30 weeks or more. For earlier births use of the new model is recommended. This result suggests that the profile of causes of growth restriction in very preterm births differs from that in later births, with a greater proportion of very preterm births being exposed to causes of growth restriction seldom seen in later births.

P123 CLINICAL CAUSES OF STILLBIRTH ASSOCIATED WITH MATERNAL OBESITY

Mandy Williams, Michelle Southam, Andre Francis, Jason Gardosi
West Midlands Perinatal Institute, Birmingham, United Kingdom

Objective: We wanted to examine the effect of maternal obesity on the risk of stillbirth, applying the main categories of the ReCoDe classification.

Methods: The cohort consisted of 48,357 consecutive, unselected births from 6 NHS maternity units during 2006/7, including 328 stillbirths from 24.0 weeks. Maternal body mass index (BMI) was categorised as <20, 20-24.9, 25-29.9, 30-34.9, 35+. The clinical classification of ReCoDe (relevant condition at death was used to group the stillbirths into three main categories: congenital anomalies: 18%, fetal growth restriction (FGR - defined as <10th customised birthweight centile): 43%, and a miscellaneous group which included maternal, placental, umbilical cord and intrapartum related conditions: 39%.

Result: Mothers with BMI <20 had an overall lower risk of stillbirth (OR 0.5, CI 0.3-0.8), while obese mothers had an elevated risk (BMI >35: 1.6, 1.1-2.3). Analysis within subgroups showed no significant association between high BMI and stillbirths due to congenital anomalies or miscellaneous causes. However, the association with BMI was significant for stillbirths in the FGR category (Table).

BMI	OR	CI
< 20	0.5	0.2 – 1.2
20-24.9	Ref	
25-29.9	1.6	1.0 – 2.4
30-34.9	1.8	1.1 - 2.8
35+	2.4	1.4 - 4.1

Conclusion The increased risk of stillbirth in mothers with high BMI is due to stillbirths with fetal growth restriction.

P124 STILLBIRTHS DUE TO FETAL GROWTH RESTRICTION IN NORTHERN IRELAND: IS THE RATE HIGHER THAN WE THINK?

Dale Spence[1] Alyson Hunter[2] Jim Dornan[1] Andre Francis[3] Jason Gardosi[3]
[1] Queen's University Belfast; [2] Royal Jubilee Maternity Hospital, Belfast; [3] Perinatal Institute, Birmingham, UK

Objective To investigate the main categories of stillbirths in Northern Ireland, using data from CEMACH (NI) Stillbirth Register

Methods: Approval was granted by NIMACH, formerly CEMACH (NI) to access their stillbirth register from January 2008-December 2011. Anonymous, relevant data relating to both mother and baby were elicited. During this 4 year period there were complete data on 403 stillbirths. Details entered from each case were categorised according the CMACE [1] and ReCoDe [2] classification systems. Fetal growth restriction (FGR) was defined as a birthweight below the tenth customised centile, adjusted for maternal height, weight, ethnic group and parity, with 2 days deducted from the gestational age at delivery, representing the average delay between fetal death and delivery.

Results The table shows the main categories of stillbirths, according to CMACE and ReCoDe. A total of 25.6% and 17.4% cases, respectively, remained unclassified. The main reason for the fewer number according to ReCoDe was a higher rate of stillbirths identified as FGR, which represented the single largest category of stillbirths: 35.7%. Conversely, more cases according to CMACE had placenta and cord related conditions.

	CMACE		ReCoDe	
	n	%	n	%
Congenital anomaly	62	15.4	62	15.4
Fetal growth restriction	25	6.2	144	35.7
Placenta and cord	118	29.3	63	15.6
Maternal conditions	40	9.9	22	5.5
Infection	34	8.4	26	6.5
Intrapartum	2	0.5	1	0.2
Miscellaneous	19	4.7	15	3.7
Unclassified / Unexplained	103	25.6	70	17.4
Total	403	100.0	403	100.0

Conclusion: The proportion of stillbirths considered unexplained is related to the classification system used. Fetal growth restriction is an important clinical condition associated with stillbirths and can be underestimated. Use of maternal characteristics and customised fetal growth charts gives a more accurate rate of stillbirth caused by FGR.

References: [1] Centre for Maternal and Child Health Enquiries – Perinatal Mortality 2008. CMACE, London 2010
[2] Gardosi et al Classification of stillbirths by relevant condition at death (ReCoDe) - BMJ 2005;331:1113-1117

P210 THE RELATIONSHIP BETWEEN LOW BIRTHWEIGHT FOR GESTATIONAL AGE AND EXECUTIVE FUNCTIONING AT AGE 54 MONTHS

CD Drews-Botsch, LA Schieve, J Kable, C Coles
Emory School of Public Helath, Atlanta, GA, USA

Objective: Limitations in fetal nutrition or oxygenation lead to both poor fetal growth and minor changes in neurodevelopment. Executive functioning (EF) has been associated with both intrauterine growth restriction and socioeconomic status (SES). The present analysis evaluates the inter-relationships between fetal growth, SES and EF in preschool-aged children.

Methods: 290 Children with low birth weight for gestational age, race and gender (small-for-gestational-age, SGA) were selected from the 1993-1994 populations of live-born infants at two Atlanta area hospitals. 163 appropriate-for-gestational-age (AGA) infants were randomly sampled as a comparison population. The two hospitals served distinct populations: one a primarily white, upper-middle class population; the other a primarily African-American, lower SES population. At 54 months of age, a study psychologist administered the Statue and Visual Attention subtests of the NEPSY (mean = 10; standard deviation = 3). Analyses of Variance and multiple linear regression were performed to evaluate the impact of being SGA at delivery on EF.

Results: There was a monotonic trend between level of SGA and poorer EF. After controlling for gender and hospital of birth as a proxy for SES, scores on both the visual attention (-0.98, 95% CI -1.82,-0.15) and statue (-0.37, 95% CI -1.21, 0.48) subscales of the NEPSY were lower among children born weighing less than the 5th percentile for gestational age, than AGA children, but the association reached statistical significance only for the former. Stratum-specific estimates according to birth hospital (SES) were not appreciably different than the overall associations observed between fetal growth and EF.

Conclusion: SGA was associated with decreases in EF in preschool-aged children. Such decrements may have a long term impact on school performance and may be an indicator of subsequent attention-deficit-hyperactivity-disorder (ADHD) diagnoses. SES does not appear to influence the association.

P211 NATIONAL PERINATAL EPIDEMIOLOGY CENTRE (NPEC) IRELAND: CLASSIFICATION OF STILLBIRTHS: CAUSE OF DEATH AND IUGR AS AN ANTECEDENT FACTOR

Manning E, Meaney S and Greene R A
Cork University Maternity Hospital, Cork, Ireland

Objective: The NPEC perinatal mortality audit tool was developed, adapted from the UK Centre for Maternal and Child Enquiries, to evaluate perinatal deaths in Ireland. The objective of this audit tool is to identify antecedent risk factors associated with stillbirth which is critical to inform clinical practice which may lead to alternative management and outcome.

Methods: A pilot study was conducted whereby anonymised data on stillbirths, from 3 of the 20 Irish maternity units, were collected for the 2010 calendar year. Both the NPEC and Extended Wigglesworth Classification System were utilised to classify cause of death. Data were examined in relation to maternal and infant characteristics as well as previous and current pregnancy details.

Results: Of the *12*,526 births, representing 17% of all documented births in Ireland in 2010, 57 stillbirths were recorded resulting in a stillbirth rate of 4.6 per 1,000 births. Cause of death was classified as unexplained in 17.5% (n=10) of cases using the enhanced classification system compared to 47.0%(n=25) using the Wigglesworth Classification System. Intrauterine growth restriction was classified as the main cause of death in 10.0% (n=6) of all recorded stillbirths and as an antecedent factor in 41.2% (n=7) of stillbirths with congenital fetal anomaly. Preliminary findings showed that mothers of IUGR cases were more likely to be hypertensive and overweight. Two thirds (n=4) of cases had an antenatal diagnosis of IUGR.

Conclusions: The results of this pilot study demonstrated the capacity of the NPEC perinatal mortality audit tool and classification system in elucidating risk factors, in particular IUGR, associated with stillbirths and in reducing the number of unexplained causes. Enhanced perinatal mortality clinical audit will guide future clinical practice, better inform public health interventions and improve quality of care in the maternity services.

P212 SENSITIVITY AND SPECIFICITY OF CUSTOMISED GROWTH CHARTS IN USE AT A LANCASHIRE TEACHING HOSPITAL

Keira Haddow, Sanjeev Prashar
University of Manchester, UK

Objective: To assess the sensitivity and specificity of the customised growth charts used at a Lancashire Teaching Hospital used for small for gestational age (SGA) and large for gestational age (LGA) babies.

Method: A case note review was performed on every set of antenatal notes for women who delivered between 5/8/12 and 6/9/12. Of the resulting 404 births, 27 were excluded from the study. The markings and use of the customised growth charts were assessed.

Results: The sensitivity, specificity and positive and negative predictive values were evaluated for the customised growth charts used at this Lancashire Teaching Hospitals. When used as a screening tool for SGA babies, the sensitivity was 24.39%, the specificity was 97.01%, the positive predictive value (PPV) was 50% and the negative predictive value (NPV) was 91.27%. When used as a screening tool for LGA babies, the sensitivity was 36%, the specificity was 88.57%, the PPV was 18.37% and the NPV was 95.09%. Common problems with the use of the customised growth charts included insufficient plotting of measurements, inaccurate plotting of measurements and absence of measurement (in cm), date or signature below plottings.

Conclusion: Without proper plotting and documentation, the customised growth charts used at a Lancashire Teaching Hospital demonstrate a much lower sensitivity for the detection of SGA babies than that reported in the literature. More frequent training on the use of customised growth charts may be needed for midwives and doctors to ensure that the sensitivity of the customised growth charts remains high.

P214 MANAGEMENT OF WOMEN PRESENTING WITH REDUCED FETAL MOVEMENTS: HOW WELL ARE WE DOING?

K. Skorupskaite, C Love
New Royal Infirmary of Edinburgh, UK

Objectives: Studies have shown that failure to manage women presenting with reduced fetal movements (RFM) appropriately might contribute to stillbirth. The aim was to assess the adherence of the tertiary centre to the NHS Lothian and RCOG guidelines in the management of women with RFM.

Method: A retrospective case note review was performed of women presenting with RFM during November 2011 in Scottish tertiary centre.

Results: There were 119 visits with RFM. Blood pressure was not checked in 26.7% (n= 32) and urinalysis was not performed in 58.8% of the attendances (n= 70). ≥27 weeks of gestation: CTG was performed in 97.1% of the visits. There were 90 indications for USS, out of which 46.7% (n= 42) were done and 53.3% (n= 48) omitted. The commonest indication for USS was risk for stillbirth (45.6%, n=41). No maternal fetal movements perceived despite a reassuring CTG was the main reason for performing an USS (86.7%, 13 in 15). The commonest reason for not offering USS was multiple presentations with RFM (67.6% 23 in 34). 24-26+6 weeks of gestation: Out of 6 USS indicated for gestational age, 2 (33.3%) have been performed. However, all 6 pregnancies resulted in term births weighing more than 2500g. <24 weeks of gestation: Out of 9 visits, USS was indicated in 2 cases; for no fetal heart (USS performed) and for known obstetric cholestasis (USS not performed). Outcomes were of 9 term babies weighing over 2500g.

Outcome	Risk factors for stillbirth (%) n=37	No risk factors for stillbirth (%) n=52
Live birth-term	83.7	98.1
Live birth-preterm	10.8	1.9
Stillbirth	5.4	0
Birth weight ≤2500g	81	94.2
Low birth weight 1500-2499g	18.9	3.8
Very low birth weight <1499g	0	1.9

Conclusion: The management of women with RFM in Simpson Centre is below the standard set in the current guidelines. New guidelines are need to define the gestational age for CTG monitoring and indications for USS.

P215 FOCUSED FGR REVIEWS AS A TOOL TO IMPROVE PERINATAL MORTALITY - EXPERIENCE FROM INNER CITY POPULATION

Nishigandh Deole, Shalini Patni
Heartlands Hospital, Birmingham, UK

Aims: To assess if focused reviews of the perinatal mortality can have a positive impact in a population with traditionally high perinatal mortality.

Methods: Focused reviews of perinatal mortality were commenced in 2007. These involve education of staff with regular multidisciplinary meetings and case presentations along-with implementation of action points developed, and dissemination of learning points together with emphasis on GROW training. Perinatal mortality data which is being comprehensively collected at our Trust from August 2007 using 3 coding systems (ReCoDe, CEMACE and CESDI) was analysed. All cases of stillbirths and neonatal deaths secondary to FGR as per above classification were included

Results: The perinatal mortality rate (PNMR) has historically been very high at our hospitals, and has been an outlier both regionally and nationally with PNMR of 21.8 in 2003 and 18.3 in 2007 and 16.7 in 2008, with a staggering fall to 10,2 in 2011 which is a significant improvement. Fetal growth restriction has been one of the 2 major causes of perinatal deaths along with congenital malformations.

	2011-2012	2010-2011	2009-2010	2008-2009	2007-2008
All Births	7250	7124	7545	7729	6930
Live births	7203	7067	7496	7676	6863
SB	47	57	49	53	67
Early NND	27	22	29	26	39
PNMR	10.2	11.09	10.3	10.2	16.7
Perinatal losses -FGR	16 (21.6%)	15 (19.7%)	23 (29.4%)	27 (34%)	25 (22%)
PNMR due to FGR	2.2	2.1	3	3.5	3.6

Analysis of the losses due to FGR reveals an improving trend in perinatal mortality since the introduction of dedicated perinatal reviews (and we are now the best performing in the 'cluster'). This has accompanied a concurrent increase in the capacity of scanning services, which resulted in increased referral rates for suspected IUGR by SFH assessment (62.4% in 2010 vs 43% in 2007) and reduced waiting time for growth scan following referrals.

Conclusions: We have managed to reduce the PNMR significantly at our trust, primarily by reduction in FGR related losses by improving their detection with improved screening via education and enhancement of scanning capacity.

P216 PERSONALISED CHARTS IMPROVE DETECTION OF SMALL FOR GESTATIONAL AGE EVEN IN A HOMOGENEOUS DISTRICT GENERAL HOSPITAL POPULATION

Laura Goodfellow, Joanne Davies
Countess of Chester of Hospital, Chester, UK

Objective: The RCOG recommended personalised growth charts for all pregnancies in 2002. Some departments, including our own, have chosen not to follow this guidance as the pregnant population is judged to be largely homogeneous (95% European origin in this sample). This is felt to facilitate the use of population growth charts, simplifying the fetal growth assessment process. To assess whether our use of population growth charts is justified we performed an audit into our detection of small for gestational age (SGA) pregnancies, and then assessed how our detection of SGA pregnancies would have altered had we used personalised charts.

Methods: Singleton pregnancies delivering between 1/1/11 and 31/8/11, without congenital abnormalities and over 32 weeks gestation were reviewed. Those pregnancies with a baby weighing <10th centile at delivery according to our population charts were selected (n=106). A retrospective notes review was undertaken to record antenatal symphysis fundal height (SFH), fetal biometry and pregnancy outcome.

Personalised growth charts were produced for all women, and the researchers judged whether the SGA would have been detected had the personalised charts been used.

Results: Our department detected 27% of SGA pregnancies using population growth charts. If we had used personalised charts we could have improved our detection of SGA to 48% ($p<0.001$). Only 6 pregnancies (5%) were under the population 10th centile but over the 10^{th} centile by personalised term optimal weight, and only one of these was induced for SGA.

Conclusion: There was broad agreement in our target birthweight with population and customised centiles, presumably because of our homogeneous population. However, the process of recording SFH and fetal biometry on personalised growth charts has the potential to improve detection of SGA pregnancies as previously published (Gardosi and Francis, 1999). We suggest that personalised growth charts should be considered in all obstetric departments.

P217 FACTORS INFLUENCING THE DIFFERENCE BETWEEN ACTUAL AND PREDICTED PERCENTILES BASED ON CUSTOMISED GROWTH CHARTS AT A LANCASHIRE TEACHING HOSPITAL

Keira Haddow, Sanjeev Prashar
University of Manchester, Manchester, UK

Objective: To assess whether the customised growth charts (CGCs) used by a Lancashire teaching hospital are adequately predicting foetal size antenatally.

Method: Data was collected from antenatal notes for every woman who delivered between 5/8/12 and 6/9/12. Of the resulting 404 births, 29 were excluded from the study. Information from the customised growth charts were used to obtain an estimated foetal weigh, which was converted to a predicted percentile using the GROW technology. These percentiles were then compared to actual percentiles calculated using birth weight and the correlation between the two was assessed.

Results: Although highly significant ($P<0.0001$), the correlation was weak ($R^2=23.1\%$). While this may have been partly due to the floor and ceiling effect caused by using percentiles, several factors were found to influence the difference between actual and predicted percentiles. Increasing BMI (b= -0.79; P= 0.001), maternal Pakistani ethnicity (b= -22.29; P=0.0069), female gender of the baby (b= -5.79; P=0.041), history of previous SGA baby (b= -9.56; P= 0.023) and no response for family history of sudden infant death (SID) (b= -51.77; P=0.011) increased the likelihood of having a baby whose actual percentile was lower than the predicted percentile. Maternal Afro-Caribbean ethnicity (b= 33.78; P=0.032), a history of 1 first trimester pregnancy loss (b= 8.44; P=0.024), multiparity (b=14.32; P<0.0001), having one or more additional ultrasound scans during the pregnancy (b= 8.15; P=0.005), and no response for a family history of pregnancy loss/stillbirth (b=63.55; P=0.002) increased the likelihood of a having a baby whose actual percentile was higher than the predicted percentile.

Conclusions: The CGCs currently in use do not adequately predict foetal size antenatally. Although some findings may be artefactual, it is possible that some of the coefficients used to generate the CGCs are not suitable for the population served by this Lancashire Teaching Hospital.

P218 FETAL GROWTH DISTURBANCE: RISKS AND CONSEQUENCES

Alina Rodriguez
Imperial College, London, UK

Objective: To provide an overview of ongoing Nordic research concerning maternal lifestyle (stress, depression, smoking, obesity) during pregnancy in relation to fetal growth. To describe aims, methodology, and implications of the soon-to-be launched large-scale Swedish cohort, "Made in Norrland".

Method: Prospective longitudinal pregnancy-offspring cohorts from the Nordic countries containing rich data sets including prospectively gathered medical factors and birth outcomes from medical registers as well as self-reported maternal lifestyle.

Result: The cohort studies consistently show that maternal lifestyle factors, especially those related to psychological stress, are related to smaller birth size. Both maternal lifestyle and smaller birth size in these cohorts and others are related to mental health problems such as attention deficit hyperactivity disorder (ADHD) symptoms and signs of atypical cerebral laterality in children. In order to fill gaps concerning early human development, a new study is being launched in Sweden – Made in Norrland. This study will track fetal growth from gestational week 18 through the first year of life, linking prenatal and postnatal growth trajectories with medical factors, maternal lifestyle, genetic, and epigenetic analysis. Fetal growth will be examined in relation to infant neurodevelopment at birth and at 3 months. **Conclusions**: Together these studies present a coherent picture highlighting the importance of maternal lifestyle and mental health during pregnancy for growth of the fetus and infant well-being as well as long-term consequences for child and adolescent mental health.

P219 HEALTHY PREGNANCY 4 ALL – NEW APPROACH IN RISK ASSESSMENT DURING PREGNANCY IN THE NETHERLANDS

Vos AA, Waelput AJM, Bakker R, de Jong-Potjer LC, van Veen MJ, Bonsel GJ, Steegers EAP, Denktaş S
Rotterdam University of Applied Sciences, Netherlands

Objective: Risk selection in current clinical practice seems particularly based on medical associated risk factors. Despite the increasing evidence for the influence of non-medical risk factors (social status, lifestyle or ethnicity) on adverse perinatal outcomes, these risk factors remain highly underexposed.

Promotion of healthy pregnancies has gained high priority with the relatively unfavorable position of the Netherlands regarding adverse perinatal outcomes. In response to this unfavorable position, a nationwide program 'Healthy Pregnancy 4 All' (HP4ALL) has been initiated. Part of this program is systematic antenatal risk assessment for both medical and non-medical risk factors, regular and structured deliberation between different healthcare professionals in a multidisciplinary setting and usage of appropriate care pathways to encounter detected risks.

Methods / Results: Neighbourhoods in fourteen municipalities in which adverse perinatal outcomes appeared higher for both national and municipal level were selected for participation. The study concerns a cluster randomized controlled trial. Municipals are randomly allocated to intervention (n = 3500) and control groups (n = 3500). The intervention comprises systematic risk selection with the Rotterdam Reproductive Risk Reduction (R4U) score card in pregnant women at the booking visit and referral to corresponding care pathways. A predefined threshold, based on weighed risk factors derived from the R4U, determines assessment between different professionals in healthcare, social care and local agencies in a multidisciplinary setting.

The study aims 1) to investigate the effectiveness of systematic approach in antenatal healthcare on adverse pregnancy outcomes (primarily prematurity and small-for-gestational-age) and 2) the efficacy of implementation (measured by the number of R4Us filled by the health care professional, the performance of multidisciplinary deliberations and patient and healthcare professional satisfaction).

Conclusions: Results from the 'HP4ALL' study could be used to improve the systematic approach in antenatal healthcare to enhance perinatal outcomes and thereby future health status of a new generation in the Netherlands.

P220 EFFECTIVENESS OF CUSTOMISED GROWTH CHARTS IN PROMPTING APPROPRIATE FURTHER INVESTIGATIONS OF SUSPECTED ABNORMAL FETAL GROWTH

John Heathcote, Jackie Baxter , Audrey Warren, Aparna Reddy
Buckinghamshire Healthcare NHS Trust, UK

Introduction: Customised growth charts (CGCs) are designed for use across serial antenatal assessments, as a tool to screen for potential cases of intrauterine growth restriction.

Objective: An audit of antenatal notes was conducted to assess (1) the frequency of use of CGCs, in compliance with local guidelines, and (2) their efficacy in triggering appropriate further investigations and review, in cases of potential abnormal foetal growth.

Methods: A sample of antenatal notes was analysed retrospectively from 102 consecutive deliveries at Bucks Health Care. Presence on file of a CGC and its regularity of use were documented. In those notes where a CGC was present and contained three or more recordings of fundal height measurement, the growth trends were analysed by two objective assessors to determine whether these were suggestive of abnormal fetal growth. Of the subset of pregnancies where static or slow foetal growth was identified, subsequent patient management was assessed, to ascertain whether CGC use actually prompted the further foetal growth monitoring that was indicated.

Results: 102 antenatal notes comprised the study sample. 98 (96%) of these contained a CGC. 92 (94%) of the CGCs present incorporated at least three fundal height measurement plots beyond 24 weeks gestation. Growth trends of 31 cases (34%) were adjudged to have been suspicious, yet appropriate action was deemed to have been taken in only 17 (55%) of these. Failure to recognise slow growth when the growth did not follow the curve was major factor when action was not taken.

Conclusions: Despite consistent use of CGCs throughout antenatal assessment, the audit reveals that indicated steps to investigate suspected abnormal foetal growth were not completed in a significant number of cases (45%). This may result from the subjectivity intrinsic within CGC interpretation, or the training demands that the tool places on the obstetric team.

P221 THE ASSOCIATION BETWEEN ALCOHOL CONSUMPTION IN PREGNANCY AND RISK OF SMALL FOR GESTATIONAL AGE INFANTS

Fergus P McCarthy,[1] Linda O'Keefe,[1] Ali S Khashan,[1] Robyn A North,[2] James Walker,[3] Philip N Baker, [4] Gus Dekker, [5] Lucilla Poston, [2] Lesley M E McCowan, [6] Louise C Kenny[1] on behalf of the SCOPE Consortium.
[1] The Anu Research Centre, Cork University Maternity Hospital, University College Cork, Cork, Ireland. [2] Women's Health Academic Centre, King's College London, and King's Health Partners, United Kingdom. [3]St James University Hospital, Leeds, United Kingdom. [4]Liggins Institute, University of Auckland, New Zealand and University of Manchester, United Kingdom. [5]Lyell McEwin Hospital, University of Adelaide, Adelaide, South Australia. [6]Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand.

Objective: To investigate the association between alcohol consumption in pregnancy and the risk of small for gestational age (SGA).

Method: Exposure to alcohol and amount of alcohol consumed during pregnancy was recorded. Exposure to alcohol was recorded as quit in pregnancy and continued drinking alcohol in pregnancy. Further classifications were also examined including quit alcohol consumption before conception, quit alcohol consumption before 15 weeks' gestation and continued drinking alcohol at 15 weeks' gestation. Amount of alcohol consumed in pregnancy was recorded as abstinent, low, moderate, heavy and very heavy. The effects of binge drinking before and during pregnancy were also examined.

Results: Among the 5628 nulliparous women in the final study population, 2230 (39.6%) women did not consume alcohol during pregnancy, 1090 (19.4%) consumed low amounts of alcohol, 1383 (24.6%) consumed moderate amounts of alcohol, 625 (11.1%) consumed heavy amounts of alcohol and 300 (5.3%) women consumed very heavy amounts of alcohol.

	Adjusted OR SGA*	
Low (1-2 units/week)	1.0	(0.8-1.3)
Moderate (3-7 units/week)	1.2	(1.1-1.3)
Heavy (7-14 units/week)	1.1	(0.9-1.3)
Very heavy (>14 units/week)	1.2	(0.9-1.6)
Quit alcohol consumption at conception	1.1	(1.0-1.3)
Continued alcohol consumption at 15 weeks' gestation	1.2	(0.9-1.6)
Quit drinking before conception	0.8	(0.6-1.3)
Quit drinking before 15 weeks' gestation	1.0	(0.9-1.2)
Continued drinking at 15 weeks' gestation	1.1	(1.0-1.4)
Pre-pregnancy binge drinking	1.0	(0.9-1.1)
Continued to binge drink in pregnancy	1.2	(1.1-1.5)

* Using logistic regression and presented as odds ratios (95%CI) adjusted for age, BMI, smoking status, years of schooling, marital status, ethnicity, infant sex, income and SCOPE centre ** Women with no alcohol consumption in pregnancy as reference group

Conclusion: Low consumption of alcohol in pregnancy is not associated with an increased risk of SGA. Higher degrees of alcohol consumption in pregnancy are associated with SGA. Women who quit drinking alcohol by 15 weeks' gestation do not have an increased risk of SGA.

P222 TRANSGENERATIONAL IMPACT OF SMOKING DURING PREGNANCY ON CHILD BIRTH OUTCOMES

Laura Louise Miller, Jean Golding, Kate Northstone, Marcus Pembrey
University of Bristol, UK

Objective: To establish whether birth outcomes affected by maternal smoking during pregnancy are also related to maternal grandmother smoking when the mother was in utero.

Method: The Avon Longitudinal Study of Parents and Children (ALSPAC) recruited pregnant mothers with a due date between 1st April 1991 and 31st December 1992. Questions on maternal grandmother (MGM) and mother smoking during the relevant pregnancies were asked during the study mother's pregnancy. Four categories of smoking exposure were created: neither smoked, only MGM smoked, only mother smoked, both smoked. Offspring weight (g), crown-heel length (cm), and head circumference (cm) were either measured at birth by ALSPAC measurers or obtained via obstetric records. The two former measures were used to create BMI at birth. All results were adjusted for parity (first born/not first born), maternal education (5 categories), mother's partner smoked during pregnancy (no/yes) and gestation (39+/37-37/<=36).

Results: Data were available for between 7201 and 9303 children (depending on outcome). Significant changes in birthweight (MGM: +33g, Mother: -102g, Both: -155g) and BMI (MGM: +0.13 kg/m^2, Mother: -0.14 kg/m^2, Both: -0.31 kg/m^2) were found for all three smoking categories compared to those for whom neither smoked after adjusting for other factors. A reduction in crown-heel length and head circumference was observed when only the mother or both the mother and MGM smoked during pregnancy. There were differences in these patterns for boys and girls.

Conclusions: Evidence of a transgenerational impact of smoking during pregnancy was found, with varying relationships suggested for different child birth measures such that if the mother was exposed in utero but didn't herself smoke her infant weighed more than infants born to women who neither smoked themselves nor did their mothers. An additional impact of adverse birth outcomes when both the mother and maternal grandmother smoked during pregnancy was suggested.

P223 DETECTION OF FETAL GROWTH RESTRICTION IN A LARGE TEACHING HOSPITAL USING NICE STANDARD ANTENATAL CARE GUIDANCE

Sharp, A., Ingram, E., Edem-Dartey, I., Roberts, D., Bricker, L
Liverpool University, UK

Objective: To identify the proportion of growth restricted fetuses (FGR) in singleton pregnancies at Liverpool Women's Hospital identified with standard antenatal care as per NICE guidance.

To compare delivery and neonatal outcomes in those pregnancies with antenatal detection of FGR versus those who were not detected.

Methods: All singleton deliveries >34^{+0} weeks during 2011 were assessed for gestational age at delivery and birthweight from the hospital computer records. FGR was defined as birthweight <5th centile on customised charts (Perinatal Institute). Antenatal detection was defined as an entry on the delivery summary of IUGR. Cases with fetal abnormality were excluded. Delivery and neonatal outcomes were obtained from the hospital computer record system.

Results: 444 babies, of which 428 were livebirths and 16 stillbirths, had a birthweight <5th centile. 149 (33.5%) cases were identified antenatally; 295 (66.4%) were not. There was a higher induction rate (Relative Risk 3.699; 95% CI 2.784-4.913; p<0.0005), higher CS rate (1.401; 95% CI 1.015-1.934; p=0.040) and lower spontaneous labour rate (0.188; 95% CI 0.12-0.276, p<0.0005) in babies identified antenatally. Antenatal identification of FGR increased the Neonatal Intensive Care Unit (NICU) admission rate (1.936; 95% CI 1.343-2.791; p<0.0005) and the need for phototherapy (2.772; 95% CI 1.261-6.091); p=0.011). Stillbirth rates were the same between both groups (identified 6/149, non-identified 10/295).

Conclusions: Standard antenatal care using non-customised SFH charts as recommended by NICE guidance only identifies a third of <5th centile babies. Our findings suggest that antenatal identification of FGR leads to more inductions, caesarean sections and admissions to NICU. It remains to be determined whether antenatal detection results in reduced stillbirth/neonatal morbidity.

P224 DEVELOPMENT AND USABILITY OF AN ONLINE CUSTOMISED ANTENATAL CHART GENERATOR

Gibbons KS, Liu Y, Mahomed K, Beckmann M, Gardener G, Flenady V
Mater Medical Research Institute, Brisbane, Australia

Objective: A recent survey of Directors of Obstetrics in Australia and New Zealand indicated that many would be interested in using customised antenatal growth charts (CAGCs) in clinical practice. At present, there are no available websites to generate these charts based on a validated Australian model. The objective of this study was two-fold: 1. develop a website that can generate CAGCs; and 2. evaluate the website for usability.

Methods: 1. The website was developed using published methodology (a customised birthweight model combined with a fetal growth standard) and based on the PHP (hypertext pre-processor) programming language. 2. Usability of the website was evaluated by surveying Midwives and Obstetricians from two hospitals in Brisbane, Australia. After a brief training session, these clinicians were asked to perform three scenarios while being observed by a facilitator to identify points in the process where the website was used incorrectly. Following the scenarios, users completed the System Usability Scale (SUS) (scale 0-100; 100 highest) as well as providing semi-structured feedback.

Results: 1. The website allows dynamic creation of CAGCs that can be used with measures of either ultrasound estimated fetal weight (EFW) or symphyseal fundal height (SFH) measurements to monitor the growth of a fetus. These charts, along with tables of the 10th, 50th and 90th centile values of both EFW and SFH for gestational ages between 24 and 42 weeks, can be easily printed for use during antenatal care. 2. The three scenarios were attempted well by all clinicians evaluated; a limited number of process errors in completing the scenarios were noted. The mean (standard deviation) SUS score was 82 (11), indicating good usability.

Conclusions: CAGCs can be easily generated using a validated Australian model with minimal clinician training. The utility of these charts now needs to be rigorously tested in an Australian setting.

P225 THE IMPACT OF FIRST TRIMESTER CROWN-RUMP LENGTH ON FETAL SIZE IN MID PREGNANCY, BIRTHWEIGHT AND INFANT SIZE

Ali S Khashan[1], Louise C Kenny[1], Fergus P McCarthy[1], McCowan Lesley[2], David I Broadhurst[3], Gustaaf Dekker[4], Deidre M Murray[5], Dharmintra Pasupathy[6], James Walker[7], Philip N Baker[8], Keelin O'Donoghue[1] on behalf of the SCOPE Consortium and the BASELINE Birth Cohort
[1]Anu Research Centre, Department of Obstetrics and Gynaecology, University College Cork, Cork, Ireland
[2] Department of Obstetrics and Gynaecology, University of Auckland, Auckland, New Zealand
[3]Department of Medicine, University of Alberta, Edmonton, Canada
[4] Women's and Children's Division Lyell McEwin Hospital, University of Adelaide, Adelaide, South Australia
[5]Department of Paediatrics and Child Health, University College Cork, Cork, Ireland
[6] Division of Women's Health, Women's Health Academic Centre, King's College London, and King's Health Partners, UK
[7]Leeds Institute of Molecular Medicine, University of Leeds, Leeds, UK
[8] The National Centre for Growth & Development, University of Auckland, New Zealand

Objective: To examine the association between first-trimester crown-rump length (CRL) and: fetal size in mid pregnancy, at birth and at 2 and 6 months of age.

Methods: Low risk nulliparous participants in the international Screening for Pregnancy Endpoints (SCOPE) study (www.scopestudy.net) with a regular menstrual cycle, certain first day of the last menstrual period, and a scan between 10 and 13 weeks' gestation comprised the study population. First-trimester CRL was expressed as the difference between the observed and expected size of the fetus and grouped as normal difference (-1 and +1 days), smaller (-2 to -6 days) and larger (+2 to +6 days) than expected. Small (SGA) and large (LGA) for gestational age were defined as birthweight below the 10th and above the 90th customised percentiles respectively. Estimated fetal size was converted into a gestational age adjusted z-score. Adjusted linear and logistic models were used for data analysis.

Results: Of 5,628 women in the final SCOPE cohort and 2,949 (52%) were included in this study and 592 infants from Cork (55% of the Cork cohort) had measurements of infant size at 2 and 6 months. There was a significant association between smaller than expected CRL and SGA (aOR=1.70, [95% CI: 1.32, 2.19]) and larger than expected CRL and LGA (aOR=1.87, [95% CI: 1.38, 2.52]). First-trimester smaller than expected CRL was associated significantly with estimated smaller than expected fetal size at 20 weeks scan (adjusted estimate=-0.39, [95%CI: -0.48, -0.30]), reduced birthweight (adjusted estimate=-115, [95% CI: -146, -85]). Smaller than expected CRL and fetal size were associated with reduced infant weight and length at 2 months of age. Larger than expected CRL was associated with increased fetal size and birthweight.

Discussion: First-trimester CRL is significantly associated with fetal size in mid pregnancy, birthweight, SGA, LGA and may be linked to infant size.

P226 HOW ACCURATE ARE THIRD TRIMESTER SCANS IN GLASGOW?

K McPherson, D Arnot, M Ledingham, R McPherson
Princess Royal Maternity Unit, Glasgow, UK

To ascertain how accurate third trimester scans are across Glasgow

We reviewed notes and scan images from 50 patients from Southern General and 50 patients from The Princess Royal Maternity Unit in Glasgow randomly from the 1st of April to the 1st of July 2012. Exclusion criteria were set as pregnancies where both a routine anomaly scan and third trimester scan was performed, and was restricted to live births. Multiple gestations were analysed separately. Scan images of abdominal circumference were scored independently according to the BMUS criteria by both a sonographer and clinician and combined.

This was compared to the recorded birth weight to ascertain how accurate our scans are, and which image parameters most closely correlated to an accurate prediction of birth weight centile for gestation.

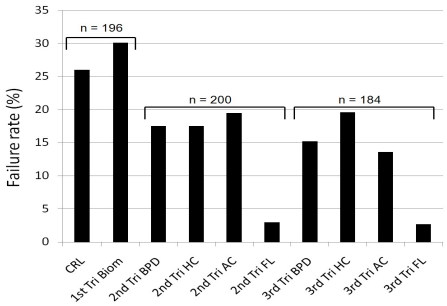
P227 CAN EDUCATION AND IMAGE REVIEW STANDARDIZE IMAGE ACQUISITION AND CALIPER PLACEMENT IN 2D ULTRASOUNDS? EXPERIENCE FROM NICHD FETAL GROWTH STUDY

Karin Fuchs
Columbia Presbyterian, New York, USA; on behalf of on behalf of the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) Fetal Growth Study

Objective: To describe the experience of using intensive education and image review to credential experienced sonographers to perform standardized 2D ultrasounds of fetal biometry as part of the ongoing multi-center prospective NICHD Fetal Growth Study.

Methods: Participating sonographers were required to attend a multi-day education session that included didactic and hands-on training in a standardized approach to image acquisition and caliper placement. All sonographers were required to submit 15 standardized scans (5 in each trimester). Each scan was independently reviewed by two experienced reviewers. Images were scored to assess quality, plane, caliper placement, and – when relevant – qualitative interpretation. 1st trimester scans were scored out of 18 possible points; 2nd and 3rd trimester scans were scored out of 27 possible points. Scans achieving a score ≥ 80% were considered passing; scans scoring < 80% were considered failing and required submission of a supplemental scan.

Results: A total of 36 sonographers participated from 14 centers. Median sonographer experience performing obstetric ultrasounds was 11.5 years (range 3-30). Overall, 580 scans were submitted, of which 77.8% passed. More than 90% (20/22) of sonographers were required to submit ≥ 1 supplemental scan. Pass rates were significantly lower for initial submissions (74.7%; 349/467) than supplemental scans (90.3%; 102/113) (p<0.0005). Pass rates were similar for the three trimesters (1st: 80.6% [158/196]; 2nd: 77.5% [155/200]; 3rd: 75% [138/184]) (p 0.419). Figure 1 demonstrates the percentage of scans in which a deduction was made for select parameters. Of those sonographers who achieved credentialing in all trimesters (22/36; 61%), median time to full credentialing was 5.0 months (range 3-10).



Conclusions: Intensive training and image review can be used to credential sonographers to perform standardized 2D ultrasounds of fetal biometry. Despite extensive prior experience, sonographers were often required to submit supplemental scans to demonstrate proper image acquisition and caliper placement.

P228 FETAL SKELETAL AND SOFT TISSUE GROWTH IN NORMAL PREGNANCIES OF DIFFERENT ETHNIC GROUPS

Graham Keith Parry
Middlemore Hospital, Auckland, New Zealand

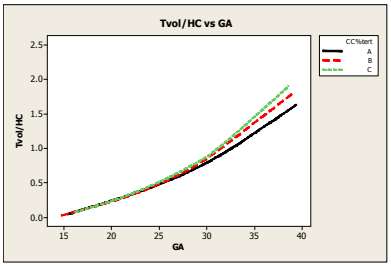
Objective: The aim was to evaluate the growth velocity in fetuses from different maternal ethnic groups using standard and novel ultrasound biometry measurements.

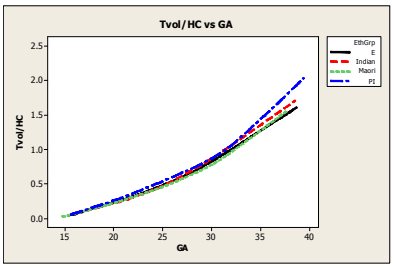
Methods: This was a longitudinal observational ultrasound study of healthy pregnant women whose primary ethnicity was European, Maori, Pacific Island or Indian. Only pregnancies with normal outcomes were included.

Each participant was scanned at 4 weekly intervals from between 16 and 18 weeks to delivery.

Ultrasound measurements were Biparietal Diameter, Head Circumference, Humeral Length, Abdominal Circumference and Femur Length. 3D ultrasound measurements were Thigh Circumference, partial Thigh Volume, Arm Circumference and partial Arm Volume. Neonatal measurements were birthweight, head circumference, crown-heel length and thigh circumference. Statistical analysis included multilevel linear mixed effects modelling.

Results: Maternal characteristics were similar, except for weight, between the ethnic groups. There were significant differences in the longitudinal growth of skeletal parameters with slower growth in the Indian fetuses compared to the referent NZE. Fetal soft tissue showed accelerated growth velocity compared to skeletal biometry from early third trimester. This increase was greater in the heavier Pacific Island ethnic group as well as in the height, and weight tertiles. Examples of soft tissue to skeletal measurement ratios are shown:





1Thigh volume/head circumference ratio by customised birthweight centile; 2Thigh volume/head circumference ratio by ethnic group

Skeletal growth is characterised by a slowing of growth with increasing gestation. Soft tissue is characterised by an acceleration of growth with increasing gestation.

Conclusions: Soft tissue growth velocity may help distinguish between fetal growth restriction and SGA or if macrosomia is pathological in diabetic pregnancies.

P229 THE PROGNOSTIC VALUE OF AN ANTENATAL DIAGNOSIS OF FETAL GROWTH RESTRICTION FOR VERY PRETERM MORTALITY AND SHORT TERM MORBIDITY

Mayass El Ayoubi[1], Jennifer Zeitlin [2] and the MOSAIC Research Group
[1]Hospital Port Royal, [2] INSERM, Paris, France

Objectives: Fetal growth restriction (FGR) is associated with an increased risk of mortality and broncho- pulmonary dysplasia (BPD) for very preterm infants. FGR is usually determined by whether the infant is small for gestational age at birth (SGA, birthweight <10th percentile for gestational age), but many very preterm infants are diagnosed as FGR during pregnancy based on ultrasound or other criteria. We sought to determine whether an antenatal diagnosis of FGR is associated with these outcomes after controlling for birthweight.

Methods: Data on infants born between 24 and 31 weeks of GA in 10 European regions in 2003 (N=4608) from the MOSAIC cohort were used to compare in-hospital mortality and BPD (oxygen dependence at 36 weeks of gestational age) by birthweight percentiles and mention in medical records of a diagnosis of FGR. Other variables included in the analyses were gestational age, sex, multiplicity and region.

Results: 16% of all infants and 72%, 30% and 6% respectively of infants with birthweight percentiles <10, 10-24 and 25 and over had an antenatal diagnosis of FGR. A diagnosis of FGR was not associated with higher mortality or BPD after adjustment for clinical factors and birthweight percentile (OR [95% CI]: 1.1[0.9-1.6] and 1.1[0.8-1.5], respectively). Adjusted OR for mortality and BPD were 1.9 [0.8-4.3] and 0.9 [0.4-1.7] for infants with a BW <10th percentile, 0.8 [0.4-1.5] and 1.0 [0.6-1.8] for infants with a BW between the 10th and 24th percentile and 0.9 [0.5-1.6] and 0.7 [0.4-1.3] for infants with a BW 25th percentile and over.

Conclusions: Information on the existence of an antenatal diagnosis of fetal growth restriction did not improve the prediction of risk of mortality or BPD for non-SGA infants; for those with a birthweight <10th percentile, the risk of mortality was higher, but not significantly.

P230 SELF ADMINISTERED SYMPHYSIS FUNDUS (SF) MEASUREMENTS USED WITH A NOVEL STATISTICAL METHOD FOR DETECTION OF INTRAUTERINE GROWTH RETARDATION; A CLINICAL EVALUATION

Eva Bergman, Ove Axelsson, Max Petzold , Christian Sonesson, Helle Kieler
Department Of Women's And Children's Health, Uppsala University, Uppsala, Sweden

Objective: To assess the ability of the statistical method of Shiryaev-Roberts (*SR method)* to identify IUGR fetuses and compare it with the traditional *SF method* (SF measurements compared with a population based reference curve).

Methods: From a population of 1888 women attending primary antenatal care centres with singleton ultrasound dated pregnancies we analysed SF measurement data from 1122 women.

Weekly self-administered SF measurements from gestational week 25 until delivery were performed and analysed according to the *SR method*. Neonatal morbidity and small-for-gestational age (SGA) were used as proxies for IUGR. SGA was defined as a birth weight < -2 standard deviations (SD) and < 10^{th} percentile. We assessed the sensitivity of the *SR method* and the *SF method to* detect neonatal morbidity and SGA. Main outcome measures was; birth related mortality, respiratory distress, hypoglycaemia, Apgar < 7 at 5 min, pH < 7.01 in the umbilical artery, neonatal care, preterm delivery, operative delivery for fetal distress and SGA.

Results: For the *SR method* the sensitivity for neonatal morbidity was between 6.0 and 36.4 %, for SGA (< -2 SD) 36.8 %, and for SGA (< 10^{th} percentile) 20.9 %. The *SF method* had a sensitivity between 6.0 and 13.8 % for neonatal morbidity, 52.3 % for SGA (< -2 SD) and 28.6 % for SGA (< 10^{th} percentile).

Conclusions: The *SR method* and the *SF method* had low sensitivities for neonatal morbidity. The *SF method* was, however, better at detecting SGA neonates.

P231 FACTORS INFLUENCING THE DEVELOPMENT AND ANTENATAL IDENTIFICATION OF SMALL FOR GESTATIONAL AGE BABIES AT A LANCASHIRE TEACHING HOSPITAL

Keira Haddow, Sanjeev Prashar
University of Manchester, UK

Objective: To assess whether any antenatal factors can influence the development and antenatal misidentification of SGA foetuses.

Methods: Self-reported maternal lifestyle and health information was collected from antenatal notes for every woman who delivered between 5/8/12 and 6/9/12. Of the resulting 404 births, 29 were excluded from the study. This data was analyzed using StatsDirect to identify any factors known at the time of booking which might influence the development of SGA babies.

Result: A logistic regression model was used to identify which maternal health, lifestyle and antenatal care factors were significant in determining if a baby was SGA or not. Maternal history of one or more first trimester pregnancy losses was found to be protective against having an SGA baby (OR 0.35; 95% CI 0.14-0.91; P=0.031), as was maternal age 30-35 when compared to the baseline of 20-29 (OR 0.34; 95% CI 0.14-0.88; P=0.026). Factors found to significantly increase the chances of having a SGA baby included smoking during pregnancy (OR 2.81; 95% CI 1.35-5.88; P=0.006), medication use in the last 6 months (OR 3.20; 95% CI 1.61-6.35; P=0.0009) and history of a previous SGA baby (OR 2.62; 95% CI 1.11-6.19; P= 0.021). Women who had a SGA baby during the study period were analysed to identify factors which increased the likelihood of these babies being misidentified as normally sized antenatally. No factors were found to significantly increase the chance of misidentification, but history of a previous SGA birth reduced the likelihood of a baby being misidentified as normally sized antenatally (OR 0.1; 95% CI 0.029-0.75; P=0.021).

Conclusion: Some information available at antenatal booking appointments can be used as an adjunct to common factors used in risk assessment to identify the risk of a pregnancy developing an SGA baby.

P232 VITAMIN D – THE CHALLENGE

Rufus Greenbaum
Bio-Tech Pharmacal, Fayetteville, USA

There were 700 recorded episodes of Rickets in the UK for each of 2008-2010. This is only the tip of the iceberg of the Vitamin D deficiency in both the mother and the baby, since there are also cases of seizures and heart failure.

If a woman starts pregnancy with a lack of Vitamin D and continues to be deficient throughout pregnancy she is at increased risk of complications and the baby may lack fetal development.

The Chief Medical Officers of the 4 UK countries issued a letter in February 2012 reminding all General Practitioners that there is existing guidance from the Department of Health, NICE and others that every pregnant woman in the UK should take 10 micrograms (400 IU) of Vitamin D per day – and that the guidance must now be followed.

My challenge to the medical profession is:

How will this guidance be implemented? Is this amount adequate? What do other countries do, & what are the results? What is the evidence for advising higher amounts of Vitamin D?

My poster presentation will show the evidence that, if the mother has Vitamin D levels >100 nmol/L, there will be improvement in Fertility rates; Pre-eclampsia (4 x); Gestational diabetes (8 x); Anaemia; Bacterial vaginosis (5 x) ; Emergency C-sections (4 x) ; Pre-term births (2 x) ; Dental problems (2 x) ; Post-natal depression

In addition the baby and the child will be healthier. There is evidence that, if the mother has Vitamin D levels > 100 nmol/L, the child will have less Asthma (5 x); Language problems at 5 years (2 x) ; Obesity; Type 1 Diabetes.

P233 NEURODEVELOPMENTAL OUTCOME OF FULL-TERM, SMALL-FOR-GESTATIONAL-AGE INFANTS

Francesc Figueras, Stefan Sanchev, Magda Sanz, Rogelio Cruz-Martinez, Angela Arranz, Francesc Botet, Eduard Gratacos
University of Barcelona, Spain

Objective: To evaluate the 2-year neurodevelopmental outcome of full-term, small-for-gestational-age (SGA) newborns with normal placental function, according to current criteria based on umbilical artery Doppler.

Patients and Methods: A cohort of consecutive full-term, SGA newborns with normal prenatal umbilical artery Doppler was compared with a group of full-term, appropriate-for-gestational-age (AGA) infants sampled from our general neonatal population. Neurodevelopmental outcome was evaluated at 24-months corrected age with the Bayley scale for infant and toddler development, third edition (Bayley-III), which evaluates cognitive, language, motor, social-emotional, and adaptive competencies. The effect of the study group on each domain was adjusted with multiple analysis of covariance and logistic regression for gestational age at delivery, corrected age at administration of the test, socio-economic status, gender, and breastfeeding.

Results: A total of 223 infants (111 SGA and 112 AGA) were included. All studied neurodevelopmental domains were poorer in the SGA group, and these differences reached significance for the cognitive (100.2 vs. 92.9, adjusted p=0.031), language (101 vs. 94.7, adjusted p=0.025), motor (100 vs. 94.2, adjusted p=0.029), and adaptive (97.2 vs. 89.1, adjusted p=0.014) scores. Likewise, the SGA group had a higher risk of low scores in language (odds ratio [OR] 2.63 adjusted p=0.045) and adaptive (OR 2.72 adjusted p=0.009) domains.

Conclusions: Compared to normal sized babies, full-term SGA infants, without currently used criteria defining placental insufficiency, have poorer 2-year neurodevelopmental outcomes. These data challenge the concept that SGA fetuses with normal umbilical artery Doppler are “constitutionally small”, but otherwise completely normal.

P234 IMPACT OF OVULATION-IMPLANTATION INTERVAL ON FIRST TRIMESTER CROWN-RUMP LENGTH, FETAL GROWTH AND BIRTHWEIGHT

Mahendru AA, Daemen A, Everett TR, McEniery CM, Wilkinson IB, Abdallah Y, Timmerman D, Bourne T, Lees CC
Addenbrooks Hospital, Cambridge, UK

Objective(s): To explore the hypotheses that variation in ovulation-implantation (O-I) interval contributes to differences in fetal crown-rump length (CRL) at 10-14 weeks and a single CRL measurement at 10-14 weeks is not related to birth weight or GA at delivery.

Method(s): The timing of ovulation, implantation and O-I interval were established using home urinary tests for luteinizing hormone (LH) and chorionic gonadotrophin (hCG), respectively in 143 women trying to conceive naturally. Women underwent three first trimester ultrasound scans. We examined the relationship between CRL z score at 10-14 weeks to O-I interval, birth weight, GA at delivery, and between first trimester CRL growth and birth weight.

Result(s): In the 71 viable pregnancies, the median ovulation and implantation days were 16 and 27, respectively with an 11-day range of O-I interval. CRL z score was inversely related to O-I interval (ρ=-0.431, *P*=0.0009) but was not related to birth weight z score or LMP derived GA at delivery (ρ=0.218, *P*=0.1; ρ=0.186, *P*=0.226). Birth weight z score was not related to first trimester growth rate (ρ=0.264, *P*=0.12).

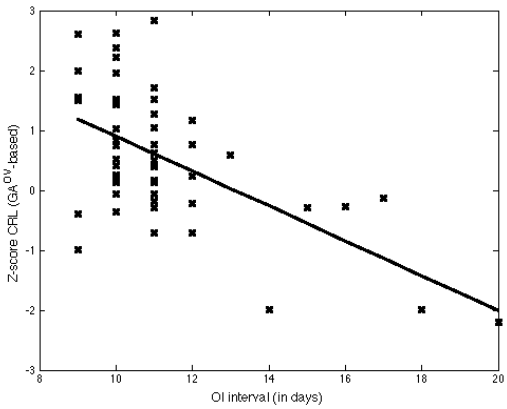


Figure: Relationship between z-score CRL and O-I interval

Conclusion(s): An embryo that implanted late had a smaller CRL at 10-14 weeks than the one that implanted early. Differences in CRL measurement at 10-14 weeks were not associated with differences in birth weight or GA at delivery, nor was first trimester growth rate associated with birth weight. First trimester fetal size discrepancy in women with known conception dates may be due to variation in implantation timing rather than a true difference in first trimester growth, which has to date been assumed from a single CRL measurement.

P235 AN ENHANCED, MIDWIFERY-LED ULTRASOUND SERVICE TO MONITOR FETAL GROWTH

Tonks A M, Williamson A, Williams M, Gardosi J
West Midlands Perinatal Institute, Birmingham, UK

Objective: Antenatal detection of intrauterine growth restriction (IUGR) is a key objective of maternity care. According to a large 2009 case-note audit, 4 in 5 babies in Birmingham born with an SGA birthweight are not recognised as such antenatally. We set out to improve detection through an enhanced ultrasound screening service for higher risk mothers.

Methods: The Community Growth Scanning service (CoGS, www.pi.nhs.uk/cogs) was established in several Birmingham clinics staffed by midwives who were trained in 3rd trimester ultrasound. Standardised protocols for referral were agreed with all clinicians, for women requiring scans based on abnormal fundal height measurement, or for serial scanning because of increased risk of IUGR due past obstetric history or other factors. SGA was defined as below the 10th customised centile. The new service was commenced in October 2010 and evaluation included all women who attended the service and delivered by the end of Dec 2011.

Results: 2,583 women were referred to CoGS during the study period. The majority (57.1%) were for serial scans and constituted 79.7% of CoGS scans undertaken. High-risk mothers were more likely to receive serial scans (mode: 4 scans, with 68.3% having 3 or more), compared to the 2009 baseline (mode: 1 scan; 73% had less than 2). Compared to an overall SGA rate of 13.1% in the local population, the prevalence of SGA birthweight in mothers referred for serial ultrasound was 26.2%, with an the antenatal detection rate of 47.7% (CI 42.7-52.7%). In pregnancies referred because of abnormal fundal height measurement, the SGA birthweight rate was 20.3%, of which 26.3% (CI 20.6-32.1%) were detected antenatally. The median delay between referral for fundal height and delivery was 35 days (IQ range 17-57). There were 2 perinatal deaths of normally formed IUGR babies within this cohort (0.8/1,000 births, CI 0.0-1.8).

Conclusion(s): Enhanced provision of ultrasound resources to mothers at increased risk results in significant improvements in antenatal detection of intrauterine growth restriction.

P236 DETECTED VS. UNDETECTED SMALL-FOR-GESTATIONAL-AGE: A MULTICENTER COHORT STUDY

Chauhan SP, Baydoun H, Chang E, Igwe E, Sandlin AT, Dahlke JD, Ananth CV, Magann EF, Anderson KR, Abuhamad AZ
Eastern Virginia Medical School, Norfolk Virginia, USA

Objective: ACOG practice bulletin on intrauterine growth restriction (IUGR), states that small-for-gestational age (SGA) is detected in 50% of cases and those undetected cases have higher mortality. The primary purpose of this multi-center study was to determine factors linked to SGA (birth weight < 10% gestational age [GA]) being detected vs. undetected; the secondary purpose, determine whether SGA detection significantly influences composite neonatal morbidity (CNM).

Study Design: At 4 centers, we identified all non-anomalous singletons, with sonographic exam before 22 weeks and SGA (birth weight < 10% for GA using Alexander nomogram) that delivered in 2009. If IUGR was suspected antenatally, SGA was considered detected and undetected otherwise. An adjusted log-linear model was constructed to identify variables associated with SGA detection and a multivariate log-linear model, to examine the net effect of SGA detection on CNM (thrombocytopenia, RDS, proven sepsis, grade III/IV IVH, seizure, or death). Both analyses were adjusted for 5 variables: maternal age, ethnicity, nulliparity, body mass index (BMI) at 1st visit and smoking.

Results: There were 11,487 births and 8% (929) were SGA that met the inclusion criteria. Though the detection rate varied (18-36%), overall 25% of SGA were detected prenatally. After adjustment for 5 variables, detection varied significantly by ethnicity. Likelihood of sonographic estimate fetal weight (SEFW) and birth weight varied significantly between the detected vs. undetected groups. CNM occurred in 13% and after adjusting for 5 variables, it varied significantly with BMI at 1st visit and whether SGA was detected (43%) vs. undetected (22%; OR 2.24, 95% CI 1.62, 3.12).

Conclusion: Only 1 out of 4 SGA was detected prenatally and the modifiable variable that could improve detection is SEFW within 4 weeks of birth. A prospective multi-center is warranted to determine if antenatal detection of SGA significantly lowers CNM.

P237 UNIVERSAL SCREENING FOR INTRAUTERINE GROWTH RESTRICTION AMONG UNCOMPLICATED PREGNANCIES: TIME FOR ACTION

Chauhan SP, Rouse DJ, Ananth CV, Magann EF, Chang E, Dahlke J, Abuhamad AZ
Eastern Virginia Medical School, Norfolk Virginia, USA

Objective: Currently 10-50% of small for gestational age (SGA; birth weight < 10% for gestational age) are identified prenatally. Though a randomized clinical trial (RCT) noted that sonographic examination in the 3rd trimester, in conjunction with delivery at term for abnormalities of fetal growth, significantly decreased the likelihood of SGA in uncomplicated pregnancies, universal screening for abnormal growth is not recommended by national guidelines. Thus, we undertook a review of literature to determine what additional research is needed to determine if universal screening with sonographic examination is warranted.

Methods: We identified 15 characteristics of screening tests and attempted to determine if there is evidence to routinely obtain sonographic estimates of fetal weight in the third trimester and decrease rate of SGA.

Results: Of the 15 suggested characteristics, currently ten (67%) are fulfilled, two uncertain (sonographic examination is cost-effective or reliable), and one (the test must do its job) is possibly valid. Due to the lack of RCT demonstrating reduction in morbidity, there is potential for lead-time and length bias. To observe a 36% decrease (from 4.1% to 2.6%) in composite perinatal morbidity, 6,000 women need to be randomized to at least two sonographic examinations in the third trimester vs. routine prenatal care.

Conclusion: A cost-effective analysis and a multi-center RCT are warranted, and justified, before we universally screen uncomplicated pregnancies with additional 3rd trimester examinations.

P310 A NOVEL METHOD OF VISUALISING AND QUANTIFYING PLACENTAL VASCULATURE

Lara Morley, Olivia Moran, Jens Stahlschmidt, Derek Magee, Darren Treanor, Nigel Simpson
St James University Hospital, Leeds, UK

Objectives: Traditional placental analysis entails interpretation of macro- and microscopic appearances of tissue in histopathology. However, identification and assignment of clinical significance of lesions identified on two-dimensional sections from isolated areas of placenta is somewhat subjective. Through digitised capture of the placental sections, it may now be possible to develop a method of efficiently and objectively analysing high-throughputs of tissue to enhance current methods.

Methods: Participants were women delivering by elective caesarean section at Leeds Teaching Hospitals at 36-41 weeks gestation. Women with clinically normal pregnancies and outcomes were included.

Placental tissue was processed using standard histopathological techniques and stained with CD-31 to identify endothelial cells. Slides were scanned into an automated system and analysed using a Microvessel Analysis Tool (Aperio ePathology Solutions, Vista, CA, USA) (Figure 1).

Results: Digital analysis was evaluated to ensure concordance between software and manual identification of vessels (R^2 = 0.8). Greater inter-observer error was found than when using software (R^2 = 0.76). Eight sections were sampled from defined sites across seven placentae. No significant differences in vessel number were observed within sections obtained from central versus peripheral sites, nor between maternal, central or fetal regions within each section (p=0.2, p=0.13, respectively). Significant differences in vessel number were seen between placentas (p<0.000). Differences in vessel density, lumen area, perimeter and vascular area were also significant between placentae (p<0.000). We observed a trend towards an inverse correlation between vessel number & placental weight.

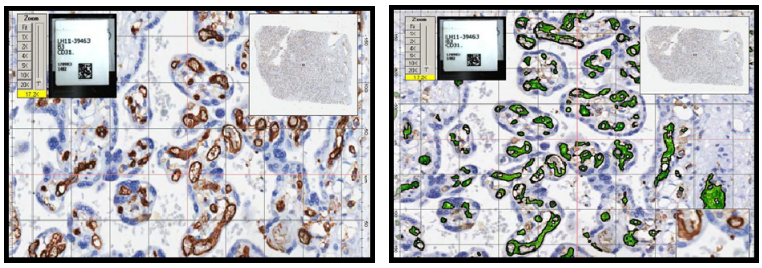


Figure1. a) CD-31 stained placental slide b) Digital vessel analysis

Conclusion: Digital analysis of placental sections is a feasible method of quantitatively analysing feto-placental vasculature. Developing an automated method may enhance diagnostic histopathology though grading severity of numerical abnormalities, and may enable assessment of the impact of interventive strategies.

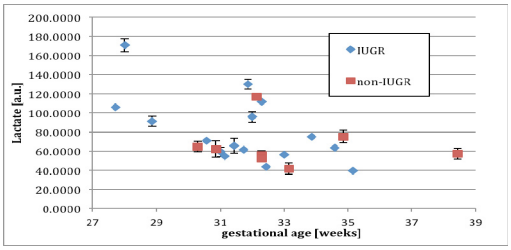
P311 MAGNETIC RESONANCE SPECTROSCOPY SHOWS DECREASING BRAIN LACTATE WITH FETAL MATURATION

G Charles-Edwards, J Ashmore, D Lumsden, S Bower, J Jarosz ,S Keevil, K Nicolaides, M To, C Yu
Kings College, London, UK

Objective: To explore the measurement of brain lactate levels with fetal maturation by magnetic resonance spectroscopy (MRS) in intrauterine growth restriction (IUGR) and normal fetuses.

Methods: A long echo time MRS sequence was used to acquire localised MR spectra from 31 fetal brains in women with singleton pregnancies: 21 intra-uterine growth restricted (IUGR) cases (4 high umbilical pulsatility index, 5 absent umbilical end diastolic flow, 3 reversed umbilical artery (UA), 4 low middle cerebral artery (MCA), 2 high ductus venosus (DV), 3 reduced amniotic fluid) and 10 non-IUGR (5 normals and 5 small normal). Observed lactate peaks were fitted and referenced to unsuppressed water with a gestational age correction for brain water concentration. A binary risk score was generated for each case in 4 categories (UA > 95th centile, MCA < 5th centile, DV > 95th centile, birth weight < 5th centile) giving a total risk score out of 4. Univariate general linear modelling was used to compare lactate concentration with risk scores and patient groups, with gestational age as a covariate.

Results: A spectral peak consistent with the presence of lactate was observed and fitted in 25 cases. Although there was no significant difference in fetal brain lactate between patient groups or total risk score, overall there was a significant inverse relationship (p<0.05) between lactate levels and gestational age, as shown. This observation is consistent with MRS measurements in preterm neonates (Leth *et al*. 1995 Acta Paediatr 84(5): 495-499).



Conclusion: MRS shows reducing brain lactate with fetal maturation, consistent with preterm neonatal observations. To our knowledge these are the first results using MRS to map changes in fetal cerebral lactate with gestational age. MRS may offer a valuable non-invasive tool for the measurement of lactate and other metabolites *in utero*.

P312 GENETIC ANALYSIS OF INTRAUTERINE DEATH (IUD) WITH IUGR USING THE HIGH ESOLUTION TECHNIQUE OF MICROARRAY ANALYSIS

Lisa Cooper-Charles[1], Ina Nicklaus-Wollenteit[2], Tamas Marton[2], Lee Silcock[1], Georgina Hall[1], Derek Lim[3], Nicola Cooper[3], Louise Brueton[3], Dominic McMullan[1], Phillip Cox[2]
[1]West Midlands Regional Genetics Laboratory, [2]Department of Perinatal Pathology and [3]Department of Clinical Genetics, Birmingham Women's Hospital, Birmingham UK

Objective: IUD at ≥24 weeks gestation affects 1 in 200 pregnancies, with IUGR present in approximately 50%. Although IUGR is frequently due to placental pathology, genetic abnormalities may also underlie a significant proportion. We are undertaking a comprehensive pathological and genetic study of non-placental IUGR. High resolution, whole genome microarray analysis (WGMA) has recently been introduced into postnatal clinical genetic practice to identify sub-microscopic chromosome imbalances. However, there is limited experience of this technique in IUD's, particularly those with IUGR.

Method: To date the study has undertaken WGMA in 18 cases of IUD with IUGR (<3rd centile), with or without congenital anomalies. Following standard QF-PCR/MLPA analysis, cases with a normal result were submitted for WGMA testing on DNA extracted from a skin or placental biopsy.

Results: Of the 18 cases submitted to date, 13 showed no clinically significant copy number imbalance (CNI). 4 showed a CNI of uncertain significance of which 1 was inherited and therefore considered likely benign. In 1 case microarray analysis identified a significant sub-microscopic chromosome imbalance. This was a 33 week stillborn fetus with IUGR and congenital anomalies (absent thumb, spina bifida, tracheo-oesophageal fistula, oesophageal atresia). Microarray analysis identified a homozygous deletion of part of the FANCA gene consistent with Fanconi anaemia that is characterised by IUGR and the congenital anomalies described.

Conclusion: WGMA can identify the cause of IUD with IUGR without placental pathology. Further investigations will determine whether the CNI of uncertain significance are pathogenic in this situation. All cases without pathogenic CNI will be further investigated with SNP and methylation arrays to identify other genetic abnormalities. This study will help inform future clinical diagnostic practice and ensure cost effective use of valuable resources.

P313 LOCAL VEGF GENE THERAPY TO THE UTERINE ARTERIES IMPROVES FETAL GROWTH IN ANIMAL MODELS OF FETAL GROWTH RESTRICTION

Anna David, David Carr, Vedanta Mehta, Michael Boyd, Raymond Aitken, John Milne, Hannah Barker, Adnan Avdic-Belltheus, Ian Zachary, John Martin, Donald Peebles, Jacqueline Wallace
UCL Institute for Women's Health, London, UK

Objective: Severe fetal growth restriction (FGR) has no treatment. Reduced uterine blood flow (UBF) is a common cause. In normal sheep pregnancy, adenovirus (Ad) mediated over-expression of vascular endothelial growth factor (VEGF) in the uterine arteries (UtA) increases UBF. We investigated this effect in two animal models of FGR.

Method: Singleton pregnancies were established in adolescent sheep, using embryo transfer, and ewes were subsequently overnourished to generate FGR (n=68) or control-fed (n=12). Mid gestation FGR ewes were randomised to receive Ad.VEGF ($5x10^{11}$ viral particles, n=18), Ad.LacZ, (control vector, n=14) or saline (n=13) injected into each UtA; controls received saline. Necropsy was at 131±0.6d. A further 33 mid-gestation FGR ewes received Ad.VEGF (n=17) or saline (n=16) and delivered spontaneously at 141±0.4d. Fetal growth was evaluated (blind) using serial ultrasound.

Virgin guinea pigs were nutrient restricted peri-conceptually to create FGR. At mid-gestation laparotomy (30-34 days) UtAs and radial arteries bilaterally were transduced externally with Ad.VEGF-A_{165} or Ad.LacZ, ($5x10^{9}$ viral particles) combined with a thermosensitive pluronic gel. Fetal organ weights and biometry were recorded at necropsy (63-65 days).

Result: In sheep, abdominal circumference was greater in Ad.VEGF treated versus control treated FGR fetuses at 21±0.4d and 29±0.4d post-injection (p=<0.001-0.047). At term necropsy fewer fetuses had severe FGR (weight >2 SD below the control mean) in Ad.VEGF vs. Ad.LacZ+saline groups (5/18 vs. 18/27, p=0.038). There was attenuated "head sparing" in Ad.VEGF versus Ad.LacZ+saline groups. Born Ad.VEGF-treated lambs were heavier (p=0.081) with increased fetal: placental weight ratios (p=0.074). In FGR guinea pigs, Ad.VEGF-A_{165} treatment increased fetal weight (94.5±2.01g, n=11) when compared to control Ad.LacZ treatment (84.9±2.81g, n=10, p=0.061). The brain/liver weight ratio was significantly lower (0.45±0.019 v/s 0.53±0.017, p=0.021).

Conclusion: Ad.VEGF treatment increases fetal growth in FGR animal models. With EU funding we are now starting a 6 year programme to translate this therapy into women.

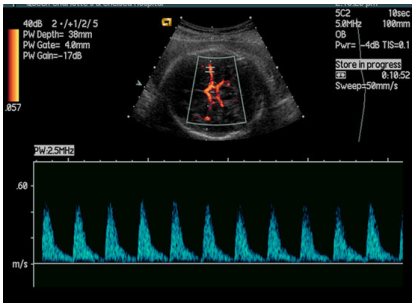
P314 ROLE OF MIDDLE CEREBRAL ARTERY DOPPLERS IN FETAL SURVEILLANCE: LITERATURE REVIEW

S. Bhatti, S. Bower, C.Yu
St Mary's Hospital, London, UK

Objective: To review the existing evidence for the clinical use of middle cerebral artery Doppler indices in the management of early and late onset fetal growth restriction.

Method: Pub med search, for fetal growth restriction (early and late onset), middle cerebral artery and MCA PSV.

Results: We looked into the different publications demonstrating the use of MCA usually in conjunction with other fetal vessel Doppler as a predictor for fetal well being and in the timing of the delivery. We have grouped the studies into early onset growth restriction and late onset growth restriction.



Middle cerebral artery Doppler's waveform

Conclusion: In normal pregnancies the MCA peak systolic velocity (PSV) increases and the MCA pulsatility index (PI) decreases with gestation. In FGR fetuses, the "brain-sparing" effect is detected by a decrease in systolic/diastolic (S/D) ratios or PI of the MCA. In severe fetal hypoxia, there is a rebound increase in S/D ratio and a diminished perfusion to the brain. However the MCA Doppler does not consistently predict fetal deterioration, although more recent data has shown that fetuses with normal UA Dopplers but with abnormal MCA waveforms have earlier deliveries, more SGA, more caesarean sections and increased neonatal unit admissions. The combination of elevated MCA PI with UA Doppler may have a role in optimising the timing of the delivery of FGR fetuses.

P315 THE DUTCH IUGR RISK SELECTION STUDY (IRIS STUDY) – A RESEARCH PROPOSAL

Ank de Jonge
Vrije Universiteit Medisch Centrum, Amsterdam, Netherlands

Background: Of all babies that die after 25 weeks gestation, 40% are small-for-gestational-age (SGA). Although there is no evidence that routine third trimester ultrasound screening (US) leads to better perinatal outcomes, it is increasingly used in the Netherlands to detect SGA, resulting in a considerable rise in health care costs.

Before routine third trimester US screening is implemented it is essential to evaluate its effectiveness and cost-effectiveness. If effective, this intervention may lower the relatively high perinatal mortality rate in the Netherlands. If funding is granted, the study will start in December 2012.

Design: Nationwide cluster randomised controlled trial. Primary care midwifery practices will be randomised. Included women will be followed through if they are referred to specialist care.

Intervention and Control: In all practices, growth will be monitored using standardised symphysis fundal height measurement and US will be performed if indicated. Additionally, in intervention midwifery care practices, routine US examinations will be performed between 28 to 30 weeks and 6 weeks thereafter between 34 and 36 weeks.

Primary Outcomes: The primary outcome is a composite of perinatal mortality and severe perinatal morbidity before neonatal discharge.

Main Secondary Outcomes: Separate types of severe adverse perinatal outcomes mentioned in the primary outcome, number of ultrasound scans, consultations, referrals, pain medication, place of birth, operative delivery, birth weight, gestatonal age, premature birth, non-cephalic presentation at birth, neonatal intensive care unit admission. In a subsample: women's positive and negative experiences with the approach to fetal growth monitoring in the third trimester, ethical dilemmas, clients' costs.

Sample Size: 15,000 women in 60 midwifery practices, 7,500 in each arm.

Main Data Analysis and Economic Evaluation: Analyses in the main study will be by intention to treat and logistic regression techniques will be used. The economic evaluation will be performed from a societal perspective.

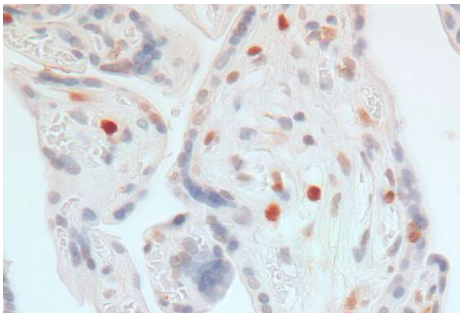
P316 THE CLINICAL FEATURES OF IDIOPATHIC FETAL GROWTH RESTRICTION AND DNA DAMAGE/REPAIR AND APOPTOSIS RESPONSE IN THE PLACENTA

Celia Devenish, William Clow, Rebecca Crabbe, Tania Slatter and Noelyn Hung
Dunedin Hospital, New Zealand

Objective: The aim of this study was to identify women whose pregnancies showed evidence of idiopathic growth restriction (IGR) and to identify the site of any DNA placental damage and apoptosis as a possible mechanism of IGR.

Method: Post delivery, twenty five women were recruited with growth restricted foetuses as part of the Otago Placenta Study. The placentae were assessed by standard pathological assessment and for evidence of DNA damage to the placentae using immunohistochemical markers, including gamma H2AX. GammaH2Ax is a robust marker of both single and double stranded DNA damage/repair and signs of apoptosis.

Results: The DNA damage repair response was detected within the villi of a subset of FGR placentae. The figure demonstrates a positive DAB immunohistochemical reaction (brown staining) in the nuclei of villous stromal cells and negative reaction (no brown staining) in syncytiotrophoblast. This is in contrast to the syncitiotrophoblast DNA damage associated with smoking. The distribution and severity of the DNA damage is discussed in conjunction with the clinical findings and possible functional effects on the placenta identified by immunochemical stains for HCG and HPL and GLUT1 expression.



DNA damaged nuclei in villous stroma (x630 magnification)

Conclusion: Some cases of IUGR are associated with villous stromal DNA damage – a different site/mechanism to that associated with smoking.

P317 CAUCASIAN SPECIFIC FETAL BIOMETRY

A Khalid, D. McKenna, A. Khashan, J. Higgins
University College Cork, Ireland

Introduction Fetal biometry remains gold standard for the diagnosis of small-for-gestational-age (SGA) fetuses. The biometric charts constructed by Chitty et al are commonplace and incorporated into contemporary ultrasound equipment. Their charts are now outdated, developed using obsolete ultrasound equipment and included diverse ethnic groups.

Objectives: To construct fetal biometric charts in the Irish Caucasian population.

Method: This was a prospective, cross-sectional study involving low-risk women attending Cork University Maternity Hospital. Women were recruited from their first trimester dating scan and randomly allocated to one scan between 14-40 weeks gestation. Scans were performed by a sole researcher. Gestation was calculated using the estimated-due-date (EDD) by dating scan. Recruits were Irish Caucasian women with a singleton pregnancy. Exclusion criteria were women with conditions affecting fetal size including hypertension, pre-eclampsia, renal disease, autoimmune disorders and diabetes mellitus. Fetuses with congenital anomalies were also excluded. Biometrical measurements were performed using the Voluson E8 ultrasound by GE Healthcare.

Results: Nine-hundred-and-fifteen women were recruited. Seven-hundred-and-ninety-three women met the inclusion criteria and were scanned as per protocol. Biometric charts for biparietal diameter (BPD), head circumference (HC), femur length (FL) and abdominal circumference (AC) have been generated for this population.

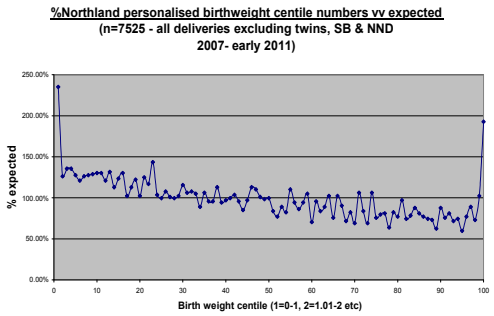
Conclusion: We have constructed Caucasian specific fetal biometric charts with up-to-date equipment, using Chitty and Altman's methodology.

P318 EXCESS DISTRIBUTION OF 99-100TH PERSONALISED CENTILE BIRTHWEIGHT BABIES IN NORTHLAND, NEW ZEALAND - A DEPRIVED AREA IN A DEVELOPED COUNTRY

Clow William, Rebecca Lamb, Kristy Wolff, Dale Corcoran, Peter Herbison, Tom Dawson
University of Otago, Dunedin, New Zealand

Objective: To study the factors related to the unusual distribution of centile births in Northland, New Zealand. – an area of a developed country where deprivation and housing overcrowding are associated with disproportionate numbers of extremely large babies (99 & 100th centiles)

Method: The personalised bithweight centiles of all 7525 babies (excluding twins) delivered in Northland between 2007& early 2011, where complete data on maternal height & weight, ethnicity, gestation at delivery, maternal smoking history, mode of delivery and apgar scores were available, were studied. The distribution of deliveries that occurred, expressed as a percentage of expected (75 deliveries per centile) were calculated. Statistical analysis of the factors associated with the unusual distribution was undertaken.



Result(s): Having corrected for maternal height, weight, gestation, sex and ethnicity using the New Zealand bulk centile calculator, Northland was found to have a significant excess of babies born at the very extremes of birthweight centiles. Using logistic regression statistical analysis, the unexpected excess of exceptional macrosomia.(99-100th centiles) was related to earlier gestation at delivery ($p<0.0001$), and maternal BMI ($p=0.014$). Screening for maternal gestational diabetes failed to detect many of these abnormally large babies. Assisted delivery, including emergency caesarean section, was less common for these deliveries and shoulder dystocia was rarely recorded.

Conclusion: The unusually high numbers of 99-100th personal centile birthweights in Northland, New Zealand are statistically related to early gestation and higher maternal BMI. The earlier deliveries may have meant that relative size had an undetectable obstetrical effect.

P319 DOES PLACENTAL DYSFUNCTION CONTRIBUTE TO THE INCREASED INCIDENCE OF STILLBIRTH WITH ADVANCED MATERNAL AGE?

Samantha Lean, Alexander E P Heazell, Tracey A. Mills, Jane Boscolo-Ryan, Linda Peacock, Rebecca L. Jones
Manchester Academic Health Science Centre, UK

Objective(s): Women of advanced maternal age (>35 years old) have an increased incidence of fetal growth restriction (FGR) and stillbirth. The aetiology is unknown; however FGR is closely linked to placental dysfunction, specifically altered placental morphology and imbalances in cell turnover. We hypothesised that placentas from women of advanced maternal age would exhibit altered morphology, suggesting that placental dysfunction contributes to the increased risk of FGR and stillbirth in these pregnancies.

Method(s): Term placentas were collected following uncomplicated pregnancies from women aged 20-30 (controls), 35-39 and ≥40 years old (n=15 per group). Villous tissue sections from 4 regions of each placenta were examined using standard histological techniques. The number of syncytial knots (STKs) per villous area (a marker of placental degeneration) were quantified. Sections were immunostained for endothelial cells (CD31) to assess villous vascularisation. Image analysis was performed using Image pro plus on 10 images per tissue section.

Result(s): There were an increased number of STKs present in the villous tissue of women aged 35-39 compared to control (26.2 vs. 18.8 STKs per mm^2 villous tissue, $p<0.05$; Kruskal-Wallis). Similarly, STKs were increased in women aged ≥40 compared to controls (27.6 vs. 18.8, $p<0.05$). Maternal age had no effect on the degree of vascularisation or number of avascular villi.

Conclusion(s): Increased presence of SNAs indicates exaggerated placental degeneration in women over 35 years. Although the cause and consequence of increased STKs is unknown, these are a common feature of placentas in other pregnancy pathologies (FGR, pre-eclampsia), as well as in post term pregnancies. There was no difference in the degree of placental vascularisation with maternal age, suggesting normal vascular development. Further studies will examine placental cell turnover and syncytiotrophoblast area, to understand the influence of maternal age on placental morphology and its potential role in poor pregnancy outcome in older women.

P320 PERINATAL OUTCOME IN SMALL-FOR-GESTATIONAL-AGE FETUSES WITH NORMAL UMBILICAL ARTERY DOPPLER AFTER 37 WEEKS

Silvio Martinelli, Roberto Eduardo Bittar, Mariana Fabbri Guazzelli de O. Pereira, Alexandre Nozaki, Vera Lúcia Jornada Krebs, Rossana Pulcinelli Vieira Francisco, Marcelo Zugaib
Hospital Das Clinicas, Sao Paulo, Brazil

Objective: Since it has been assumed that the small-for-gestational-age (SGA) fetuses with normal umbilical artery Doppler have a good perinatal outcome, it has been stressed the importance of managing them differently from growth restricted fetuses. It has been usually accepted that these fetuses may reach term, but timing of delivery that would allow better results remains unclear. The present study aims to clarify that question and establish the basis for new protocols for the management of SGA fetuses.

Methodology: A transversal case-control study was conducted between 2006-2010 at the Obstetrics Clinic of the University of Sao Paulo Medical School. Perinatal outcome was assessed from a group of 137 singleton SGA fetuses with normal umbilical artery Doppler matched by gestational age at delivery: between 37-37 6/7 weeks (group A, n= 69) and beyond 38 weeks (group B, n= 68). The diagnosis of SGA was confirmed after birth in all cases according to Alexander et al. (1996). Data were compared by chi-square, Fisher's exact test and Mann-Whitney U test, and the level of significance adopted was of 5%.

Result and Discussion: The average gestational age at birth was 37,3 weeks in group A and 39,1 weeks in group B (p<0,001). Fetuses on the group A presented lower birth weight (2271 g x 2526g, p<0,001). There were no statistically significant differences between the groups according to perinatal mortality, 5-minute Apgar score <7, umbilical artery pH < 7,20, hypoglycemia, hypocalcemia, sepsis, intensive care unit admission and orotracheal intubation. The incidence of neonatal jaundice was higher in group A (80% x 54%, p< 0,001).

Conclusion: Delivery of normal SGA fetuses near 40 weeks did not incur in a greater mortality or morbidity for the neonates. It also has the advantage of allowing a greater weight gain and maturity at birth.

P321 DEVELOPMENT OF BIRTH WEIGHT FOR GESTATIONAL AGE CURVES – SRI LANKAN EXPERIENCE

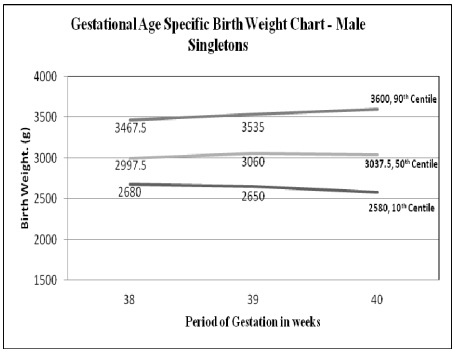
T. Ruwanpathirana, D.N. Fernando, H. Senanayake
Ministry of Health, Sri Lanka

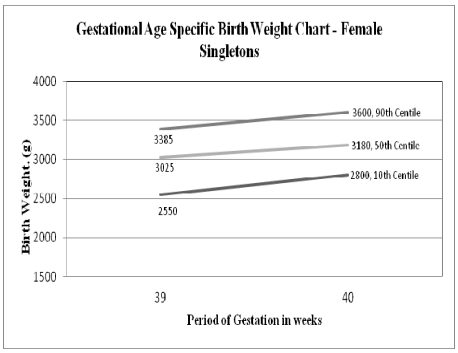
Objective: To develop weight for gestational age charts in a Sri Lankan setting

Method: A longitudinal approach was used where a sample of mothers (n=1200) in early pregnancy were followed up until after delivery. Study was conducted in two Medical Officer of Health areas, in Colombo district. All pregnant mothers registered by Public Health Midwives of the two areas whose period of gestation (POG) was assessed to be less than 14 weeks using ultrasonography and were planning to deliver in one of the five identified hospitals were included. Information on all possible risk factors contributing to low birth weight were assessed using a series of questionnaires, clinical examination, mother's records and hospital records. Birth records at the five identified hospitals were used to obtain data related to the birth.

Results: Records of 474 mother / newborn pairs (who did not have any risk conditions for low birth weight) were used for development of gestational age related birth weight charts for each sex and POG. Mothers with POG less than 38 weeks and more than 40 weeks were limited.

Incidence of Small for Gestational Age (SGA) assessed using the 10th centile value for each POG, was 19% for males and 18.6% for females. Among the babies who had birth weights more than 2500g, 11.6% were classified as SGA. Percentages of symmetrical and asymmetrical SGA newborns were 72.1% and 27.9% respectively.





Conclusion The charts were developed paying attention to all methodological aspects. Hence, they could be used for assessment of incidence and risk factors for SGA until charts based on national level data are available.

P322 THE INCIDENCE RATE OF DISCORDANT GROWTH IN DI-CHORIONIC TWINS IN A MULTI-ETHNIC POPULATION

Bassel Wattar, Debora Glover, Kausik Das
Heartlands Hospital, Birmingham, UK

Objective(s): to detect the incidence rate of discordant growth in di-chorionic twins in a multi-ethnic population and its implication on perinatal morbidity.

Method(s): retrospective observational study. 83 set of DCDA twins were included. Data was collected using electronic patient data and ultrasound reports were screened manually. Weight differences were calculated using birth weight.

Result(s): Discordant fetal growth (defined as 18% difference in birth weight) was noted among 16 sets of di-chorionic twins had discordant growth suggesting a high incidence rate of 19.3% (1 in 5).

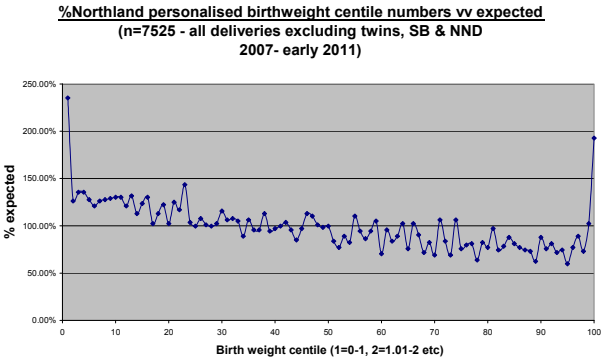
Conclusion(s): Fetal weight discordance has a high incidence rate in DCDA twins that continues to birth and was proven to increase the risk of perinatal morbidity. It is important to counsel the couple that there is a one in five chance of significant growth difference between the DCDA twins and regular growth monitoring with ultrasound remains the key element in managing discordant growth in di-chorionic twins.

P323 EXCESS DISTRIBUTION OF 0-1 PERSONALISED CENTILE BIRTHWEIGHT BABIES IN NORTHLAND, NEW ZEALAND - A DEPRIVED AREA IN A DEVELOPED COUNTRY

Clow William, Jennifer Blassingame, Peter Herbison, Tracey Hildreth
University of Otago, Dunedin, New Zealand

Objective: To study the factors related to the unusual distribution of low centile births in Northland, New Zealand – an area of a developed country where deprivation and housing overcrowding are associated with disproportionate numbers of extremely small babies (<=1%)

Methods: Data: 7525 deliveries (excluding twins) in Northland between 2007-11, where complete data on maternal height & weight, ethnicity, gestation at delivery, maternal smoking history, mode of delivery and apgar scores were available, were studied. Personalised bithweight centiles were calculated. The distribution of deliveries, expressed as a percentage of expected (approx.75 per centile) were calculated. Statistical analysis of the factors associated with the unusual distribution was undertaken.



Result(s): Having corrected for maternal height, weight, gestation, sex and ethnicity using the New Zealand bulk centile calculator, Northland was found to have a significant excess of babies born at the very extremes of bithweight centiles. Using logistic regression statistical analysis, the unexpected marked excess (240%) of extremely low centile birth weight <=1% babies was associated with current smoking (p<0.0001), higher maternal parity (p=0.006) , early gestation (p=0.011) & maternal BMI (p=0.005. While ethnicity (particularly Maori) and still birth were originally statistically significant, that significance disappeared on logistical regression. While induction rates were higher in the small babies, emergency caesarean sections & low apgar scores (<6@5mins) were less common, but, as expected, the perinatal death rate of 38.9 compared unfavourably with 9.6 overall.

Conclusion(s): The unusually high numbers of 0-1 personal centile birthweights in Northland. New Zealand are statistically related to smoking, BMI and early gestation. The very low birthweight centiles were not associated with excess delivery problems, apart from the adverse perinatal outcomes.

P324 DEVELOPMENT OF THE BIRTHWEIGHT APPROPRIATENESS QUOTIENT: A CUSTOMISED MEASUREMENT OF BABY'S SIZE

Gibbons KS, Chang AMZ, McIntyre HD, Mamun A
Mater Medical Research Institute, Brisbane, Australia

Objective: The customised birthweight model (CBM) has been suggested to improve detection of babies that may be at risk of adverse outcomes associated with abnormal growth. However CBM is currently used in conjunction with either an intrauterine growth standard or the individualised birthweight ratio (IBR), both of which have significant methodological flaws. This study aimed to investigate the statistical validity of the IBR, and should the measure appear statistically flawed, to develop a new measurement to represent the appropriateness of a baby's size at birth.

Method: Routinely collected data on singleton, term births was extracted from the clinical databases of the Mater Mothers' Hospital, Brisbane, Australia, for the time period 1998-2009 inclusive. The relationships between birthweight, customised birthweight and IBR were investigated using correlation, regression analysis and division of births into groups of <2500g, 2500-4000g and >4000g. A new measure, the Birthweight Appropriateness Quotient (BAQ), was developed via a transformation of the cubic relationship between birthweight and IBR. The utility of the BAQ was compared with IBR and birthweight in identifying infants with adverse neonatal outcomes.

Result: There were statistical flaws with the IBR due to significant correlation between birthweight and customised birthweight, as well as a heterogeneous relationship between these two measurements across the range of birthweight. By contrast, BAQ is uncorrelated with birthweight. Comparison of BAQ and IBR as indicators of adverse neonatal outcome demonstrates that BAQ identifies babies at risk due to their small size as well as those babies at risk due to inappropriate growth.

Conclusion: BAQ is a customised measurement of baby's size free of the statistical flaws experienced by the IBR with the ability to identify at-risk infants.

P325 USE OF CUSTOMISED BIRTHWEIGHT CENTILES IN FETUSES WITH CONGENITAL HEART DISEASE

Story L, Pasupathy D, Sankaran S, Sharland G, Kyle P
St Thomas' Hospital, London, UK

Objective: No study has fully assessed specific growth patterns in fetuses with Congenital Heart Disease (CHD), nor defined birthweight on customised centile charts, known to have improved predictive value for perinatal morbidity and mortality. This study aims to compare customised and population centiles in the CHD population and assess if low birthweight is associated with poorer perinatal outcome.

Method: A retrospective review of cases of CHD managed and delivered at St Thomas' Hospital and the Evelina Children's Hospital 2006-2011 was performed. Fetuses with antenatal evidence of karyotype abnormalities and multiple pregnancies were excluded. Standard population centiles and customised birthweight centiles were calculated and pregnancy outcomes recorded. Chi Squared and logistic regression were used for statistical analysis.

Result: 461 pregnancies had data available for calculation of customised birthweight centile charts and outcome data for 449 cases. There were 9 intrauterine deaths. The number of fetuses with birthweights less than the 10th centile on population and customised centiles and outcome can be seen below (see table on page 2). 19% of cases had a birthweight centile <10th on population and 28% on customised. A customised birthweight <10th centile was associated with a higher incidence of neonatal death (p=0.03). Independent of classification on population charts, a customised birthweight centile <10 is associated with a lower likelihood of livebirth (p=0.04).

	Birthweight <10th Population Centile		**Birthweight >10th Population Centile**	
	<10th Centile Customised	**>10th Centile Customised**	**<10th Centile Customised**	**>10th Centile Customised**
Number of Cases	79 (18%)	5 (1%)	44 (10%)	319 (71%)
Gestation at Delivery (wks) *Median* *Interquartile Range*	 38+2 36+6-39	 38+5 38+4-40+2	 38+4 37+4-39+2	 38+5 38+2-39+2
Birthweight at Delivery (g) *Median* *Interquartile Range*	 2250 1770-2550	 2790 2450-2930	 2745 2495-2887	 3230 2980-3530
Outcome *Live to date* *Neonatal Death* *(IUD)*	 61 (77%) 15 (19%) 3 (4%)	 5 (100%) 0 0	 34 (77%) 8 (18%) 2 (5%)	 274 (86%) 41 (13%) 4 (1%)

Conclusion: A significant proportion of fetuses with CHD have low birthweight and the use of customised birthweight centiles increases its detection. A birthweight less than 10th centile is associated with an increased risk of neonatal death.

P326 THE LUMBAR SPINE LENGTH AND THE FEMUR-TRUNK DISCREPANCY (FTD)

Amal Aabadli Kandri Rody, L. Legendre, Claude Virtos
*Maternité de Dreux France. °Université René Descartes Paris. France.

Objective: To show the role of the lumbar spine length (LSL), for evaluating the fetal stature and proportions, and in case of short femur, to get a clear idea, whether the fetus is short overall, or whether he has only short long bones.

Method: The first part of this study was retrospective, to demonstrate the LSL's reliability for evaluating the fetuses' longitudinal dimension .the second step was prospective, to show the applicability in ultrasound (Table below). All skeletal anomalies were excluded. A FWE formula including (AC) (HC) (BPD) (FL) and (LSL), has been used in a sample of 60 fetuses, to show its possibility. The femur-trunk discrepancy (FTD) is defined by the difference between the statures estimated by femur and by LSL. The greater is this result, the more disproportioned is the fetus.

Result: In feto-pathological files: Strong correlation between the (LSL) and the fetal stature(r: 0.9785 95% CI: 0.9714 to 0.9839 P <0.0001). The two methods (FL) and (LSL), have given a close evaluation of the fetal statures noted on the reports: A One-way ANOVA test showed, a P value not statically significant: 0, 7342. In ultrasound: the mean of the (FTD) was 0, 5031(95% confidence interval: 0, 3383 to 0, 6679) Bland Altman test: Bias of 0,503072, SD: 2, 19608 95%. Limits of agreement: from -3, 80124 to 4, 80738. The formula using AC HC BPD FL and LSL, has given a FWE comparable to the Hadlock formula, with some differences (see supplemental data).

	Prospectivestudy:198 feto-pathological files (after termination radiographs)	Retrospective study : 682ultrasound biometrics (16-39 week gestation)
Measurements	-**Lumbar spine length** from L1 to S1 on roof to on roof -**The femur length** diaphisis.	Idem
Method	A: **Olivier and Pineau** method (Fetal stature = 6.29 (FL) + 4.42 + / - 1.82cm) B: **LSL method**: Fetal stature=LSLx10 (cm)	Idem

Conclusion: A strong correlation between fetal stature and fetal lumbar spine length has been proven. This implies that we can use this easy measure in ultrasound, to evaluate the fetal stature; and by the way of the FTD, to get a clear idea of the fetal proportions. The LSL could be used in FWE formula.

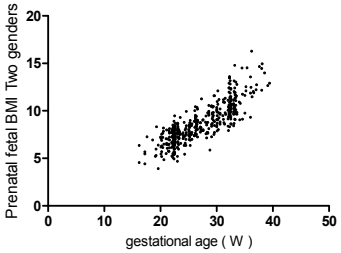
P327 THE FETAL BMI IN ULTRASOUND

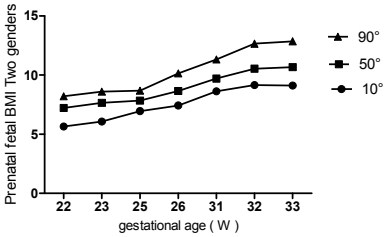
Amal Aabadli Kandri Rody*°. Lydie Legendre* .Claude Virtos*.
*Maternité de Dreux France. °Université René Descartes, Paris, France.

Objective: To determine whether the fetal BMI is a variable during the pregnancy, and assess its clinical usefulness.

Method: This is a prospective study, including 485 ultrasound examinations from 16 to 39 weeks gestation, excluding all fetal skeletal malformations, and imprecise dating. Hadlock, Olivier&Pineau and Quetelet formulas were used for fetal Weight, stature, and BMI. The FBMI were compared to post natal premature BMI curves. The women, who underwent elective Caesarean section before labour, or an instrumental vaginal delivery for fetal abnormalities, were excluded.

Results: Strong correlation between the fetal BMI and the gestational age: (Pearson r 0, 8436, 95% confidence interval 0.8154 to 0.8678 R squared 0, 7117 P value < 0.0001). A first ultrasound fetal BMI percentile curve (10 °, 50 °, and 90 °) was outlined.133 pregnancy outcomes are known, among them 5 had a BMI above 95 °in the third trimester ultrasound (Group B) and 128 a BMI under 95 ° (Group A). The comparison between the two groups shows for a difficult delivery (instrumental or caesarean section) a Likelihood ratio: 2,88; a Relative risk : 2.226 (95% confidence interval :0.7149 to 6.931), a low sensitivity (8% 95% confidence interval 0.009840 to 0.2603) , a high specificity(97,22% 95% confidence interval :0.9210 to 0.9942) but a P value (P: 0.2363). The smallness of group B probably explains the p value , the low sensitivity and the 95% confidences.





Conclusion: Direct correlation between the gestational age and the fetal BMI, and existence of a centile distribution. Therefore, some foetuses are too big for their stature and others too thin for it. Are an excessive FBMI a sign of macrosomia (in some contexts hydrops), and too small an FBMI a sign of IUGR, despite the fetal estimated weights are normal or border line? This question remains open.

P328 3D FETAL VOLUMES IN A NORMAL OBSTETRIC POPULATION, THEIR RELATIONSHIP TO BIRTHWEIGHT AND GESTATION

Simcox L, Bamford N, Lee S, Johnstone E
St. Mary's Hospital, Manchester, UK

Objective: We aimed to assess the value of 3D volume acquisition in predicting final birth weight in a low risk pregnant population.

Introduction: Evidence suggests that 3D sonography allows more accurate assessment of fetal weight by including soft tissue volume. This, however, is based on cross-sectional data from the late third trimester, rather than from prospectively collected series. The current study assesses if fetal organ volumes earlier in pregnancy can be used to predict birth weight. This will allow us to identify pregnancies at risk of fetal growth restriction.

Method: 50 patients have been evaluated to date in this ethically approved (10/H1013/9), prospective cohort study. Standard 2D fetal biometry (head circumference, biparietal diameter, abdominal circumference and femur length) and 3D organ volumes (placenta, head, kidney and thigh at 14-16 weeks, head, kidney and thigh at 18-20 weeks, and kidney and thigh at 26-28 weeks gestation) were acquired during each trimester. Automated volume measurements were obtained using the Siemens *syngo four*Sight ViewTool. Simple linear regression analysis was performed with gestation, birth weight and birth weight percentile as outcome variables.

Results: A significant association with fetal head($r=0.721$, $p<0.0001$) and thigh volume ($r=0.474$, $p<0.0006$) with gestation at 14-16 weeks was demonstrated. There was also a significant association with fetal head($r=0.541$, $p<0.0001$), thigh ($r=0.483$, $p<0.0001$) and kidney volume ($r=0.293$, $p<0.0036$) with gestational age at 18-20 weeks. No significant association was found between fetal volumes during each gestation and birthweight percentile. However, placenta volume at 14-16 weeks ($r=0.198$, $p<0.0227$) and thigh volume at 18-20 weeks gestation ($r=0.161$, $p<0.0422$) were significantly associated with final birth weight.

Conclusion: We have shown a significant correlation between some, but not all, of the parameters assessed in early pregnancy and final birth weight. Longitudinal analysis may enable predictive growth charts to be produced.

P329 INCREASED FETAL BRAIN PERFUSION AND NEONATAL NEUROBEHAVIORAL PERFORMANCE IN NORMALLY GROWN BABIES

Francesc Figueras, Raquel Mula, Miguel Parra-Saavedra, Stefan Savchev, Angela Arranz, Magda Sanz, Eduard Gratacos
University of Barcelona, Spain

Objective: To explore the association between fetal cerebroplacental ratio (CPR) and frontal brain perfusion at third trimester with neonatal neurobehavioral performance in normally grown babies.

Method: Cerebroplacental ratio and frontal brain perfusion measured by fractional moving blood volume (FMBV) were assessed in 258 consecutive healthy fetuses at routine third trimester scan (32-35.6 weeks). Neonates were evaluated with the Neonatal-Behavioral-Assessment-Scale (NBAS). The association between Doppler parameters and neurobehavior was analyzed by MANCOVA and logistic regression, with adjustment for smoking, socio-economic class, mode of delivery, gestational age at birth, postnatal days at examination and gender.

Results: Fetuses with increased FMBV (in the upper quartile) had lower neurobehavioral scores in all areas, reaching significance in social (6 vs. 6.4; p 0.025), motor (5.6 vs. 5.8; p 0.041) and attention (5.3 vs. 5.9; p 0.005). Fetuses with increased FMBV had higher risk of abnormal (<10th centile) social (OR 2.9 [95CI% 1.33-6.5), motor (OR 3.3 [95%CI 1.36-8.1]) and attention (OR 2.5 [IC95% 1.1-5.8]) scores. Fetuses with lower CPR (in the lower quartile) did not differ in their neurobehavioral scores from those with normal values.

Conclusion: Normally grown fetuses with increased frontal brain perfusion have poorer neurobehavioral competences, suggesting a disrupted neurological maturation.

P330 ELEVATED BRAIN WEIGHT/ LIVER WEIGHT RATIO IN NORMAL BODYWEIGHT CENTILE TERM PERINATAL DEATHS: AN INDICATOR OF TERMINAL INTRAUTERINE MALNOURISHMENT?

Tamas Marton, Beata Hargitai, Claire Bowen, Phillip M Cox.
Birmingham Women's Hospital, Birmingham, UK

Objective: In recent years we have noted that a proportion of antepartum/intrapartum stillbirths (IUD), with a normal or elevated body weight centile also show an elevated brain weight : liver weight ratio. We postulate that this is an indication of intrauterine malnourishment/incipient intrauterine growth restriction (IUGR) which may have a bearing on the cause of death.

Method: This is a retrospective study, based on our departmental post mortem MS access database. All cases with a consented post mortem examination are entered in the database (more than 3000 entries in the last four years). For the purposes of this study we have identified 331 cases, 37/40 weeks gestation and over of IUD/intrapartum death (254; 77%) or early neonatal death (77; 23%) respectively. A brain weight/ liver weight ratio (BLR) of >4.0 was regarded as abnormal. The customised body weight centile was calculated using a centile calculator (www.gestation.net/birthweight_centile/birthweight_centiles.htm).

Results: Of the 331 cases, the BLR was >4.0 in 74 (22.4%). 19 (25.7%) of these 74 cases had a body weight above the 25th centile and these were all IUD's. Of these, 6 had elevated brain weight: thymus weight ratio (>60) as an indication of thymic atrophy/stress. Where data were available, 10 out of the 16 (62.5%) mothers were overweight and obese (BMI>25) and 7 were obese (BMI>30) (43.8%).

Conclusions: Our data show that in approximately one quarter of unselected cases of perinatal death with a brain: liver weight ratio of >4, the body weight is above the 25th customised centile. One third of these show thymic atrophy. We suggest that this indicates intrauterine malnourishment/incipient IUGR, which would be missed if weight centile is the only criterion used to assess IUGR/fetal nutrition. Nearly two-thirds of the cases had an increased maternal BMI. It is possible that in this group the altered carbohydrate metabolism of the mother resulted in a macrosomic baby, who suffered a terminal decline in placental nutrient supply.

Presenting authors

Alexander Heazel S362
Manchester Academic Health Science Centre,
Manchester, UK

Karin Kallen S253
Lund University,
Lund, Sweden

Azriny Khalid P317
University College
Cork, Ireland

M Khan P110
Baqai Medical University
Karachi, Pakistan

Mahjabeen Khan S392
Dow University of Health Sciences,
Karachi, Pakistan

Ali Khashan S232, P225
University College,
Cork, Ireland

Rebecca Lamb P318
University of Otago,
Dunedin, New Zealand

Katherine Laughon P118
Eunice Kennedy Shriver National Institute
Bethesda, USA

Samantha Lean P319
Academic Health Science Centre
Manchester, UK

Christoph Lees K382
Addenbrooke's Hospital,
Cambridge, UK

Elisa Llurba S223, S243
University of Maryland,
Baltimore, USA

Amita Mahendru P234
Addenbrooke's Hospital,
Cambridge, UK

Mahlatse Makgoba S393
Imperial College
London, UK

Edel Manning P211
Cork University Maternity Hospital
Ireland

Silvio Martinelli P320
Hospital Das Clinicas
Sao Paulo, Brazil

Bill Martin K384
Birmingham Women's Hospital
Birmingham, UK

Tamas Marton P330
Birmingham Women's Hospital
Birmingham, UK

Fergus McCarthy P221
University College
Cork, Ireland

Lesley McCowan K235
University of Auckland
Auckland, New Zealand

Karl McPherson P226
Princess Royal Maternity
Glasgow, United Kingdom

Laura Miller P222
University of Bristol
United Kingdom

Nurridin Mohammed P120
Aga Khan University Hospital
Karachi, Pakistan

Isabelle Monier S254
INSERM,
Paris, France

Lara Morely P310
St James University Hospital,
Leeds, United Kingdom

Sharma Munim P114, P117
Aga Khan University Hospital
Karachi, Pakistan

Kypros Nicolaides K241
King's College,
London, UK

Aris Papageorghiou K373
Oxford University
Oxford, UK

Graham Parry P228
Middlemore Hospital, Auckland
New Zealand

Dharmintra Pasupathy K395
St Thomas' Hospital,
London, UK

Leona Poon S113, S242
Kings College,
London, UK

Esther Reid S394
Queens University,
Belfast, UK

Alina Rodriguez P218
Imperial College,
London, UK

Alphonse Roex S255
Lyell McEwin Hospital,
Adelaide, Australia

Thilanga Ruwanpathirana P321
Ministry of Health
Sri Lanka

Joyce Sande P119
Aga Khan University Hospital
Nairobi, Kenya

Ayesha Sania S222, P116
Harvard School of Public Health,
Boston, USA

Sicco Scherjon K383
St Lucas Andreas Hospital
Amsterdam, Netherlands

Andrew Sharp P223
Liverpool University
Liverpool, UK

Andrew Shennan K245
Kings College,
London, UK

Louise Simcox P328
St. Mary's Hospital,
Manchester, UK

Karolina Skorupskaite P214
New Royal Infirmary
Edinburgh, UK

Michelle Southam S234
Perinatal Institute,
Birmingham, UK

Dale Spence P124
Queen's University,
Belfast, Northern Ireland

Tomasina Stacey S256
St James University Hospital,
Leeds, UK

Petru Stratulat P115
Health Protection Research Institute,
Chisinau, Republic of Moldova

Lisa Story P325
St Thomas' Hospital,
London, UK

Ann Tonks P235
Perinatal Institute,
Birmingham, UK

Jacoba Van der Kooy S231
Erasmus MC,
Rotterdam, Netherlands

Julia Unterscheider S381
Perinatal Ireland Research Consortium,
Dublin, Ireland

Linda Vanotoo P111
Ghana Health Service
Ghana

Amber Vos P219
University of Applied Sciences
Rotterdam, Netherlands

Bassel Wattar P322
Heartlands Hospital,
Birmingham, UK

Mandy Williams S116, P123
Perinatal Institute,
Birmingham, UK

Christina Yu P311
Kings College,
London, UK

Jennifer Zeitlin K224
INSERM,
Paris, France

Jun Zhang K111
Shanghai Jiao Tong University,
Shanghai, China

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