THE EDMONTON OBESITY STAGING SYSTEM AND PREGNANCY OUTCOMES IN WOMEN OVERWEIGHT AND OBESITY: A SECONDARY ANALYSIS OF A RANDOMISED CONTROLLED TRIAL.

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BACKGROUND

While useful on a population basis, body mass index (BMI) does not provide insight into body composition, an important predictor of health outcomes, or the impact of excess adiposity on markers of health (1, 2). The American Association of Clinical Endocrinologists recommend the use of complication-based schema to inform obesity management (3, 4).The Edmonton Obesity Staging System (EOSS) is proposed to assess the clinical severity of overweight and obesity (5). This is the first study to apply stage 0-2 EOSS to a general pregnancy cohort of women with BMI≥25kg/m^2.

1. Gill et al., Soz Praventivmed. 2003;48(3):191-200.
2. Ross, et al. Nat Rev Endocrinol. 2020;16(3):177-89.
3. Ejima , et al. Obesity (Silver Spring). 2020;28(2):353-61.
4. Garvey et al., Endocr Pract. 2016;22 Suppl 3:1-203.0
5. Sharma and Kushner. Int j obesity (2005). 2009;33(3):289-95.

AIMS

The primary aim of this study is to determine the severity and change in EOSS scores in women with overweight and obesity but otherwise healthy pregnancy. As a secondary aim, we explore potential relationships between EOSS and pregnancy and birth outcomes.

METHODS

This is a secondary analysis (n=348) of the Pregnancy Exercise and Research Study (PEARS). The trial employed an m-health-supported lifestyle intervention among pregnant women with BMI ≥25kg/m2 in Dublin, Ireland. EOSS was applied in early (14-16 weeks) and late (28 weeks) gestation using fasting lipids, glucose, blood pressure and maternal wellbeing (WHO-5 Wellbeing). Outcomes included gestational age, mode of delivery and infant size. Pearson's correlations, chi-square statistics and multiple logistic regression were used to identify relationships. One way analysis of variance was used to identify differences between groups.

Table 1: Individual criteria used for application of the Edmonton Obesity Staging System (EOSS))

	Stage 0	Stage 1	Stage 2*
Glucose (mmol/L)	<5.6	5.6-6.9	>6.9
Triglyceride (mmol/L)	<1.7	1.7-2.26	>2.3
Total Cholesterol (mmol/L)	<5.2	5.2-6.1	>6.1
LDL Cholesterol (mmol/L)	<3.3	≥3.3	>4.2
HDL Cholesterol (mmol/L)	≥1.6	<1.6	<1.0
Systolic blood pressure (mmHg)	<130	130-140	>140
Diastolic blood pressure (mmHg)	<85	85-90	>90
WHO 5 Wellbeing score (%)	≥13	<13	<7
EOSS Stage 1 or 2 is given if the individual has any one or more criteria in line with the corresponding cut offs. Early pregnancy EOSS scores used all variables in the table while late pregnancy EOSS included triglyceride concentrations, total cholesterol, LDL cholesterol, HDL cholesterol, systolic blood pressure, diastolic blood pressure and WHO 5 Wellbeing score only. * A diagnosis of PIH, PET or GDM also resulted in a stage 2 EOSS score in late pregnancy.			

RESULTS

The mean (SD) age was 32.4 (4.4) years and median (IQR) was BMI 28.0 (26.6, 29.9) kg/m^2 (Table 2).

Table 2: Maternal and infant characteristics in the PEARs study (n = 348)

	n	Mean (SD)
Age (years)	347	32.4 (4.4)
Body Mass Index (kg/m^2)*	348	28.0 (26.6, 29.9)
Body Mass Index category (n,% obesity)	348	84 (24.1)
Ethnicity (n, % White)	338	320 (94.7)
Education (n, % completed third level)	337	208 (61.7)
Smoking in early pregnancy (n, % current)	300	13 (4.3)
Parity (n, % 1 or more)	348	163 (46.8)
Socioeconomic status (n, % above average advantage)	348	250 (71.8)
Study group (n,% intervention)	338	165 (49.4)
Mode of delivery (n, % caesarean delivery)	344	92 (26.7)
Infant sex (% male)	340	84 (24.1)
Birth weight (g)	344	3640.2 (553.5)
Low birth weight (% <2500g)	344	9 (2.6)
Macrosomia (% >4000g)	344	78 (22.7)
Small for gestational age (n, % < 10th centile)	322	24 (7.5)
Large for gestational age (n, % >90th centile)	322	35 (10.9)
Placental weight (g)	303	661.1 (143.9)
Birth length (cm)	317	51.2 (2.4)
Head circumference (cm)*	312	35.2 (34.3, 36.0)
Gestational age at delivery (days)*	342	284.0 (275.0, 288.0)
Preterm birth (n, % <37 weeks)	342	15 (4.4)
Continuous data are presented as mean ± Standard Deviation unless * which is median (interquartile range). Early refers to data collected between 14-16 weeks and late refers to data collected at 28 weeks' gestation. Met = metabolic equivalent of task.		

The proportion of EOSS scores ≥1 was 81.9% and 98.9% in early and late pregnancy using metabolic criteria and 87.6% and 98.9% when wellbeing was added. Metabolic parameters worsened throughout gestation in 60.1%, resulting in a higher EOSS score with 10.5% experiencing a 2-point increase. There was no impact of the intervention on EOSS score p=0.604.

RESULTS

Table 3 shows the differences in pregnancy outcomes by EOSS category. In unadjusted multiple logistic regression, a potential relationship between ear0ly EOSS score and large-for-gestational age was found $\chi 2=6.422$, df(2), p=0.04, though significance was lost when controlled for known confounders p=0.223.

Table 3: Maternal and fetal outcomes by metabolic Edmonton Obesity Staging System (EOSS)

	Early pregnancy (metabolic only)							Late pregnancy (metabolic only)						
	EOSS 0		EOSS 1		EOSS ≥2		p	EOSS 0		EOSS 1		EOSS ≥2		p
	n		n		n			n		n		n		
Gestational age at delivery (days)*	59	284.0 (275.0, 289.0)	170	284.0 (275.0, 289.0)	113	283.0 (274.0, 287.0)	0.966	3	269.0 (266.0, 269.0)	29	285.0 (276.0, 289.50)	242	284.0 (275.0, 288.0)	0.082
Birth weight (g)	60	3558.12 (623.57)	171	3652.89 (522.29)	113	3664.56 (561.21)	0.444	3	3778.33 (452.94)	29	3586.72 (504.70)	243	3656.41 (563.59)	0.936
Low birth weight (<2500g)	3	5.0	4	2.3	2	1.8	0.534	0	0.0	1	3.4	6	2.5	0.584
Macrosomia (>4000g)	10	16.7	41	24.0	27	23.9	0.471	1	33.1	3	10.3	64	26.3	0.159
Small for gestational age (< 10th centile)	6	10.7	11	6.8	7	6.7	0.592	0	0.0	1	3.4	18	7.5	0.762
Large for gestational age (>90th centile)	5	8.9	12	7.5	18	17.1	0.040	1	33.3	1	3.4	28	11.6	0.191
Placental weight (g)	50	636.72 (131.37)	151	655.07 (136.54)	102	681.98 (158.31)	0.146	3	631.0 (37.32)	28	642.46 (156.77)	219	663.72 (144.06)	0.891
Birth length (cm)	53	50.91 (3.11)	158	51.21 (2.24)	106	51.46 (51.75)	0.418	3	50.0 (1.32)	28	51.12 (2.07)	219	51.23 (2.52)	0.581
Head circumference (cm)*	53	35.0 (34.0, 36.0)	155	35.30 (34.30, 36.20)	104	35.0 (34.50, 36.18)	0.442	3	35.0 (34.70, 35.0)	26	35.35 (34.03, 36.0)	219	35.20 (34.50, 36.30)	0.689
Mode of delivery (caesarean delivery)	15	25.0	40	23.4	37	32.7	0.207	1	33.3	7	24.1	62	25.2	1.000
Preterm birth (<37 weeks)	3	5.1	10	5.9	2	1.8	0.252	0	0.0	1	3.4	10	4.1	0.924
Continuous data are presented as mean (standard deviation) unless * which is median (interquartile range of 25th, 75th centile). Categorical variables (Low birth weight, macrosomia, ,small for gestational age, large for gestational age, mode of delivery and preterm birth) are reported as n (%) of the outcome. p values for continuous variables are generated through analysis of variance while categorical variables were compared using chi-square statistics, except in the case of cell numbers below expected count (Fischer's exact statistics reported.)														

CONCLUSION

In early pregnancy, most women overweight and obesity are considered "at risk" of obesity-associated complications using the EOSS, limiting the clinical utility of the tool in predicting pregnancy complications.

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