

Determinants of insulin resistance and obesity in newborns of obese Mothers.

Zaheera Saadia*, Khalid Nasrallah, Thekra Abdulrahman Alsamel· Latifah Al-Mutlaq

^aCorrespondence: Professor Dr Zaheera Saadia. Department of Obstetrics and Gynecology, College of Medicine, Qassim University, 52571, Saudi Arabia, Email id: zmhmod@qu.edu.sa , zaheerasaadia@hotmail.com



OBJECTIVES:

Research, gaps remain in deciding, how to assess newborns at risk, of long-term consequences. Many anthropometric measurements have been used for determining neonatal obesity like height, weight, weight/Length ratio.

Low Ponderal index (PI= Weight(grams)×100/Length cm³ had a well- established link to fetal malnutrition, However, high PI and its association with neonatal obesity reveals conflicting results. We hypothesized that maternal weight, height, fetal gender will predict whether a newborn will have low or high PI in obese women.

MATERIALS AND METHODS

Design: Quantitative cross -sectional study. Women delivering at MCH hospital Buraydah, Al Qassim, Saudi Arabia between 36 weeks-40 weeks of gestation were included

Methods:

- Sample size of 246 had 95% Confidence level with margin of error 5. Pre pregnancy or BMI measured before 10 weeks of gestation was used to calculate maternal obesity. BMI below 18.5 is underweight and between 25 and 29.9 is overweight, 30 or above is obese
- PI of below 2 was considered low, 2-3 as normal and above 3 as Macrosomia.
- Neonatal cord blood sugar level was assessed to determine insulin resistance. It was considered low below 70mg/dl, high above 150mg/dl and normal 70- 150mg/dl.
- Multinomial regression was used to see the predictors of fetal obesity (using ponderal index) and insulin resistance (using blood sugar levels). We hypothesized that maternal weight, height, BMI, age, fetal gender will predict whether a newborn will fall in ponderal index low or high

RESULTS:

- Model fitting for neonatal obesity was significant [X²(10), 62.365, p-value 0.00]
- Maternal weight [b= -0.059, SE 0.25, p values, 0.019]. Each kg increase in maternal weight decreases the likelihood of newborn having LBW by an OR of 0.94
- With increase in maternal weight the likelihood of a newborn to be obese increased by an OR of 1.55. Each unit increase in maternal height decreased the chances of a newborn to be obese by an OR of 1.97. Newborns with high PI were more likely to be hyperglycemic with an OR of 0.032

Conclusion: PI correlates between maternal and neonatal obesity. Maternal obesity decreases the likelihood of newborn having LBW while increases the likelihood for neonatal obesity. Newborns with PI were more likely to be hyperglycemic. These babies need to be followed long-term for prevention strategies.

Table 1. Characteristics of study participants	
Variable	Median (IQR) or Count (%)
Maternal Characteristics	
Age	33(IQR=29-38)
Weight	74(IQR=63-82)
BMI	33 (IQR=26-33)
BMI classification	
Overweight (25-29.9)	5
Obese (Over 30)	125 (50)
Class 1 (30-34.9)	75(30)
Class 2 (35-39.9)	34(13.6)
Class 3 (40 or above)	16(6.4)
Gravidity	
P1	87(34.8)
G2-G3	100(40)
G6-G9	53(22)
G10-G12	8(3.2)
Gestational age	37 (IQR=37-38)
Mode of delivery	
Cesarean section	168(67.6)
SVD	79(31.6)
Instrumental delivery	20(8)
Fetal Characteristics	
Fetal Gender	
Male	133(53.2)
Female	117(46.8)
Fetal Weight	2.5(IQR=1.9-3.1)
Low birthweight (Below 2500gm)	120(51.4)
Normal (2500-3900grams)	108(43.2)
Macrosomia (4000 and above)	13(5.2)
Fetal blood sugar level	
Hypoglycemic	154(61.6)
Normal	92(36.8)
Hyperglycemic	4(1.6)

Table 2. Maternal Predictors of neonatal Obesity									
Ponderal index categories ^a		B	Std. Error	Wald	d f	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
1	Intercept	5.87	5.226	1.26	1	0.26			
*PI <= 2	Maternal weight (Kg)	0.05	0.025	5.53	6	0.01	0.942	0.897	0.99
	Maternal height (m)	2.00	3.264	0.37	1	0.53	0.134	0	80.693
LBW**	BMI	0.02	0.057	0.24	1	0.61	1.029	0.92	1.151
	New born gender	0.05	0.325	0.02	1	0.86	0.947	0.5	1.792
	Parity	0.14	0.097	2.19	1	0.13	0.866	0.716	1.048
		39.5	21.2	3.48	1	0.06			
3	Intercept	39.5	21.2	3.48	1	0.06			
PI >= 3	Maternal weight (kg)	0.22	0.119	2.68	1	0.05	1.255	0.995	1.584
	Maternal height (m)	29.2	13.638	4.60	1	0.03	1.98E-13	4.86E-25	0.08
Macroscopic	BMI	0.04	0.288	2.16	1	0.14	0.654	0.372	1.151
	New born gender	0.04	0.473	0.01	1	0.92	1.048	0.415	2.648
	Parity	0.02	0.133	0.04	1	0.82	0.972	0.748	1.262

a. The reference category is: 2.00 (PI=2-3 Normal), LBW=Low birth weight, PI=Ponderal index

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Table 3. Predictors of blood sugar levels in neonates of obese women								
New born bloodsugar level_cat ^a		B	Std. Error	Wald	d	Sig.	95% Confidence Interval for Exp(B) Lower Bound Upper Bound	
1	Intercept	-0.422	0.727	0.33	1	0.562		
Low	MATERNALWEIGHT	0.013	0.01	1.62	1	0.202	1.01	0.993
	GHTKG			5	1	0.202		1.033
Below 70mg/dl	NEWBORNWEIGHT	0.159	0.171	0.86	1	0.353	0.85	0.61
	HTKG			3	1	0.353		1.193
	Ponderal_cat	0.243	0.277	0.77	1	0.378	1.27	0.741
				4	1	0.378		2.196
3 High	Intercept	12.57	3.796	10.9	1	0.001		
Above 150mg/dl	MATERNALWEIGHT	0.04	0.027	2.15	1	0.142	1.04	0.987
	GHTKG			6	1	0.142		1.098
	NEWBORNWEIGHT	-0.061	0.588	0.01	1	0.918	0.94	0.297
	HTKG			1	1	0.918		2.977
	Ponderal_cat	2.735	1.273	4.61	1	0.032	15.4	1.271
				6	1	0.032		186.95

a. The reference category is: 2.00. (70-150mg/dl)

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