ORIGINAL ARTICLE

The impact of maternal obesity on neonatal Apgar score and neonatal Intensive care unit admissions in a tertiary care hospital

Tehmina Parveen, Farah Hameed, Jawad Azeem Khan

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Civil Hospital, Karachi.
JA Khan

Hamdard College of Medicine & Dentistry/ Hamdard University Hospital, Karachi.
T Parveen
F Hameed

Correspondence:
Dr. Tehmina Parveen,
Flat# C-16, Block 17,
Gulshan-e-Iqbal, Karachi
Cell: 0331-4138682
Email: tehmina.jawwad@yahoo.com

Abstract:

Introduction: Maternal obesity is becoming a common health problem worldwide, it adversely affects maternal and fetal outcomes and increase incidence of low Apgar scores at birth and NICU admissions.

Objective: The primary objective of our study was to determine the impact of maternal obesity on neonatal Apgar scores and NICU admissions and to evaluate the common reasons of NICU admissions.

Material and methods: We conducted a cross-sectional study from January 2015 to December 2016 at Hamdard University Hospital, Taj Medical Complex. The reproductive age women with singleton pregnancies were included in this study. Their BMI calculated at booking visits and followed to see the effect of obesity on neonatal Apgar scores and NICU admissions. The data was analyzed by using SPSS version.21.

Results: Total 370 women were included in this study. 126(34%) were overweight, 86(23.2%) were obese and 31(8.4%) were morbidly obese. 124(33.5%) developed GDM, 69(18.6%) women developed PIH, 9(2.4%) pregnancies complicated with pre-eclampsia, and 214(57.8%) women had caesarean section. 112(30.3%) babies were born with poor Apgar score and 174 (47%) babies admitted in nursery. Respiratory distress syndrome (RDS), suspected sepsis and hypoglycemia were the common reasons of NICU admissions.

Conclusion: We found strong association between maternal obesity and poor Apgar scores at birth and increase rate of NICU admissions.

Keywords: BMI (body mass index), Apgar score, NICU (neonatal intensive care unit), GDM (gestational diabetes mellitus), PIH (pregnancy induced hypertension), RDS (respiratory distress syndrome), IUGR (intra uterine growth restriction).

Introduction:

Maternal obesity has emerged globally as one of the major obstetrical challenges in reproductive age women. Its prevalence is linearly increasing not only in developed but also in developing countries like Asia and found to be a major contributor to adverse pregnancy and birth outcomes.[1-3]

In the United States, more than one half of pregnant women are overweight or obese, and 8% of reproductive-aged women are extremely obese.[4] In Dublin, about one in six women is obese and one in 50 is morbidely obese.[5] In Galway, 25% of women were found to be obese at their first antenatal visit.[6] Similar levels have been reported in Britain.[7]

The prevalence of Class-III maternal obesity was 1.6% in Dublin (1.4% in primigravidas, 1.8% in multigravidas), 1.8% in Galway and 2.0% in the UK.[8,9]

World Health Organization (WHO) has classified maternal obesity as BMI > 30kg/m2, overweight (25 – 29.9), normal (18.5 – 24.9) and underweight (< 18.5).[10]

Maternal obesity is associated with adverse preg-

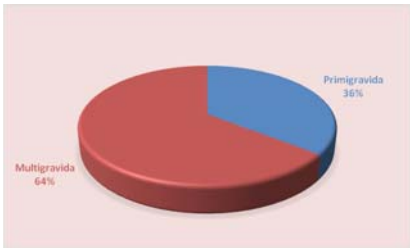

Figure-1: Distribution of women according to parity

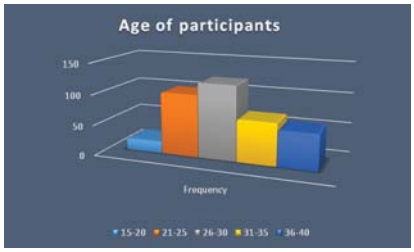

Figure-2: Distribution of women according to Age

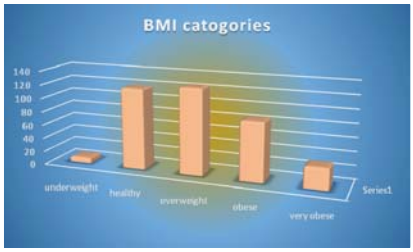

Figure-3: Distribution of women according to BMI

nancy outcomes for both mother and her fetus, such as gestational diabetes mellitus (GDM), pre-eclampsia, congenital malformations and macrosomia, poor Apgar scores, admissions in neonatal intensive care unit[11] and has been associated with an increase in obstetric interventions such as caesarean section and induction of labour.[3] In the longer term, maternal obesity is associated with an increased life long risk of diabetes mellitus and cardio-vascular disease for the woman and an increased risk of childhood obesity for her offspring.[12-15] Apgar score at 5-10 min is the basic tool for the assessment of neonatal condition at birth, low apgar scores at delivery are associated with increased risks of neonatal intensive care unit admissions, cerebral palsy, neonatal seizures and neonatal death.[14-16]

Maternal obesity is associated with a significantly increased risk of low apgar scores at birth and increase admissions to NICU. The purpose of this study was to evaluate the impact of maternal obesity on neonatal apgar scores and NICU admissions. We also examined the reasons of NICU admissions. This study will give awareness to women of child bearing age regarding maternal and neonatal complications associated to prepregnancy BMI and importance of calculating BMI at booking in order to optimize the perinatal outcomes and avoid neonatal intensive care unit admissions and poor Apgar scores at birth.

Objectives: To determine the impact of maternal obesity on neonatal apgar score and neonatal intensive care unit admissions. To evaluate the common reasons of neonatal intensive care unit admissions.

Material and methods:

We conducted a prospective cross-sectional study from January 2015 to December 2016 at Taj Medical Complex, Hamdard University Hospital Karachi. Total 370 women were selected for this study of 18-40 years with singleton pregnancy in primipara and multiparous women with previous normal deliveries. While women with multiple pregnancies, previous caesarean sections and medical disorders were excluded. The women were enrolled between 8th to 20th weeks of gestation, their BMI were calculated by using standard formula of weight in Kg and height in m2(Kg/m2). The BMI was classified according to WHO BMI classification. Women then followed to see the effect of maternal obesity (overweight and obese) on neonatal apgar scores and NICU admissions and the common reasons of NICU admissions were evaluated. The obesity related maternal problems like GDM, PIH, Pre-eclampsia and cesarean section were also examined.

Data Analysis: The data was analyzed by using SPSS version 21.0. Frequency and percentage were computed for categorical variable like BMI categories, mean and standard deviations was computed for continuous variables like age, gestational age, body mass index, and weight of baby, apgar score at 5 min, NICU admissions and reasons of NICU admissions. Effect modifiers like age and BMI was controlled through stratification by applying chi-square test and p-value <0.05 was considered significant.

Results:

Total 370 women were included in this study, 132(35.7%) were primigravida and 238(64.3%) were multigravida Figure-1. Majority of women 112(33%) were 26-30 years old Figure-2. Out of 370 participants, 8(2.2%) were underweight, 119(32.2%) were healthy, 126(34.1%) were

Table-1: Effect of BMI on maternal outcome

Chi-square tests of BMI-categories by Maternal out comes						
BMI-Categories		**underweight 10-18**	**healthy 18.5-24.9**	**overweight 25-29**	**Obese >30**	**P-value chi-square test**
GDM	124(33.5%)	1 (.8)	7 (5.6)	53 (42.7)	63 (50.8)	0.000
PIH	69(18.6%)	0 (0)	10 (14.5)	23 (33.3)	36 (52.2)	0.000
Pre-eclampsia	9(2.43%)	0 (0)	1 (11.1)	1 (11.1)	7 (77.8)	.037
Caesarean Section	214(57.8%)	1 (.5)	58 (27.1)	58 (27.1)	97 (45.3)	.000

Table-2: Neonatal Apgar score in overweight and obese women

APGAR-score at 5min		**underweight**	**healthy**	**overweight**	**Obese**
Good	257(69.4%)	6 (2.3)	86 (33.5)	77 (30)	88 (34.2)
Low	112(30.7%)	2 (1.8)	32 (28.6)	49 (43.8)	29 (25.9)

Table-3: Reasons of NICU admissions

Reasons of NICU admission total	Under-weight	healthy	overweight	Obese	p-value (0.001)
Total admissions	174(47%)	2(1.1)	39(22.4)	61(35.1)	72(41.4)
RDS	25(6.8%)	0 (0)	7 (1.8%)	6 (1.6%)	13 (3.5%)
Sepsis	12(3.2%)	0 (0)	3 (0.8%)	4 (1.08%)	5 (1.35%)
Observation	45(12.2%)	0 (0)	6 (1.6%)	19 (5.1%)	20 (5.4%)
Birth Asphyxia	11(3%)	0 (0)	5 (1.35%)	4 (1.08%)	2 (0.54%)
Hypoglycemia	20(5.4%)	0 (0)	0 (0.0)	10 (2.7%)	10 (2.7%)
Meconium Aspiration Syndrome	18(4.9%)	0 (0)	8 (2.16%)	9 (2.43%)	1 (0.27%)
IUGR	5(1.4%)	0 (0)	1 (0.27%)	1 (0.27%)	3 (0.8%)
Oligohydramnios	22(5.9%)	1 (0.27%)	9 (2.43%)	2 (0.54%)	10 (2.7%)
Absent liquor	1(0.3%)	0 (0.0)	0 (0.0)	1 (0.27%)	0 (0.0)
Low birth weight	16(4.3%)	1 (0.27%)	4 (1.08%)	4 (1.08%)	6 (1.6%)
NND	2(0.5%)	0 (0.0)	1 (0.27%)	0 (0.0)	1 (0.27%)
IUD	1(0.3%)	0 (0.0)	1 (0.27%)	0 (0.0)	0 (0.0)

overweight and 86(23.2%) were obese and 31(8.4%) were very obese Figure-3.

Poor maternal and fetal outcomes were seen in women with greater BMI, Out of 370, one hundred and twenty four (33.5%) women developed GDM, of these 53(42.7%) were overweight and 63(50.8%) were obese. Similarly, 69(18.6%) women developed PIH and majority i.e. 23(33.3%) and 36(52.2%) were over-weight and obese respectively. 9(2.4%) pregnancies complicated with pre-eclampsia, majority 7(77.8%) were obese 214(57.8%) women had caesarean section, out of them 97(45.3%) were obese. table-1

Our study showed strong association of greater BMI with poor apgar scores and NICU admissions. 112(30.3%) babies were born with poor apgar score, majority were delivered by overweight and obese women 49(43.8%) and 29(25.9%) respectively. 174(47%) babies admitted in nursery, 61(35.1%) of overweight and 72(41.4%) of obese women table-2.

The common reasons of NICU admissions were respiratory distress syndrome (RDS) in 25(6.8%), 6(1.6%) of overweight and 13(3.5%) were of obese mothers. similarly, 12(3.2%) babies were admitted for antibiotics due to prelabour rupture of membranes (suspected sepsis) and majority were overweight and obese mothers. Birth asphyxia found in 11(3%) babies, hypoglycemia 20(5.4%), meconium aspiration syndrome 18(4.9%), IUGR 5(1.45), oligohydramnios and absent liquor 22(5.9%) and 1(0.3%) respectively. While no significant difference found in perinatal mortality between healthy and obese BMI groups table-3.

Discussion:

Maternal BMI (Body mass index) status prove to have significant impact on maternal and fetal outcome, it also have significant psychological and financial burden to family. Optimization of maternal BMI is essential for better outcome of pregnancy. Our study demonstrates that increasing maternal BMI is significantly associated with poor fetal Apgar scores and increased NICU admission.

The incidence of morbid obesity in our study population is 8.4%, while 23.2% were obese and 34.1% were overweight. Similar results were reported by Galan and Hernandez 8.3% women were morbidly obese.[16] ACOG committee found extreme obesity in 8% of reproductive age women,[17] Cynthia and linda[18] reported 23% while, lynch et al[19] found 25% obese women in their population. We found maternal obesity as an important risk factor for serious obstetric complications like GDM(33.5%), PIH(18.6%), pre-eclampsia (2.4%) and caesarean section (57.8%). These results are consistent with other studies.[20-24]

Our study showed strong relationship of obesity and low apgar scores at 5 min, Stepan H[25] and Raatikainen K[26] reported similar findings.

On the other hand, Chen M[27] found no association between maternal obesity and low apgar scores. These notable differences between studies were due to different rates of obesity and presence of confounding factors like GDM, PIH/Pre-eclampsia and cesarean sections.

Low apgar scores may result in more infants requiring careful observation, an increased need for assisted ventilation and more NICU admissions. Our study demonstrates the increase rate of NICU admission in overweight and obese mothers, and these findings are consistent with several studies.[28-31]

In explaining the reasons of NICU admissions, majority of neonates were admitted for observation due to low apgar scores, respiratory distress syndrome and hypoglycemia. Debbi Suk et al and Ju et al. found significantly increased risk of hypoglycemia and neonatal resuscitation at deliveries involving overweight and obese mothers.[28-32]

The association of low Apgar scores and maternal BMI was mostly linear with increasing weight. Similarly, NICU admission rate was significantly associated with greater maternal BMI.[32]

Further studies are required to see the associations of maternal BMI status on Neonatal Apgar scores and NICU admissions after controlling the confounding factors like DM and PIH.

Conclusion:

Maternal obesity is a common and increasing problem worldwide, clinicians and families want good maternal-fetal outcome. Our findings suggest that a reasonable reduction of maternal pre-pregnancy BMI may decrease NICU admissions.

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Role and contribution of authors:

Dr Tehmina Parveen, literatur review, data collection, analysis, and paper writing.

Dr Farah Hameed, collected the data and helped in discussion writing

Dr Jawad Azeem Khan, data analysis and results

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