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Physiology

A Study of Relation of Maternal Overweight and Obesity with Congenital Malformation in a Population of Eastern India

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Original Research Article

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Abstract: Overweight and obesity is a rising health related problem in recent times. It affects general population, the pregnant mother as well as the conception in various ways. Aim of our study was to find out from the data sets recorded in chief district medial officer's offices, S.C.B. medical college and various hospitals and institutes in and around Cuttack city, Odisha, whether maternal overweight & obesity is associated with an increased risk for various structural birth defects. The study resign is a retrospective study. The study population consisted of 200 newborns and foetuses with congenital malformations in and around Cuttack city from January 2015, to September 2015. Maternal weight and height data were obtained from the Hospital records where the children were born or the pregnancies were terminated. About 35 % of the study population was overweight and 17% were obese. Congenital malformation was more associated with obesity. Cardiovascular defects (37%) and neural tube defects (32%) were the most frequent malformations. Other congenital defects were less frequent. It can be concluded that maternal overweight & obesity is a risk for congenital defects.
Keywords: Congenital defects, maternal overweight & obesity, neural tube defect, foetus.

INTRODUCTION

Obesity in India has reached epidemic proportions in the 21st century, with morbid obesity affecting 5% of the country's population [1]. There were 20 million obese women in India in 2014 compared with 9.8 million obese men, according to a study published in the British medical journal, the Lancet indicating that obesity is more in women in India.

Severe obesity was observed in an additional 4 million Indian women. There were less than 800,000 obese women in India in 1975 compared with 400,000 obese men. India saw a more significant rise in obesity from its 19th position for both men and women in 1975 to rankings 5th and 3rd respectively in 2014, reflecting increasing obesity rates among women worldwide [2]. Increased BMI in pregnancy was associated with more incidence in pre-eclampsia, post term pregnancy, gestational diabetes, IUGR, macrosomia, Caesarean section and postpartum complications like PPH & wound gaping [3-5].

The foetus is at risk for stillbirth and congenital anomalies. Obesity in pregnancy can also affect health later in life for both mother and child. For women, these risks include heart disease and hypertension. Children have a risk of future obesity and heart disease. Women and their offspring are at increased risk for diabetes [5, 6]. Obesity (independent of diabetes) among gravidae poses unique risks which extend towards the foetus, with several large population-based analyses demonstrating independent increased risks for foetal malformations including neural tube defects, cardiac anomalies, and oro-facial clefts as well as stillbirth and macrosomia [7].

AIM OF THE STUDY

Aim of our study was to establish a relationship between maternal obesity and foetal and newborn congenital birth defects.

METHODS

Source of data

From the data set recorded from SCBMCH and various hospitals in and around Cuttack city STUDY PERIOD: January 2015 to September 2015.

Study design

Retrospective analytical study. 200 new-borns and foetuses with congenital malformations were recruited into the study and data of BMI, any maternal

viral infection, iron & folate deficiency, h/o taking any teratogenic drugs addictions of their mothers were collected from the hospital records.

Women were classified into four categories of body mass index (BMI)—
Under weight –BMI < 18.5 kg/m2,
Normal weight– BMI – 18.5—24.9 kg/m2,
Overweight- BMI-25-29.9 kg/m2,
Obese- BMI>30 kg/m2,

RESULTS

Among the study group underweight were 15%, overweight were 16%, obese were 15% and 54% comprised of normal according to basal metabolic rate.

Out of the congenital anomalies CVS defects were 16.60%, 15.70%, 21.80%, 43%, Neurological defects were 13.30%, 25.90%, 28.10%, 40%, Gastrointestinal defects were 10%, 13.90%, 12.50%, 16.70%, Urogenital defects were 26.70%, 15.70%, 9.30%, 13.30%, and Limb defects were 20%, 12.03%, 18.70%, 23.30% in underweight, normal, overweight and obese women respectively (table-2).

Underweight, overweight and obese were of nearly equal in frequency whereas more than 50% were in normal group.UW-Underweight, OW- Overweight.

Table-1: Distribution of mother according to BMI

UW	15%
NORMAL	54%
OW	16%
OBESE	15%

Table-2: Distribution of Congenital defects according to BMI

Anomaly	UW	NORMAL	OVERWEIGHT	OB
CVS Defects	16.60%	15.70%	21.80%	43%
Neurological	13.30%	25.90%	28.10%	40%
GI	10%	13.90%	12.50%	16.70%
Urogenital	26.70%	15.70%	9.30%	13.30%
Limb defects	20%	12.03%	18.70%	23.30%

UW-Underweight, OW- Overweight, OB-Obese

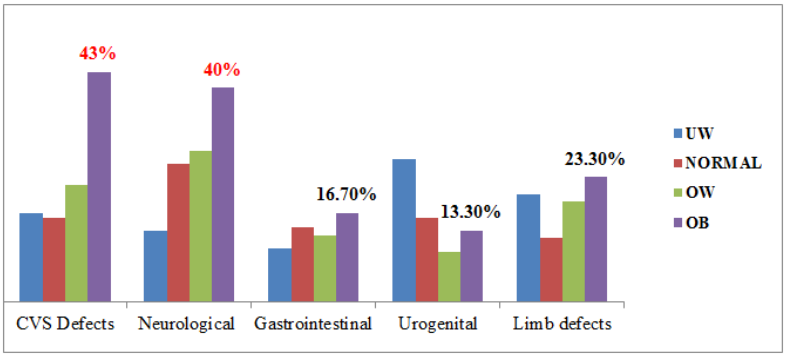

Fig-1: Representing table no 2

Among the neurological defects, NTD (neural tube defect) accounted for 23.3% of total CNS defects. Among cardiovascular defects septal defects accounted for 17.2% of total CVS defect.

DISCUSSION

From our study it is evident that congenital anomalies are more associated with obesity and overweight. Obesity is related to congenital birth defects mainly cardiovascular defects (43%) and neurological defect (40%). Among the CVS defects most common was septal defect and among neurological defects NTD was most common.

Similar results were presented by following investigators; Rolando A Hernández Fernández1 *et al*.[8]**,** McMahon DM, Liu J, Zhang H, Torres ME *et al*. [9], Cai G, Sun X, Zhang L, Hong Q *et al*. [10]. Rolando A Hernández Fernández1 *et al*. in their study mention that cardiovascular defects (34.4%) and neural tube defects (37.5%) were the most frequent malformations [8].

Study conducted by McMahon(2015) DM, Liu J, Zhang H, Torres ME(2013)et al found that obese women (BMI ≥ 30) had twice higher odds of having an NTD-affected pregnancy (odds ratios [OR] = 2.06, 95% confidence interval [CI] = 1.12, 3.81) than normal weight women (BMI: 18.0-24.9)[9].

Obesity induces chronic low-grade inflammation that may be the primary cause of associated diseases. Chronic inflammatory cells release reactive oxygen species that may cause damage to biomolecules such as lipids, proteins and nucleic acids. These damages could interfere with development of the foetus and result in congenital defects. In addition chronic inflammation also produces placental inflammation and insufficiency which may lead to foetal hypoxia. This subsequently can interfere with development of the foetus [8],(fig no.2).

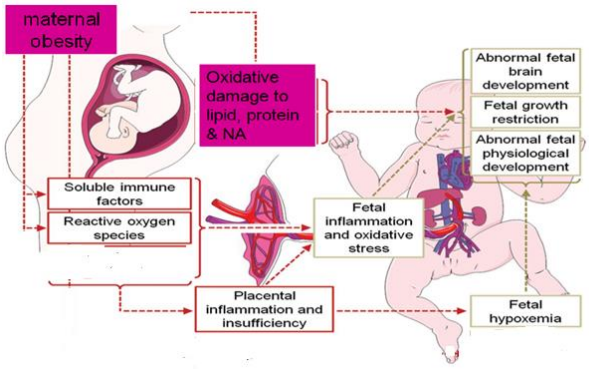

Fig-2: Maternal obesity induces chronic low-grade inflammation. Chronic inflammatory cells release reactive oxygen species that may cause damage to biomolecules such as lipids, proteins and nucleic acids (NA) and placental insufficiency. These damages interfere with development of the foetus and result in congenital defects as well

CONCLUSSIONS

- Maternal obesity is associated with definite co-morbidity of both mother and foetus.
- Obesity is related to congenital birth defects mainly cardiovascular defects and neurological defects.
- Obesity is a modifiable risk factor. So, it should be modified by life style modification and dietary management in order to get healthy child of the healthy mother.

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