

Nutritional Status of Pregnant Women during the Third Trimester and Infant Birth Weight

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Abstract: Background: Gestational period is a significant stage through which a balanced dam feeding is important for ensuring successful gestation outcome. Nutritional requirements are elevated during pregnancy, and gathering those requirements has a potential positive influence on birth weight. **Objectives:** To identify the correlation between nutritional levels of gestational women during the 3rd trimester and birth weight. **Subjects and Methods:** This is across-sectional discretionary study. The study population consisted of 200 pregnant women aged 20-35 years old, recruited from the inpatient Obstetric wards at Monira, Galaaand Warraq Hospitals. They were interviewed through a specific pregnancy questionnaire. Anthropometric measurements were performed, dietary assessment was performed by using a 24 hour dietary recall and food frequency of selected food items. **Results and Conclusion:** Of the studied sample group, women with normal weight presented 48%, Overweight presented 45%, while obese women presented 7%. There was a significant positive correlation of the mothers' body weight and infant birth weight. 30.5% of pregnant women had anemia, and about 43% of their babies had anemia too. There was inadequate intake of macronutrients and some micronutrients, including zinc, iron, calcium and vitamins A, B1, B2, with adequate intake of protein and vitamin C., There was positive correlation between mothers dietary intake and infant weight regarding caloric intake and carbohydrate and some minerals and vitamins B1, B2, iron, zinc, magnesium, calcium, potassium, copper.

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1. Introduction

Gestational period is very important stage through it a balanced dam nutrition is essential for sustaining the pregnancy and ending with normal outcome (King, 2007). During pregnancy there is a high elevation in the metabolic requirements due to changes in the woman's physiology and increasing supplies of a developing fetus (Gernard, 2016). Pregnant women are a nutritionally vulnerable group. (Sahoo, 2006). Adequate intake of macronutrients and optimum levels of essential vitamins and minerals are needed to maintain nearly all aspects of metabolic and cellular activities, such as cell differentiation and proliferation in addition to homeostasis and tissue development (Luciana Bertoldi, 2001). The physical requirements on the mother's body reach their maximum during the third trimester of gestation (Roe, 2007), where, the caloric needs for healthy women of normal weight with a fairly energetic daily life, endure a sensible elevation during gestation, which consequently result in rising energy intake, in a balanced way among macrolelements (Franca Marangoni, 2016). Protein is critical for ensuring proper growth of fetal tissue as well as uterine tissue growth during pregnancy. Deficiency in protein intake can have dire consequences on fetal outcome. (Agarwal, 2012) The brain develops more during the third trimester than during the first two, especially in

the last month of pregnancy. DHA is very crucial for infant's brain, where it enhanced the growth and the functional maturity (Krashma, 2015). Globally, the anemia affecting most of pregnant women represent a health risk (Kisioglu et al., 2004), particularly, in the stage of 3rd, where there is an increase in the volume of mother's blood parallel with increase in the requirements of the baby hence the increased demand for iron (Sharma, 2013). Adequate iron utilization throughout the 3rd trimester enhances an increasing in baby weight to get the sufficient amounts of oxygen required to build up physically powerful heart, muscles and lungs (Moller, 2015). It is known that vitamin K is essential for clotting of blood. Vitamin K can assist in blood clotting and recovery particularly at 3rd trimester stage where the body is organizing for delivery (Fall, 2003). In the third trimester when the baby's bones are developing, the importance of calcium cannot be more overstated. Calcium is essential for building fetal bones and regulating body's use of fluids. (Lamberg-Allardt, 2015). Some investigators found that during the third trimester, calcium intake may decrease systolic and diastolic blood pressure and consequently decrease the risk of preeclampsia. (Ortega et al.,). Moreover, vitamin D is playing an essential role in keeping and building of bone mineralization in the fetus and dam, beside formation of healthy and strong bones, it though can

also sharing in diminishing the risk of preeclampsia (Sabour, 2006). A balanced diet is preferred during the third trimester, to carry dams and their children through before conception to gestation and even for weeks or months post parturition (Roe,2011). Maternal nutritional status is an important determinant of pregnancy outcome. Both faces of malnutrition - under and over nutrition – have been traditionally considered risk factors for adverse gestational outcomes (Ramakrishnan,2005). Some researchers reported that the first stage of gestation is very critical for child health, concerning the quality and quantity of nutrition required by the pregnant women, thus malnutrition or under nutrition of the mother will reflect badly on the health of fetus, where it affect directly on fetal metabolism leads to affect adversely on fetal adaption to the deficiency of nutrition to utero-placental nourishment (Colon,2015). Finally, this decrease the rate of growth of fetus and elevates the danger for low birth weight (Kubota,2013) Increased frequency of obesity in many countries can be characterized as a pandemic of major public health concern. (Bang SW,2009). Dependable with the phenomena noticed in the general people, the percentage of overweight and obese pregnant women are elevated significantly. Obesity-related reproductive health complications comprise a huge number of illness like coagulopathies, hypertensive disorders, respiratory complications and gestational diabetes (Mehta, 2004), as well as fetal problems like shoulder dystocia, congenital malformations, and the infants are large in correlation with the gestational stage (Gopalan,2002). Appreciative the correlation between maternal nutrition and the birth weight of neonates may elicit improvement of nutritional programs that keep neonatal birth weight within the normal range, decrease the health care load and improve long-term quality of life (Malshini,2017).

Objectives

Assessment of the nutritional levels of the pregnant women during the 3rd trimester.

Identifying the correlation between nutritional status of pregnant women during the third trimester and birth weight.

2. Subjects

This is a cross section description study carried out from July 2017 till June 2018. The study population consisted of 200 pregnant women aged 20-35years old who were recruited from the inpatient Obstetric wards of Monira, Galaa and Warraq Hospitals who accepted to participate in the study. The population sample was interviewed through a specific pregnancy questionnaire. Anthropometric measurements were performed, dietary assessment was performed by using a 24 hour dietary recall and food frequency of selected food items. Our patients

were underwent laboratory investigation including the hemoglobin of all mothers and some of the infants. Inclusion criteria all pregnant women that fulfilled our criteria female childbearing period healthy pregnant women no diabetes, hypertension, dyslipidemia, no other chronic diseases.

Ethical consideration

Oral consent was taken from all the women participate in the research.

Study Tools

I -Interview questionnaires: Questionnaires were adapted from standardized pregnancy questionnaires in Obstetric clinics.

II -Food frequency Questionnaires (FFQ) developed by the National Nutrition Institute provides information on eating patterns and intake. The Food Frequency questionnaire comprises a list of foods and beverages on which respondents reported their usual amount and frequency of consumption (**WHO2007**).

III - 24-hour Recall (24-H R): This provides information on the types of foods consumed at mealtimes and between meals, portion sizes over the past twenty four hours. This information is then used to calculate the average daily caloric intake.

IV- Anthropometric Measures: Weight and height were measured and then BMI was calculated for each participant.

Weight measurement procedures for the participants were according to **Hammond, 1998** as follows: A calibrated level plate from scale placed on a flat hard surface was used. Participants were measured without shoes. Participants were directed to stand in the center of the platform, with body weight equally distributed between both feet.

Height measurement procedures were performed according to **Hammond, 1998** as follows: Height was measured while the participants stood without shoes. The participant was directed to stand on a flat surface with weight distributed evenly on both feet, heels together and head positioned so that the line of vision was perpendicular to the body. Arms hung freely and the head, back, buttock, and heels were intact with the vertical board. A metric ruler and a movable horizontal head board was used. After the participant stood properly, the head board was moved down to the top of the head so as to flatten any hairstyle, and make contact with the top of the scalp.

Body Mass Index (BMI) was categorized as follows:

- Underweight: BMI is less than 18.5 Kg/m²
- Normal: BMI is between 18.5- 24.9 Kg/m²
- Overweight: BMI is between 25-29.9Kg/m²
- Obese: BMI is 30.0 Kg/m² and above

3. Results

In the table above, out of the 200 women in the sample group, 0% were underweight, 48% had normal

BMI, 45% were overweight and 7% were obese, with a significant p value of 0.000.

Table (1): Percent Distribution of Mothers according to their BMI

BMI	Number	%	P
Underweight	0	0	0.000
Normal	96	48.0	
Overweight	90	45.0	
Obese	14	7.0	

Table (2): percent distribution of infants according to birth weight

	Number	%	P
Very low BW	0	0	0.000
Low BW	58	29	
Normal BW	136	68	
Large BW	8	3	

Low Birth Weight is defined as weight at birth less than 2500 gm. Of two hundred babies delivered, 0% had very low birth weight, 29% had low birth weight, 68% had normal birth weight and only 3% were large birth weight for gestational age.

Table (3) Correlation between mother BMI and infant weight and infant Hb

	Infants Weight (p value)
Infants Hb	0.179
Mother BMI	0.0001

Table (3) showed that there was positive correlation between mothers BMI and infant weight with p value (0.0001). There was also positive correlation between infant weight and infant hemoglobin.

Table (4): percent distribution of mother and infant HB

	No	%	P
Mother Hb			0.000
< 11	61	30.5	
≥ 11	139	69.5	
Infants Hb			0.284
< 13	38	43.7	
≥ 13	49	56.3	

Our results here showed that 30.5% of pregnant women had hemoglobin percentage below 11 gm dl with a significant correlation showing that about 43% of their babies had anemia.

Table (5) Mean ± SD and % RDA of daily Macro- & Micronutrient intake

	Mean ± SD	%RDA
Energy (kcal)	1560.0 ± 589.1	52.0
Protein (gm)	57.2 ± 26.6	86.7
Carbohydrates (gm)	208.4 ± 78.4	50.5
Fat (gm)	55.1 ± 32.1	55.1
Minerals		
- Calcium (mg)	615.8 ± 354.3	51.3
- Magnesium (mg)	106.4 ± 51.2	48.4
- Zinc (µg)	7.5 ± 3.4	75.0
- Iron (mg)	10.2 ± 4.9	37.1
Vitamins		
- Vitamin A (µg)	578.5 ± 133.9	72.3
- Vitamin C (µg)	67.1 ± 84.5	122.0
- Vitamin B1 (µg)	0.7 ± 0.4	50.0
- Vitamin B2 (µg)	0.9 ± 0.7	64.3

Dietary adequacy was interpreted according to the following categories: 50% or less considered unsafe level of consumption, 50-75% unacceptable level of consumption, 75-100% acceptable level of consumption, 100-120% adequate level of consumption and more than 120% considered over

consumption. The current data showed unsafe level of consumption of iron and magnesium, unacceptable consumption of calories and vitamins A, B1, B2, zinc and calcium. Acceptable level of consumption was found for protein, carbohydrate and fat, while the only overconsumption was for vitamin C

Table (6) correlation between mothers dietary intake infant weigh

	Infants weight	
	r	P
Calories	0.141	0.046
Carbohydrate	0.302	0.000
Protein	0.033	0.638
Fat	-0.050	0.483
Fiber	0.210	0.003
Sodium	0.080	0.260
Potassium	0.275	0.000
Calcium	0.192	0.007
Phosphorus	0.276	0.000
Magnesium	0.238	0.001
Iron	0.244	0.000
Zinc	0.176	0.012
Copper	0.183	0.009
Vitamin A	0.125	0.079
Vitamin C	0.034	0.631
Vitamin B1	0.296	0.000
Vitamin B2	0.175	0.013

Table (6) There was positive correlation between mothers dietary intake and infant weight regarding calorie intake and carbohydrate and some minerals and vitamins B1, B2, iron, zinc, magnesium, calcium, potassium, copper

4. Discussion

It was found that the mainly significant regulators of human fetal development is the nutritional status of mothers. The statement a healthy mother gives birth to a healthy offspring is true. The malnutrition affected adversely on both mothers and foeti, therefore under nutrition of women will lead to deliver of weak child, leading to increase in the morbidity and mortality rates (Sahoo,2006.). Therefore, it is of great importance to supply the pregnant women with necessary balanced requirements from nutrients sufficient to supply the foetus with enough energy for proper growth without withdrawing from mother's body to continue her gestation (Mridula,2003), through estimating the weight of the child at birth, it is possible to predict the growth of newly born infants and the survivability (Muthayya, 2009,) Hence, the current work was aimed to investigate the impact of maternal nutritional status on the infant's birth weight. Two hundred pregnant women aged 25-35 years participated in this study, of

48% were of normal weight, 45% were overweight, and 7% were obese. Our results were in line with that of Angela Elena et al.,2015, which reported 65.8%;23.6% and 10.6% of ordinary weight, overweight and obese, respectively. Low Birth Weight is known as the weight of infant at birth is less than 2.5kgm (Cunningham,2013). Infants whose birth weight exceeds 4000 g at term are classified as large for gestational age (LGA). (Xu H, Simonet. 2010) Our results showed that there was positive correlation between mothers BMI and infant weight. The major strength of our study is represented by Brunner Huber, 2007 and Bodnar L, 2010 who both found a positive correlation between the mother's BMI and birth weight. Our result was confirmed too with that of Malshani L, 2017, who reported that 20.6% of women who were underweight delivered 17.4% LBW babies. The Center for Disease Control and Prevention (CDC) postulated that anemic condition when the level of hemoglobin is less than 11 g/dL during the third trimester of gestation. The current finding revealed that 30.5% of pregnant women suffering from low in Hb levels (less than 11 gm dl) with a significant result of about 43% of their babies had anemia. Our result also matches that of Kazibe Koyuncu,2017, who reported that incidence of anemia among pregnant women reached 25.2% during the third trimester of

gestation. Zubaida Umar, 2015 found that the incidence of anemia between pregnant women in low standard level was high and averaged (68.33%). Our result was also supported by the result of Sharma et al., 2003 who reported that anemia during gestation is high and may be attributed to quality and quantity of nutrients intake and on the state of mother's health. We found that There was positive correlation between mothers dietary intake and infant weight regarding caloric intake and carbohydrate and some minerals and vitamins B1, B2,, iron, zinc, magnesium, calcium, potassium, copper, our result was in line with Rotana E., et al 2017 they found that in third trimester pregnant women energy intake and carbohydrates had strong positive correlation with infant birth weight., Malshni et al reported that the, maternal carbohydrate intake has significant impacts on neonatal birth weight in the second trimester. The nutritional requirement for pregnant women undergoes a moderate increase during pregnancy (Abdulai Abubakari, 2016). We found that there was unsafe level of consumption of iron and magnesium, unacceptable level of consumption of calories, carbohydrate, fat, vitamins A, B1, B2, and zinc and calcium. While an acceptable level of consumption was found with protein intake, overconsumption was observed with vitamin C intake. Our result matched that of Khalid et al, 2007. They reported that the average nutrient intake was less than the suggested dietary allowances (RDA) for pregnant women. Krishna et al., 2014, concluded also that in the third trimester of pregnancy there were inadequacies in all the nutrients evaluated except in energy. The obtained data support the importance of administering maximum nutrition during gestation.

Conclusion

There was positive correlation between mothers BMI and infant weight with p value (0.0001), 30.5% of pregnant women had anemia and about 43% of their babies had anemia. The majority of pregnant women had low intakes of macronutrients, iron, calcium, magnesium, vitamin A, B1, B2, with adequate protein intake. There was positive correlation between mothers dietary intake and infant weight regarding caloric intake and carbohydrate and some minerals and vitamins B1, B2,, iron, zinc, magnesium, calcium, potassium, copper, our result was in line with Rotana et al., 2017. The nutrition of mothers during gestation and health are considered as the mainly important predictor of human fetal growth. Thus, a healthy mother can deliver a healthy child.

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