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CONTENTS

Maternal Nutrition during Pregnancy among the Meitei Women and its Effect on Foetal Growth

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Abstract

Maternal nutrition during pregnancy is a very important point of concern. Right nutrition in the right quantity will help the growing foetus to reach its maximum level of growth without any complications and with the right birth weight, provided the pregnancy is normal and uncomplicated. A study conducted among the Meitei pregnant women with uncomplicated singleton pregnancies regarding their daily diet and other food supplements revealed that apart from the daily diet various food supplements had actually help in promoting the growth of the foetus. The main food supplements were Iron folic, protein and calcium. No matter if a pregnant woman is having a well nourished diet or undernourished diet, supplementation of some food items which are not readily available in the daily diet should be made compulsory.

Keywords: Nutrition, Supplementary foods, Foetal growth, Biparietal Diameter, Head Circumference, Abdominal Circumference, Femoral Length

Introduction:

Nutrition is perhaps the most influential non-genetic factor in foetal growth and development (Phillips, 2006). From the moment, a woman conceives, she holds the responsibility of following a healthy diet in large quantities to support the growth of an entire life inside her womb. An expecting mother should understand that her daily nutrition is not only important for her health but is also crucial for maintaining good health of the growing foetus for its entire life. Therefore malnutrition during pregnancy should be prevented to avoid poor pregnancy outcome.

A malnourished foetus after birth is prone to infection, exhibit poor growth rate, low weight, weak immune system, greater risk to illness, low stamina and lesser height. Some effects of malnutrition during prenatal period are carried by the foetus throughout his/her entire life. Association with risk of diseases like cardiovascular disease, type-2 diabetes, obesity and hypertension in later part of life are found with prenatal malnutrition (Shlomo and kuh, 2002). Osmond and Barker, 2000 had confirmed that foetuses who had adapted to limited supply of nutrients had permanently changed their structure and metabolism. These programmed changes may be the origin of a number of diseases in later life including coronary heart disease, hypertension and non-insulin dependent diabetes. It is also claimed that cognitive impairment and low IQ are directly linked to malnutrition symptoms, especially during pregnancy and infancy period.

However overeating or over nutrition from increase intake of calories is of no benefit as the excess calories rather than going to the foetus get stored as fat in the mother (Victoria, 2012). Moreover Extensive studies have shown that maternal over nutrition retards placental and foetal growth and increases foetal and neonatal

mortality (Castro and Avina, 2002). In fact, only from the second and third trimester an addition of 300 calories to the pregnancy diet should be done.

During pregnancy the basic principles of healthy eating remain the same i.e. to get plenty of fruits, vegetables, whole grains, lean protein and healthy fats. However, a few nutrients in a pregnancy diet deserve special attention. These nutrients should be taken in its naturally found food items or either as food supplements. Out of the many nutrients needed by a pregnant woman for the proper growth and development of the growing foetus; iron, calcium, protein and folic acid (vitamin B9) seems to have more considerable importance.

Iron is needed to make haemoglobin, which is a protein in the red blood cells that carries oxygen to the tissues. During pregnancy the blood volume expands to accommodate changes in the body and help the growing foetus to make his or her entire blood supply — doubling the need for iron. If enough iron is not taken during pregnancy, the pregnant woman might become fatigued and more susceptible to infections. The risk of preterm delivery and low birth weight for the foetus also gets higher. 27 milligrams of iron a day is needed during the period of pregnancy.

Calcium also helps the circulatory, muscular and nervous systems run normally. Prada, et al 1994 had found a close relationship between dietary calcium intake during pregnancy and blood pressure, cardiac output and uterine blood flow. It was observed that maternal hypocalcemia is directly correlated with increased blood pressure, reduced cardiac output and uterine blood flow. The foetuses of hypocalcemic and hypertensive mothers show reductions in blood ionized calcium concentration, PaO_2, pH and O_2. The chronic reductions in uterine blood flow have been reported to affect foetal growth.1000 milligrams of calcium a day is needed throughout pregnancy.

Protein is crucial for the foetal growth, especially during the second and third trimesters. Maternal intake of low dairy and meat protein in late pregnancy were also associated with lower placental and birth weights. 71 grams of protein a day is needed throughout the period of pregnancy. Maternal malnutrition of folate or folic acid is also an important risk factor for development of Neural Tube Defects (NTD) like Spina Bifida, Anencephaly and Encephalocele. Studies till date have shown decreased maternal folate levels in NTD affected pregnancies (Yates, et al.1987). 800 micrograms of folate or folic acid a day before conception and throughout pregnancy.

Materials and Methods: The sample consist of 460 pregnant Meitei women with normal singleton pregnancies of different gestational period, with no medical complicacies like diabetes, hypertension, and cardiovascular problems etc with their age ranging from 18 to 43 years. A structured research schedule consisting of general information regarding socio-economic status, obstetric information of the mother, lifestyle, daily diet and nutritional intervention (food supplements) was employed for collection of data.

Co-relation of Foetal Growth with Maternal Nutrient Intake was calculated using Step-wise Regression analysis by SPSS version 20. The various foetal growth parameters of Biparietal diameter (BPD), Head circumference (HC),

Abdominal circumference (AC) and Femoral length (FL) were taken as dependent variables (criteria) and the maternal diet and supplementary foods were taken as independent variables (predictors).

Results and Discussion:

Daily diet: In the Meitei population, the daily diet mainly consists of rice, which is the staple food along with varieties of vegetables taken every day. Apart from the vegetable protein, the inclusion of fish meat, eggs and milk as a source of protein and calcium is also common in the daily diet of the people. No doubt other forms of protein sources are also consumed in the form of other animal meat, but the daily diet differs from person to person and daily diet during the period of pregnancy shows various kinds of consumption and preferences.

In table 1 the different type of diet taken by the pregnant women of the present study are categorised into six different groups. From the table it can be known that the maximum number of subjects have taken their daily diet which consists mainly of carbohydrates i.e. rice being the main item having (25.9%) frequency percent. The daily diet which consists of protein along with fruits item shows an almost equal (25.0%) frequency percent. Daily diet consisting of high protein are also found among the subjects with (23.9%) frequency percent while subjects having poor undernourished diet share (23.5%) frequency percent. The reason for having undernourished poor diet might be due to poor socio-economic condition in which proper provisions of a daily routine diet cannot be maintained. The lowest number of (1.7%) frequency percent in the table includes those subjects who had taken a nutritious balance diet required during the pregnancy.

Table 1: Daily Diet of the Pregnant Women

	Daily Diet	No. of Subjects (N)	Percent
Types of Diet	Carbohydrate Diet	119	25.9
	High Protein Diet	110	23.9
	Protein and Fruit Diet	115	25.0
	Balanced Diet	8	1.7
	Poor Undernourished Diet	108	23.5
Total		**460**	**100**

Food supplements: It is a known fact that the maternal diet has a great influence on the growth of the foetus and food supplements are those which are hard or sometimes inconvenient to get in the daily diet and therefore have to be given as additional food items. Food supplements are concentrated sources of nutrients or other substances with a nutritional or physiological effect whose purpose is to supplement the normal diet. Dietary supplements may be found in many forms such as tablets, capsules, soft gels, gel caps, liquids or powders. Table 2 displayed the types of food supplement taken by the subjects during pregnancy apart from the daily diet. It can be known from the table that, during the first

trimester i.e. the first three months, the most taken food supplements are Iron and Folic acid in which the intake of both iron and folic acid by the subjects shows the highest frequency percent of 55.0%, which is followed by the intake of folic acid only with 35.0% frequency percent. Those subjects who take only iron as the main food supplement during the first trimester are found to have the lowest (10.0%) frequency percent.

During the second trimester, the food supplements taken by the subjects consists of Iron, Folic acid, Calcium, Protein and Multivitamins. Among the food supplements, the most taken were found to be iron and calcium having the highest (47.4%) frequency while the intake of iron only shows (25.8%) frequency percent. During this trimester the intake of iron along with folic acid shows a (7.5%) frequency percent and still lower frequency percents were found in the intake of food supplements combining iron, folic acid and calcium having 5.8% frequency percent, iron, calcium, multivitamin and protein with 4.9% frequency percent, iron, calcium and protein having 4.2% frequency percent and iron, folic acid, calcium and protein with 4.1% frequency percent. Only one (0.8%) subject was found to have the food supplement consisting of iron, calcium and multivitamin.

It is also evident from the table that during the third trimester, the most taken food supplement by most of the subjects are iron and calcium having the highest (55.0%) frequency percent. The taking of iron only as the main food supplement shows the second highest (29.7%) frequency percent while the intake of food supplements consisting of iron, calcium and protein and iron, calcium, multivitamin and protein show frequency percent of 8.1% and 6.7% respectively. Only one (0.5%) subject was found to have taken the food supplements consisting of iron, folic acid, calcium and protein.

Table 2: Food Supplements Taken during Pregnancy

Food Supplements	Trimester						Total	
	1		2		3		N	%
	N	%	N	%	N	%		
Iron	13	10.0	31	25.8	62	29.7	45	9.7
Folic acid	45	34.9					106	23.0
Iron, Folic acid	72	55.0	9	7.5			81	17.6
Iron, Calcium			57	47.4	115	55.0	7	1.5
Iron, Folic acid, Calcium			7	5.8			6	1.3
Iron, Calcium, Protein			5	4.2	17	8.1	172	37.3
Iron, Calcium, Multivitamin			1	0.8			20	4.3
Iron, Folic acid, Calcium, Protein			5	4.1	1	0.5	1	0.2
Iron, Calcium, Multivitamin, Protein			6	4.9	14	6.7	22	4.7
Total	130	100	121	100	209	100	460	100

Co-relation of Foetal Growth with Maternal Nutrient Intake:

Table 3displays the step wise regression analysis of foetal BPD as dependable variable while the maternal daily food and food supplements are taken as independent variables or predictors to see which independent variable effect the most and which does not have any effect in the growth of the BPD. From the Table, it can be known that the most significantly effective independent variable on the growth of the BPD is folic acid, which is the food supplement taken during pregnancy. In the Table it can be seen that the β value regarding folic acid comes to 10.400, indicating that those who had taken folic acid during pregnancy had the growth of the foetal BPD 10.4mm more than those who had not taken this nutrient. The second important predictor which influences the growth of the BPD is the intake of Calcium. It can be known that with a β value of 6.851, the positive impact of taking calcium during pregnancy is that, those who had taken calcium had the growth of the foetal BPD 6.8mm more than those who had not taken during pregnancy.

Table 3: Step-Wise Regression Analysis of BPD as Dependent Variable

Step	Variable	β	T	P-value	95% Confidence Interval for β	
					Lower Bound	Upper Bound
1	(Constant)	69.417	59.645	<0.001	67.127	71.706
	Folic acid	10.400	3.155	0.002	3.915	16.886
2	(Constant)	81.341	11.343	<0.001	67.233	95.448
	Folic acid	10.546	3.203	0.001	4.068	17.024
	Calcium	6.851	2.134	0.034	.535	13.167

Table 4 presents the step wise regression analysis of foetal HC as dependable variable while the maternal daily food and food supplements taken as independent variables or predictors. Here also the independent variable which affects growth of foetal HC the most is Folic acid. The β value of 34.414 signify that the intake of folic acid during Pregnancy give a growth of foetal HC 34.414mm more than those who had not taken this food supplement. The second most important independent variable or predictor effecting growth of foetal HC is calcium. From the Table it can be known that intake of Calcium during pregnancy made increase growth of foetal HC 23.138mm than those who had not taken the supplement.

Table 4: Step-Wise Regression Analysis of HC as Dependent Variable

Step	Variable	β	T	P-value	95% Confidence Interval for β	
					Lower Bound	Upper Bound
1	(Constant)	252.903	61.919	<0.001	244.868	260.938
	Folic acid	34.414	2.974	0.003	11.653	57.175
2	(Constant)	298.242	11.856	<0.001	248.755	347.729
	Folic acid	35.185	3.046	0.003	12.462	57.907
	Calcium	23.138	2.055	0.041	0.984	45.292

Table5 displays the step wise regression analysis of foetal AC as dependable variable with the maternal socio-economic score, daily food and food supplements, physical activities, obstetric history and hours of sleep taken as independent variables or predictors. In the first step, it can be known that the most significantly effective independent variable on the growth of foetal AC is protein supplement, which was given during pregnancy. As proteins are the building blocks of the body, the proper growth of the organs and the right growth in the abdomen is fully enhance by the supplement of protein. From the β value of the Table it can be known that taking of protein supplements give increment in the abdominal growth to 47.227mm more than those which has not taken it. . The second most important predictor of foetal AC growth is Calcium. The taking of calcium among pregnant women had the growth of the AC 26.306mm more than those who did not take during the period of pregnancy, which is evident from the β value.

Table 5: Step-Wise Regression Analysis of AC as Dependent Variable

Step	Variable	β	t	P-value	95% Confidence Interval for β	
					Lower Bound	Upper Bound
1	(Constant)	237.646	51.150	<0.001	228.506	246.786
	Protein	47.227	3.588	<0.001	21.336	73.118
2	(Constant)	293.568	10.274	<0.001	237.355	349.781
	Protein	48.344	3.685	<0.001	22.533	74.154
	Calcium	26.306	2.057	0.041	1.141	51.471

Table 6 displays the step wise regression analysis of foetal FL as dependable variable with the maternal daily food and food supplements taken as independent variables or predictors. It can be known from the Table that the most significantly effective independent variable on the growth of the FL is Calcium, the food supplement, which was given during pregnancy. It is evident that calcium helps in the proper development of the bones and in case of the proper development of this foetal long bone, calcium supplement turn out to be the first important independent variable which effects its proper growth. The β value of 9.682 indicates a better growth of the FL which is 9.682mm better than those who were deprived of this food supplement.

Table 6: Step-Wise Regression Analysis of FL as Dependent Variable

Step	Variable	β	t	P-value	95% Confidence Interval for β	
					Lower Bound	Upper Bound
1	(Constant)	52.364	49.825	<0.001	50.296	54.431
	Calcium	9.682	3.252	0.001	3.826	15.539

Conclusion:

It is known that the right nutrition during pregnancy is beneficial both for the mother and the growing foetus. The right nutrition in the right amount and quantity will help in the proper growth of the foetus and in maintenance of the mother's health. Along with the daily diet, inclusion of supplementary food like iron, calcium, protein and folic acid can prove to be quite beneficial.

There should be a common awareness and knowledge about the type of food which really have a positive impact on foetal growth. Along with the taking of daily diet, the supplementation of some food items, which are not easily accessible in the normal diet or are needed in larger quantity, should be included. Obstetricians, paediatricians, family physicians and other child health professionals also have an ethical and professional responsibility to maintain the health of unborn foetus and of newborns and infants in the society. Their job description should not only be of checking a patient and prescribing food supplements and medicines but to make sure that the prescribed things are being taken.

The fortification of essential micro nutrients and supplementary foods in everyday consumed food items should be making out as an option in the future Government policies just like many developed and developing countries which had already implemented the policy. The application of the mentioned thoughts and initiatives might help in bringing a better health for both mother and the growing foetus, not only in a particular community or state but for the nation as a whole.

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