

## Review: Dietary and Weight Factors during and after Maternal Preconception

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### Abstract

Pregnancy is a brief period of the entire human life. It is an essential and crucial time of human growth and development. Nutrient requirements at this stage are exceptionally required to maintain steady growth of the mother and child before preconception and during conception. However, deficiencies in such nutrients may result in complications to the African mother and also predisposes the foetus/child to potential risk elements like T2D, respiratory disorders amongst other health implications. It would be plausible reproducing healthy offspring and doing so with ease and still retaining vigour at the end of each pregnancy, wouldn't it? Mothers around the world (especially African mothers) are further enlightened in this study about the dietary necessities during and after child birth (that is at every stage of pregnancy). This study updates women of all works of life, all ages as well as ethnicity, on their weight acquisition or losses, and that of the foetus (their bouncing babies). This study generally compromises the relationship between nutritional diets and their substantial effects on the mother and the foetus, and how this will in turn have benefiting effects on the child's future healthiness for a very long time. This study addressed some arguments surrounding maternal preconception and dietary nutrients using materials from experimental studies of some hosts of research analysts and scientists. Education is the key to proffering sustainable health for our intending mothers and pregnant mothers. In this study I examined relevant studies and arguments to better buttress the need for this study and found out that indeed nutrients are the key to healthy conception. This study concludes on the note that women should be more concerned about what they eat at all times and especially during pregnancy. Their weight gain is also important as it could be the best way to monitor and control pregnancy complications like the gestational diabetes mellitus which could lead to other disease complications.

**Keywords:** Maternity/Pregnancy; Nutrition; Carbohydrate diet; Protein diet; Fat diet; Obesity; Type 2 diabetes; Gestational diabetes; Preconception

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### Introduction

A mother's actual health and sometimes sedentary lifestyle she portrays before pregnancy is observable as it directly affects her subsequent pregnancies with possible impact on the health conditions of her children both born and unborn. The area of particular concern as far as an intending mother is concerned is her weight gain/loss on or before the onset of pregnancy. The outstanding increase of overweight and obesity in women in the world especially Africa has redirected partially if not totally some of her health care providers' focus to providing therapy

recommendations regarding the intending mothers' weight management before and during pregnancy.

There is a 'rob the cradle' relationship between nutrition and reproductive health and this has aroused an active interest in the areas of research concerning the correlation between both parameters. It is relevantly important to note that Western diets which are high fat diets may result in metabolic syndromes, not excluding obesity, insulin resistance, type 2 diabetes, hypertension and cardiovascular diseases. African mothers on the *same page* still require a considerable high fat diet in order to acquire sufficient supply of nutrients to maintain at least a normal foetal growth rate.

Godfrey et al. [1] and Moffett et al. [2] had revealed that younger progeny of women on a hyperphagia diet who hope to increase foetal birth weight may be at a horrid danger of reproductive failure. On another note, there were evidences in pigs that showed closely regulated reproductive problems in the presence of reserved state of energy present in their reproductive systems [3]. A 2013 study had duly reported that the ovaries in the female reproductive system are if not entirely, but in part highly sensitive [4]. However, there is a potential risk of faulty luteal functions as a result of decreased follicular strength which in passing may be due to inappropriate nutritional procedures [3].

The general reproductive health of intending mothers is solely reciprocal to their ovarian immune response more or less the deprivation of the latter would directly influence the other. The knot linking oxidative stress patterns to intense reproductive performances reveals that severe oxidative stress highly impairs ovarian development in pigs [5]. The immune functionality of the foetus is readily affected due to inadequate supply of antioxidants in pigs as they share biological similarities to humans. The pig which played as a significant model in Che et al. study [6] had subtly investigated the relationship between nutrition and ovarian development.

## Aim of Study

Therefore, in this study, I further examine and review the effects of dietary and weight factors before, during and after maternal preconception. This review will enlighten women on the mechanisms and factors mediating the effect of nutrition on reproductive health as well as weight gain during this awesome and stressful period of women around the world.

## Study Method

This study addressed the following arguments using materials from experimental studies of hosts of research analysts and scientists, under the following sub-headings:

- Maternal preconception weight status.
- Nutrient needs during pregnancy.
- Maternal carbohydrate intake and birth weight.
- Maternal fat and fatty acid intake and birth weight.
- Maternal protein intake and birth weight.
- Common problems associated with pregnancy.
- Gestational diabetes.

## Maternal Preconception Weight Status

As noted by Chu et al. and a host of other authors, I discovered that obesity during preconception stages of intending mothers had been associated with a substantial *jet-pack increase* in potential risks for pregnancy complications as well as a significant *jet-pack increase* in foetal defects [7-9].

Both maternal obesity (body Mass Index [BMI]>30) and maternal overweight status (BMI 25 to 29.9) have been shown to increase the risk of birth defects.

The Centres for Disease Control and Prevention (CDC) found that newly birthed babies born to mothers who were overweight at the time of conception had an increased risk of foetal defects compared to those born to normal weighted mothers, and also showed to have possessed a *double fold* of the risks of severe heart defects. Watkins et al. [10] noted with a *side eye*, that intending mothers who were obese prior to conception were more than likely to have babies in most cases, with spina bifida or the abdominal malformation omphalocele. However, Ehrenberg et al. [11] on the other hand, noted that an intending mother who is underweight prior to conception also puts her baby at a more potential risk for foetal complications. In both cases, there was possibly an indication of malnutrition which correlated in both complications.

Considerably, maternal malnutrition as far as pregnancy is concerned may influence foetal formation and development resulting in potential risks to heart diseases, diabetes and even high blood pressure in the future. Malnutrition on *its own bed* may be influenced by illness, food insecurity or possibly other factors known and unknown to intending mothers; and this difficulty but not complicated problem needs serious and effective attention to yield and increase possible positive outcomes and thus avoid *rolling stones* for both mother and child. Despite these nutritional complications, Chu et al. [7] in a handed study had noted that a BMI of even as less than 18.5 had been related with an increased risk of delivery before the due date of delivery.

While these issues continue to arise, underweight intending mothers should be charily and carefully watched and taken care of to ensure that these intending mothers at least try to keep up with their daily doses of nutritional requirement during pregnancy, thus carefully observing weight gain/loss during this period. There is also the need to provide nutritional supplements to intending mothers to also ensure that they meet up with their nutritional requirements.

Though all these precautions have been set in place for intending mothers, there are still cases of underweight intending mothers showing signs of weight loss or no weight gain at all. This could be as a result of pre-existing eating disorders or the recent development of lack of appetite during pregnancy. Rounding up information here and there on what suitable name to call this disorder, I stumbled on the term "Pregorexia" recently coined to describe the long stories above. Intending mothers who tend to be guilty of faulting parental health guidelines and steps due to conditions best known to them, possibly "watching their weight" as some would sometimes say, exposes themselves willingly to the dangers of short or long term foetal complications. Bansil et al. [12] discovered in detail that women identified with these eating disorders were significantly more susceptible and also clearly prone to potential risks of foetal growth restrictions, forced/induced labour, anaemia, and even genitourinary tract infections. If I must, overweight and obesity are two major health problems facing intending mothers and in general the public. Interestingly, we see (you and I) so far, that overweight and obese individuals have a potentially high risk to build up into more complex medical problems even escalating into chronic

diseases, including high blood pressure, coronary heart diseases, Type 2 Diabetes (T2D) [13], diseases of the gall bladder and some types of cancer. Daily the number of overweight or obese people especially women continues to escalate worldwide. In 2005 about 1.6 billion adults and at least 20 million children (under age 5) were overweight and about 400 million adults were obese (Body Mass Index (BMI)>25 kg/m<sup>2</sup>) [14]. Closely observing the alarming and upsetting percentage of children with obesity in the Netherlands, we discover that this abnormal condition had poised a major problem for this country [15] and at this spurning rate poises a more serious problem than a *ball and ring* situation for children all over the world.

Research findings even common knowledge suggests that the potentiality for becoming an obese adult is at least partly determined at the early phase (Childhood phase) of life. Whitaker et al. [16], Venn et al. [17] and Corvalan et al. [18], also added that obese children had this increased potentiality and relative risk of growing into an obese adult when compared relatively with children sustained on healthy weight.

Countless results have shown that infants of malnourished mothers during pregnancy indefinitely reduced birth weight. Among such results was a candid result from the Dutch Famine Cohort which consequently showed that these infants with lower birth weight having at least 50% susceptibility to health complications such as obesity amongst others later in life [19,20]. It is important to note that amongst these babies with gone-below normal weight are the males who experience rapid growth at the early developmental stages were most vulnerable in terms of developing obesity [21,22].

A higher birth weight is supposedly associated with the acquired Body Mass Index (BMI) for majority of cases. Closely observing weight features we experience on daily basis, it plausibly seemed that individuals who were petite or puny looking at birth had more abdominal fat as their abdomen carried the bulk of their general weight, regardless of their decreased BMI. We could once more observe that there are *mouth opening* indications that birth weight might just be subjective to the mother's nutritional habits during pregnancy. If indeed maternal diet during pregnancy is subjective to birth weight, then the risk disease complications in the future of the child, prevention of obesity and associated health problems should also commence immediately with effect during pregnancy. This should also draw the vigilant attention of the general public on these health policies that should guide and regulate these disease complications mentioned so far.

In many countries of the world, the Ministry of Health, Welfare, Health Organizations amongst other health institutes, have developed interactive educational programs aimed at increasing awareness for host communities about healthy lifestyle and dieting for pregnant women as well as intending mothers and parents. This will enable them to make healthy choices for their children. However, the impact of these programmes might be larger if maternal diet during pregnancy indeed influences birth weight and weight development of the offspring directly. By adapting a healthy diet during pregnancy intending mothers on their own consciously or otherwise influence the future risks for

chronic diseases in their children. Consistent and even paralleled persistent education about a worthy and healthy lifestyle during pregnancy might just be the most suitably effective means in the prevention of maternal and child obesity.

## Nutrient Needs during Pregnancy

The need for most nutrients by a woman are increased during pregnancy to meet the high demands of both the growing foetus and the mother, who on her own goes through a period of augmentation and rapid change to carry the child and prepare for lactation.

It is common slang around Africa and around the world that a pregnant woman *eats for two*. In other words she eats twice as much as she would normally eat on normal circumstances. Although this is technically correct because intending mothers often overestimate their need for additional calories, especially early in the pregnancy. For most women, the extra energy requirements are easily met by adding a small snack or two during the day. Eating smaller amounts of food more frequently, especially junk foods, also has the benefit of helping with some of the uncomfortable side effects of pregnancy, including nausea and heartburn. The focus should be on increasing the consumption of highly nutritious foods and minimizing surfeit calorie foods that may provide the extra energy needed but do not provide the micronutrients that are essential in much higher amounts. Before now, the Institute of Medicine had conversely advised pregnant women and intending mothers alike to increase their energy intake by approximately 300 kcal/day during pregnancy [23]. The new recommendations are much more sufficient in total acquired and required calories during the later stages of pregnancy. These new recommendations advised normal calorie intake at the early stages of pregnancy until the later stages at 340 kcal/day and 452 kcal/day [24]. In a comprehensive study released in 2004, Butte et al. [25] duly reported that additional energy shouldn't just differ by the trimesters, but should possibly be geared towards the mother's preconception BMI. Butte et al. [25] also outlined the additional energy requisite during pregnancy by the trimesters for underweight intending mothers at 150 kcal/day, 200 kcal/day and 300 kcal/day at each trimesters; for normal weight intending mothers at 350 kcal/day, 500 kcal/day for the first and third trimesters and finally, over weight/obese intending mothers at 450 kcal/day and 350 kcal/day at the early and late stages of pregnancy. Although the Butte et al. [25] study provides the common and convenient guidelines for caloric intake during each periods and stages of pregnancy, the most precise and advisably comfortable way to observe and scrutinize the intending mother's requisite energy intake is to assess her periodic weight gain at consecutive intervals. An intending mother's requirement for excessive calories can be affected by *de facto* levels of physical activities.

Poorly nourished mother were found to deliver low birth weight babies as compared to women who were better nourished in a 2016 study [26]. Results from a 2017 study in China showed that both preterm and term groups had imbalanced dietary intakes compared to Chinese Dietary Reference Intakes. However, a

comparison of dietary nutrient intakes between the preterm and term groups showed that fat and vitamin E intakes appeared to be associated with preterm births [27].

## Maternal Carbohydrate Intake and Birth Weight

The steady and continuous growth and development of the foetus in the womb requires a lot of exuding energy in the appearance of glucose which should be readily available to the foetus at all times at 175 g/day and 130 g/day for pregnant and non-pregnant women respectively. Commonly in America, most pregnant women and intending mothers consume enough carbohydrate diet to quickly correlate pregnancy requisite of approximately 260 g/day [28].

Pregnant women all over the world including Africa have been advised *day in day out* of the prevailing dangers of low carbohydrate diet and the consequential risks it places on their offspring during and after conception except in cases where intending mothers are diabetic, then a completely mild but not reduced carbohydrate diet is carefully and observably administered. If an intending mother or pregnant woman *takes in* with diabetes or eventually acquires it during pregnancy, she definitely needs help else her baby is placed at *a bottle's neck*.

## Maternal Fat and Fatty Acid Intake and Birth Weight

Fatty diets are quite essential in synthesising and providing metabolic as well as compound energy, after all they are more or less concentrated calories. Meals containing fats must have the following to suffice for fatty requisite: oils, margarine and butter, meat, fish, and nuts, thus making snacks, cookies, ready cooked meals and dairy products a conglomerate of fatty requisites.

Fatty diets in another capacity, provides essential Fatty Acids (FAs). These fatty acids execute a lot of vital body functions [29]. These FAs include; saturated FAs (important constituents of membranes), mono unsaturated FAs, polyunsaturated FAs, and *trans*-FAs which are desperately crucial in foetal development for body immunity, relaxation, contraction and constriction activities of the various muscles of the human body [30]. The deficiency or absence of FAs will lead to the loss of the aforementioned functions and capabilities of FAs in the body especially the reduction of the child's cognitive and psychomotor abilities [30-32].

Diets rich in Omega-3 FAs are recommended for pregnant women all over the world, yes and even in Africa. However, supplements of omega-3 FAs have been provided. This will increase the ready requisite to the foetus and should be admonished by pregnant women and intending mothers alike even until lactation commences and afterwards.

## Maternal Protein Intake and Birth Weight

Proteins are augments of amino acids which are referred to as the composite blocks of the general body tissues. The body on

its own can self produce amino acids for the body to use while a considerable percentage is delivered to the body through healthy protein diets. Such diets include; fish, meat, dairy meals, eggs, poultry, nuts and legumes.

It was discovered in three studies that there exist no significant relationship between dietary protein consumption whether in excess or in meagre amounts and birth weight [33-35]. On the contrary, a *hard teething* review on this same issue discovered that protein supplementation of intending mothers actually portrayed a significant result correlating protein diet and birth weight [36]. In other words, protein supplement (>0.25) tend to contain more daily energy than actual consumption of dietary proteins. Their further review also discovered that babies born by obese mothers on protein diets had significantly lower birth weights. Thus it had been thought that the relationship existing between increased protein intake and birth weight may just *single-handedly* depend on the preliminary stages of pregnancy. Moore et al. [37] carried out a comprehensive study and discovered that a higher/increased dietary consumption of protein at the early stages of pregnancy was closely related to an increased birth weight. In relation to other contrasting reports, Mathews et al. [38] after an extensive study on the relationship between maternal protein consumption on daily basis and infant birth weight at the later stages of pregnancy could not find any positive and significant relationship/association between them. With these varying results here and there, Huh et al. [39] carried out a similar study but based on the relationship between maternal protein consumption and infant birth weight in the second/mid stage of pregnancy and found that there was no association whatsoever.

For a healthy foetal to be formed and delivered successfully, there should be adequate supply of protein. In the same-vain, intending mothers should consume adequate protein though there might be protein deficiency. This case may be as a result of low calorie intake. In order to take advantage of the benefits of protein diets, as well as to meet up with the high energy demand during pregnancy, more of these protein diets should be taken daily to avoid protein deficiency. Just like in the case of monitoring the dietary/carbohydrate intake of pregnant women and intending mothers, the dietary intake of proteins from quality sources should also be carefully examined and assessed. This is to ensure that the requisite protein diets are made available to the foetus during its developmental stages in the womb.

## Maternal Fibre Intake and Birth Weight

Looking at fibres, we could see how considerably they affect our diets and the amount of extra comfort they provide to pregnant women. Fibres are seriously important in the development of the foetus but do not have any significant backings regardless the amount supplied.

Despite the low fibre content in American diets constituting health nuisance, it is extremely advisable that pregnant women acquire enough of fibres. These nuisances may be as a result of the high demand for sweet fluids, reduced exercise, and possibly hormonal modifications purposely devised to provide

the baby more space/room for growth. This health nuisance may contribute to problems associated with troublesome constipation and persistent haemorrhoids during pregnancy. Pregnant women and or intending mothers all over the world especially in Africa should be seriously educated on the relevance of fibre consumption. Fruits, nuts, seeds, beans, roughages/vegetables, and whole grains are all exquisite dietary sources of fibre.

## Common Problems Associated with Pregnancy

Pregnancy experiences in women vary differently depending on the individuals, even at times a first time experience may be different from subsequent experiences and vice versa. A number of factors contribute to the mother's experience with pregnancy, including how the mother feels about being pregnant; her physical reaction to pregnancy; any health conditions that she has or develops; her physical environment, including availability of food, housing, and health care; and finally, other demands that cause stress for the mother (e.g., her job or other kids). Here I hope to exhaust some of the commonly known physical side effects of pregnancy. We could both examine some more complicated issues during the course of pregnancy.

- Nausea,
- Vomiting,
- Heightened Food repugnance, and
- Heightened Cravings.

It is common knowledge that during pregnancy, the mother's body experiences some physiological transitions in order to accommodate, nourish and in fact cherish the new life in her. These transitions results in side effects, causing irregularities in her eating dispensation. Arguably, the re-adjustment of hormonal activities during pregnancy are presumed to be the major cause of these side effects, but the arguments still *floats unresolved* as to what influences these side effects; physiologic or psychological experience [40]. Regardless of what may and what may not, it is extremely critical to proffer pregnant women and intending mothers hustling and wrestling with the problems listed above so we can minimize the brunt and *sad-looking* effects of these factors. This way, Keller et al., [41] suggested that we both increase and maximize the available nutrition standard for the health for both mother and child.

## Gestational Diabetes

Gestational diabetes also known as gestational diabetes mellitus (GDM), is defined as a situation in which a woman presumably without diabetes suddenly develops or begins to develop high blood sugar levels during pregnancy [42,43]. Gestational Diabetes Mellitus (GDM) is defined as any degree of glucose intolerance starting with pregnancy or noticed during pregnancy. This is the diabetes of intending mothers during pregnancy. Lucas [44] noted that this disease condition was readily available in  $\geq 0.05/5\%$  of all pregnancies. Mostly Type 2 Diabetes (T2D) is commonly diagnosed and detected during pregnancy and thus

referred to as gestational diabetes; well as long as pregnancy persists. Failure of the blood sugar to return to normal levels after the baby is delivered; the mother will then be diagnosed with T2D [45]. It could be found that women of the following ethnic milieu show a higher genetic predisposition; Australian, Hispanic, Indigenous Islander, Asian, Pacific, African-American, or Native American, are at an even prominent and potential risk of T2D. Cheng and Caugey noted that intending mothers who were obese prior to pregnancy, after been diagnosed with POS (polycystic ovarian syndrome) were predisposed to T2D [45]. When gestational diabetes is left unattended, it poses a potential risk of raging rate of still birth and macrosomia. Schmidt et al. [46] had noted that when the infant is just so large, the infant directly admonishes its mother to prep for a caesarian section and all its cumbersome complications, especially those that have to do with major surgeries. Bager et al. [47] in addition to Schmidt et al. added that children born via caesarean section are more likely to develop allergies and asthma and respiratory problems. Examining more physiological complications related to delivery of a hefty infant, there are other possible prominent adverse outcomes.

There is a bulk of problem if the child is just producing insulin in excess non-stop especially at the time of delivery. There is a serious risk of hypoglycaemia for the child when the umbilical cord is severed. There would be no supply of glucose to the child any longer, hence hypoglycaemia complications. At the early stages of conception, hope can be restored once more for diabetic mothers who have little control over their sugar level. These women can regulate this situation by keeping their blood sugar *around the average* and slightly reduce high carbohydrate intake.

Only on the grounds that dietary intervention had failed to pop the blood sugar *around the average*, can medications (insulin therapy) be consulted. Faith had eventually taken these mothers this far and blood sugar returns to normal, it is ideal to keep tracks of the progress so far, as women who had gestational diabetes during the previous pregnancy(ies) are at a potential and prominent risk of developing and reliving the disease from subsequent pregnancies. Furthermore, a 2002 study had shown that as much as 70% of all pregnant women and intending mothers with gestational diabetes will eventually be diagnosed with T2D [48].

Education is the key prevention slogan and movement whereby the need for constant exercise, maintaining a healthy weight, and participating in healthy dieting would be buttressed and emphasized.

## Conclusion

Pregnancy as brief a period of the entire human life is an essential and crucial time of human growth and development. It generally compromises the relationship between foetus and its external and internal environment, and this in turn would have benefiting effects on the child's future healthiness for a very long time. As a society of grand literacy and educated sympathizers in Africa and the rest of the world, we must attend specially and

specifically to assisting these women; pregnant and intending mothers to understanding the effect of sedentary lifestyle and the choices they make on children. This way we can help initiate positive health impact on the mothers to ensure that their children, our children, are provided with the first health start of their lives. Food and Nutrition is a fundamental component of foetal development, as the baby cannot build with materials he or she does not have. Limiting exposure to damaging substances

such as nicotine, caffeine, food-borne bacteria, and alcohol will also aid in the child's development. Helping women deal with unpleasant side effects of pregnancy as well as more serious ones should be a focus of prenatal support in Africa and the rest of the world. Finally, encouraging healthful life-style practices during pregnancy such as moderate exercise and healthy eating will impact not only the child's long-term health, but potentially the mother's as well.

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