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WEIGHT GAIN AND DIETARY ADEQUACY AMONG PREGNANT WOMEN: A PROSPECTIVE STUDY

by
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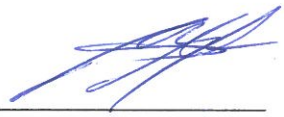

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AN ABSTRACT OF THE THESIS OF

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Background: Pregnancy is a critical period during which proper maternal nutrition is a key factor influencing the health of both the child and mother. Unaddressed imbalances during this period have been linked to several health conditions like diabetes, strokes, heart failure and other NCDs in later stages of life and in some cases, complications in birth outcomes.

Objectives: As part of the first longitudinal 3-year cohort study (MINA cohort) in the region, we aimed to assess the nutrient and food groups intake as well as gestational weight gain in Lebanese pregnant women throughout the entire gestation period.

Methods: Lebanese pregnant women (152) were recruited during their first trimester (0-13 weeks of gestation) and interviewed by trained research dietitian once during each trimester at the OBGYN clinics of the American University of Beirut Medical Center (AUBMC). Sociodemographic information, household food security data, anthropometric measurements as well as dietary intakes were recorded through multi-component questionnaires during each visit (V1: during 1st visit to the clinic, collecting data prior to pregnancy; V2: Collecting data during the 2nd visit, 2nd trimester; V3: Collecting data during the 3rd visit, the 3rd pregnancy trimester). Anthropometric assessments followed standard techniques, and the data collected were entered and analysed using Statistical Package for the Social Sciences (SPSS) version 22.0.

Results: All socio-demographic characteristics didn't differ significantly in accordance of the weight gain adequacy except for the first child pregnancy by multiparous women were 23% more likely to have adequate weight gain during pregnancy.[OR: 0.23*(0.059,0.890)]. Less than 50% of the participants had gestational weight gain within the recommended values for BMI, while 16.7% gained weight below the recommendations and 37.5% gained weight above the recommended values. Prior to pregnancy, the average intake of Vitamin A (520.69±31.76), calcium (851.66±36.6) and iron (14.12±0.54) appeared to be notably below the recommended values for having a healthy and successful pregnancy. During the 2nd trimester, the average intakes of all micronutrients studied: Vitamin A (464.81±30.46), Folate (335±15.12), Calcium (764.97±36.89), Iron (12.9±0.59) and Zinc (9.73±0.45) were below the RDA recommendations. Likewise, the prevalence rates of suboptimal micronutrients intakes were also observed in the 3rd trimester. Participants consuming calcium below two-third

the recommendations were between 37 and 44% throughout the whole pregnancy, similar to participants who were consuming vitamin A below two-third the recommendations (60 – 67%). On the other hand, participants who consumed less than two-third the recommendations for proteins, folate, iron and zinc increased dramatically, by which these percentages witnessed an over 2-fold increase between V1 and V2.
Before pregnancy, fruits and vegetables average consumption was 401g/day which matches the FAO/WHO daily recommendations of consuming 400g/day of fruits and vegetables. Meat, poultry, fish and eggs supplied 116.71 g/day of protein intake. Milk and dairy products contributed 82.1g/day, in addition to 74.1 g/day of yogurt products, providing 9.27% of daily energy intake. The intakes of fruits and fruit juices, fats and oils, non-alcoholic beverages and dairy products increased after pregnancy 11.51%, 9.7%, 2.54% and 6.73% in the 2nd trimester, and 12.19%, 11.01%,13.17% and 6.81% in 3rd trimester, respectively. Vegetables consumption decreased by around 10g/day, but the total fruits and vegetables consumption remained above 400g/day as recommended. 100% of our population were found to be food secure.

Discussion: Despite the high education level of most study participants, the prevalence of inadequate weight gain was 50%, meaning that general education alone might not be enough. The alarming suboptimal intakes in the major nutrients are of concern during pregnancy, and in this study these intakes appeared to decrease further through-out the pregnancy period. The average energy intake decreased from the 1st trimester to the 3rd trimester, which might be the reason behind the inadequate intake of proteins in the 3rd trimester. Change in energy intake was positively related to change in intake of all micronutrients. All the participants in this study were food secure, unsurprisingly, considering they come from a high socio-economic status. Given the following, the suboptimal intake levels we found in essential pregnancy nutrients were not expected. These findings suggest that being food secure does not necessarily mean nutrient secure.

Conclusion: The findings of this study showed an alarming level of nutrient intakes which might lead to deleterious maternal/offspring health outcomes. Pregnant women were not consuming the recommended levels of pregnancy-essential nutrients. Further studies are necessary in this case to better assess and interpret the reasons behind these inadequacies so that population appropriate interventions would be implemented to improve overall pregnancy and birth outcomes among the Lebanese society. It is also important to assess individual-level dietary restraints since many women tend to follow a non-scientific diet during pregnancy with the purpose of preventing weight gain.

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CHAPTER 1

LITERATURE REVIEW

In 2008, 65% of global deaths were attributable to noncommunicable diseases (NCDs), this witnessed an increase to 68% in 2012 till it reached 70% in 2017[1]. NCD attributable deaths are projected to continue to increase by 15% between 2010 and 2020[2, 3]. According to WHO NCD progress monitor report 2017, In Lebanon, 89% of deaths are from NCDs, with a total number of 32000 cases and an 18% risk of premature death from NCDs[1]. Women's health behaviours during pregnancy can have serious long term effects on their and their children's health and likelihood of developing NCDs[4]. Pregnancy has been identified as a time in the life course where NCD prevention could be particularly effective. Some studies refer to pregnancy as an 'opportune moment' for behavior change because women's concern for the health of their baby makes them more open to altering their diet and exercise habits[5].

Pregnancy is a critical period during which proper maternal nutrition is a key factor influencing the health of both the child and mother[6]. Unaddressed imbalances during this period have been linked to several health conditions like diabetes, strokes, heart failure and other NCDs in later stages of life.

The concept known as The Barker hypothesis of "fetal origins" or "fetal programming" advocates that the origins of chronic diseases of adult life lie in fetal responses to the intrauterine environment[7]. Barker suggests that the genesis of adult-onset chronic diseases originates through fetal adaptations to undernourishment[7]. This hypothesis has gained collective recognition ever since it was first presented three decades ago.

During the prenatal period, the fetus must evolve in only 9 months from a single-celled, fertilized egg to a human infant. For this to be accomplished the fetus should have all the necessary resources available from the mother in the proper quantities and at the exact times they are needed.

Studies suggest that both restricted fetal growth and high birth weight are linked with an increased risk of childhood morbidity and chronic diseases in adulthood [4, 8]. Unfortunately, it appears that this bilateral issue is present in many pregnancies where women fail to attain their adequate food and nutrient recommendations.

A. Gestational Weight Gain (GWG)

The Institute of Medicine (IOM) and National Research Council (NRC) have recently issued new guidelines for weight gain during pregnancy that differ than that published in 1990. This committee studied the trade-offs between mother and infant in both short- and long-term outcomes and pursued the ranges in which this trade-off was most favourable [9, 10]. This was assessed primarily by considering the most constant and reasonable outcomes associated with GWG: infants born small- or large-for-gestational age, the mother's risk for an unplanned caesarean delivery and excessive postpartum weight retention. Below is a table describing the current GWG recommendations. The major concern is to avoid gaining below or above these recommendations due to the association with various pregnancy and post pregnancy complications.

1. Consequences of GWG for Mother and Infant

Maternal weight gain might be associated with a range of factors. Some evidence suggests that gestational weight gain, primiparity, and maternal body size before pregnancy jointly influence long-term postpartum weight retention and the development of over-weight and obesity among women of childbearing age[11]. According to an evidence report on outcomes of maternal weight gain by the University of North Carolina Evidence-based Practice Center[12], evidence proposes an association between weight gain below IOM recommendations and preterm birth, low birthweight, small for gestational age (SGA) birthweights, and failure to initiate breastfeeding. In addition to compelling evidence for the association between weight gain above IOM recommendations and high birthweight, macrosomia, and large for gestational age (LGA) birthweights. These same findings were also generated by a systematic review of outcomes of maternal weight gain [13] by which it focused on outcomes of gestational weight gain, specifically birthweight, fetal growth, and postpartum weight retention, for singleton pregnancies with respect to the Institute of Medicine weight gain recommendations. A total of 35 studies met the inclusion criteria and were reviewed. There was convincing evidence to support associations between excessive gestational weight gain and increased birthweight and fetal growth (large for gestational age) as well as inadequate gestational weight gain and decreased birthweight and fetal growth (small for gestational age). Regarding birthweight, ten studies from nine databases examined the association between weight gain defined by IOM guidelines and birthweight. Overall, these studies provided evidence for an association between weight gains less than the IOM guidelines and lower birthweights. Mothers of low birth weight children tend to compensate through providing excessive dietary

intakes leading to accelerated weight gain between the ages of 3 and 11 years old which by its turn increases the risk of Coronary heart disease, type 2 diabetes and hypertension in later stages of life[14]. These results align with another systematic review and meta-analysis by Han et al, including Fifty-five studies, 37 cohort and 18 case-control, involving 3,467,638 women. In the cohort studies (crude data, generally supported where available by adjusted data and case-control studies), singletons born to women with low total gestational weight gain have higher risks of preterm birth and low birthweight, with the lower the gain, the higher the risks[15]. Eight articles out of the 35 studies examined gestational weight gain and Large for gestation age (LGA) and macrosemia. These studies provided strong evidence that high weight gains are associated with an increased risk of LGA infants. Only 1 study failed to find an association. Four articles showed a consistent association between macrosomia defined as greater than 4500 g and maternal weight gains above the IOM guidelines. High birth weight has serious adverse impacts on chronic health conditions and development in children. Excessive gestational weight gain (EGWG) is associated with long term obesity in mothers leading to long term maternal illnesses that include gestational diabetes mellitus, preeclampsia, the need for cesarean delivery and complications during and post-delivery, in addition to fetal risks including prematurity, still birth, congenital diseases, macrosomia and childhood obesity [6, 10]. The prevalence of obesity has increased among women of childbearing age, and approximately 60% of obese pregnant women gain more weight than recommended during pregnancy[6]. Several pregnancy cohort studies from developed countries have reported independent direct associations between pregravid weight or BMI and postpartum weight retention based on multivariable models [16-18].

The findings of a cohort study in Australia improve the evidence-base regarding determinants and obstetric complications involving large for gestational age births[19]. In this cohort, two sub-populations of infants were identified, with the first subgroup corresponding to a group of infants of normal birth weight and the second subgroup corresponding to a group of infants with large birth weight adjusted for gestational age and baby gender. The delivery of a large for gestational age infant was associated with an increased risk of obstetric complications such as caesarean delivery or instrumental delivery for mothers and the needs of resuscitation procedure or intensive/special care nursery for infants. The large for gestational age infants will also have a higher risk of complications in the immediate post-delivery period. Evidence suggests that large for gestational age infants may have long-term health issues in addition to the short-term health complications. These include an increased risk of suffering chronic diseases later in life such as diabetes, hypertension, and asthma.

Generally, the impact of gestational weight gain varies depending on maternal BMI and the outcome variable studied. Obese women, however, may benefit from a low weight gain during pregnancy[20].

Table 1.1. Current Recommendations for Weight Gain During Pregnancy*

Weight-for-height category	Recommended total gain, kg
Underweight (BMI < 18.5)	12.5 – 18.0 Kg
Normal Weight (BMI 18.5 – 24.9)	11.5 – 16.0 Kg
Overweight (BMI 25.0 – 29.9)	7.0 – 11.5 Kg
Obese (BMI≥30)	5.0 – 9.0 Kg

* *2009 IOM/NRC guidelines for weight gain during pregnancy for women with singleton fetuses[9]*

2. Consequences of Gestational Diet Quality for Mother and Infant

Since maternal diet and nutrient supplies are the main source of all key nutrients that ensure fetal growth essential for successful pregnancy[8], it is not surprising that maternal deficiencies can have serious effects on fetal development and pregnancy outcome[21].

Micronutrient deficiencies which tend to be associated with low consumption of foods rich in micronutrients, have been linked to the development of preeclampsia, gestational diabetes mellitus, spontaneous preterm birth, fetal growth restriction, as well as gestational hypertension[21]. Extensive investigations into micronutrient deficiencies have focused on those common within pregnant population, such as folate [22]. However, evidence is emerging about the importance of trace minerals like iron and zinc in supporting successful pregnancy[23]. It is known that trace minerals are crucial for the maintenance of cell proliferation and function by which severe deficiencies during pregnancy having been shown to have a teratogenic effect on the fetus[24].

Inadequate intake of vitamins or minerals, known collectively as micronutrients, can have deleterious effects on the mother and her infant[21]. According to the Institute of medicine[25], micronutrient deficiency or what we call 'hidden hunger' is a reality for around one-third of the world's population, with pregnant women and children being the most vulnerable to the effects of these deficiencies. The importance of main micronutrients like iodine has been previously recognized due to the association of certain micronutrient deficiencies with clinical conditions, however, the role of many other micronutrients in pregnancy have been lately revealed.

It is important to understand why some pregnant women demonstrate low diet quality. It is unclear how some factors influence diet quality, including food security,

education, occupation, income and many other. The theory behind this is that individuals are more likely to make better health choices when they are motivated and educated to do so, in addition to being in an environment that supports these decisions[26].

It is important to also understand why some pregnant women demonstrate low diet quality. It is unclear how some factors influence diet quality, including food security, education, occupation, income and many other. The theory behind this is that individuals are more likely to make better health choices when they are motivated and educated to do so, in addition to being in an environment that supports these decisions[26]. A study by Larsen and Gilliland[27] described the existence of food deserts in some countries, referring to socioeconomically deprived areas lacking access to affordable, healthy food, as one of the causes behind the lack of good maternal nutrition. Some studies suggest that increased risks of certain birth defects may be included among the negative consequences of food insecurity [28]. However, inconsistent relationships between many factors with diet quality in pregnancy, as well as a lack of literature on the influence of the food environment might also prove to be evident. Therefore, there exists a need to advance the knowledge of determinants of diet quality in pregnancy by focusing on both personal characteristics and the food qualities and quantities. [29]

B. Nutrition Requirements During Pregnancy and Their Impact on Birth Outcome

Generally, the needs for most nutrients increase during pregnancy to meet the high demands of both the growing fetus and the mother who similarly goes through a

phase of growth, allowing her to carry her baby. Following is a section discussing nutrition requirements during pregnancy.

1. Total Energy Requirements

Mothers-to-be usually overestimate their caloric needs during pregnancy, the needed extra energy can be easily covered by adding a couple of snacks a day with the focus on nutrient-dense food providing the important micronutrients needed during pregnancy rather than empty calories providing energy without any nutritious benefits[30]. Generally, the additional energy needs during pregnancy are minimal in comparison to most of other nutrients. In the first trimester, no extra energy intake is needed since the energy expenditure does not differ much. Additional 340 Kcal and 450Kcal of energy is recommended in the second and third trimesters, respectively[31]. In addition to that, some women might not be able to maintain an adequate energy intake during pregnancy, due to several physiological or psychological factors. According to a report by FAO, in the absence of specific micronutrient deficiencies, effects of maternal diet on fetal growth will occur only when a women's energy intake does not meet her needs during pregnancy. This by itself means that a lack of energy might lead to low macronutrient and micronutrient deficiency, altering the growth and development of the fetus[32, 33].

2. Protein Requirements

Protein is one of the major factor influencing the fetal growth and development by which it provides the building blocks necessary for the formation of enzymes, antibodies, muscles and collagen. The latter is used as the basic component for the

formation of skin, bones, blood vessels and other body tissue. Ideally, protein needs of adult women are 46-54g/day, this increases during the second and third trimesters in pregnancy to 71-74g/day to accommodate the high demand estimated of 21-25g/day deposited in fetal, placental and maternal tissues during later stages of pregnancy[30, 31], supporting the finding of a prospective observational study conducted in South Australia, by which diet of 557 women aged 18-41y ware assessed in early and late pregnancy using an FFQ. This study found that in early pregnancy, the percentage of energy derived from protein was positively associated with birth weight ($P = 0.02$), independently of energy intake and weight gain during pregnancy, and after adjustment for potential confounders. Effects were stronger among women ($n = 429$) who had reliable data, based on prespecified criteria including the plausibility of dietary data when referenced against estimated energy expenditure meaning that low protein intake in late pregnancy was associated with decreased placental and birth weights[32]. These data support the proposition that maternal dietary composition influences fetal growth. In addition to that, very high protein diet and Protein/energy restriction during pregnancy can have adverse effects. This is the suggestion of the Cochrane systematic review of randomized controlled trials of various forms of protein supplementation during pregnancy [34], by which in 13 trials involving 4665 women, balanced energy/protein supplementation was associated with modest increases in maternal weight gain and in mean birth weight, and a substantial reduction in risk of small-for-gestational-age (SGA) birth, and in three trials involving 384 women, energy/protein restriction of pregnant women who were overweight or exhibited high weight gain significantly reduced weekly maternal weight gain and mean birth weight. Generally, balanced combination of energy/protein supplementation improves fetal growth, may

reduce the risk of fetal and neonatal death whereas protein/energy restriction of pregnant women is unlikely to be beneficial, and may be harmful to the infant.

3. Micronutrients

Usually, micronutrient deficiencies co-exist and vary by stage of life, season, year, ethnic group, economic status, place of residence within a country, and among individuals in the same community making it harder to target. The majority of the previous studies target the deficiencies of a single vitamin or mineral, resulting in useful findings, yet the correction of a single micronutrient deficiency might not necessarily be effective when there are more aspects to be taken into consideration[21].

For pregnancy, the major micronutrients of concern would be Folate, Iron, Zinc, Calcium and Vitamin A. Inadequacies in these nutrients have been proven to severely affect the pregnancy outcomes.

a. Folic Acid and Iron

Folic acid deficiency has been recently administered to have a causal role in neural tube defects, yet this is more related to the preconception nutritional status. Supplementation after pregnancy are of minimal effect. Folic acid has also been long provided as a supplement along with Iron during pregnancy on the basis of hematological benefits, by which a combination of deficiency of these two minerals is associated with pregnancy anemia which in turn puts the mother at risk of death from complications, such as hemorrhage during pregnancy[21]. There is substantial evidence that maternal iron deficiency anemia increases the risk of preterm delivery and

subsequent low birth weight, and accumulating information suggests an association between maternal iron status in pregnancy and the iron status of infants postpartum[35].

b. Zinc

The RDA for zinc increases from 8mg/day to 11mg/day during pregnancy. Adequate zinc intake is essential and plays a role in the formation of organs and assisting the immune system development[30].Zinc deficiency has been linked to complications of pregnancy and delivery making interventions aiming to reduce this micronutrient's malnutrition a necessity. Studies suggest that severe zinc deficiency might have deleterious effects like spontaneous abortion or congenital malformations, while milder forms of zinc deficiency have been linked with poor birth outcome (low birth weight (LBW), intrauterine growth retardation, and preterm delivery), as well as delivery including prolonged or inefficient first-stage labor, premature rupture of membranes (PROM), and the need for operative delivery. These complications might lead to more serious issues such as increased risk of maternal lacerations, high blood loss, maternal infections, fetal distress, still birth, respiratory distress and neonatal sepsis[36]. Zinc interventions include supplementation as a principal strategy to overcome this issue in pregnancy; however, the required information to describe the dietary patterns and intakes resulting in such inadequacies are relatively lacking. To formulate future recommendations for enhancing the pregnancy micronutrient status, data is first needed on nutrient intakes and dietary patterns[21].

c. Calcium

The RDA/DRI for calcium during pregnancy does not differ than that for adult non-pregnant women (1000mg/day), even though calcium is involved in bone formation and fetal growth. Poor calcium intake may be associated with abnormal fetal development, pregnancy induced hypertension and preterm delivery. According to the WHO, Calcium supplementation has the potential to reduce adverse gestational outcomes, in particular by decreasing the risk of developing hypertensive disorders during pregnancy, which are associated with a significant number of maternal deaths and considerable risk of preterm birth, the leading cause of early neonatal and infant mortality[37]. Two Cochrane systematic reviews investigated whether calcium supplementation on daily basis during pregnancy safely improved maternal and infant outcomes. The findings revealed that this intervention significantly reduced the risk of pre-eclampsia and high blood pressure (with or without proteinuria). Women who received calcium supplements had a significantly higher risk of developing HELLP (haemolysis, elevated liver enzymes, and low platelet count) syndrome, a rare adverse event associated with severe pre-eclampsia. Calcium supplementation had no effects on the risk of developing eclampsia or maternal death or maternal admission to the intensive care unit[38, 39]. Moreover, consuming the right calcium quantities during pregnancy might not be translate into the baby's bone density, however, it has a direct protective effect on the mother's bone health since she will be losing calcium content to her baby if her intakes were not adequate[21, 30].

d. Vitamin A

Vitamin A, the fat-soluble vitamin, if consumed in high doses before and in early pregnancy can be teratogenic, leading to congenital birth defects. These birth defects can include malformations of the eye, skull, lungs, and heart. Synthetic retinoids are potent teratogens and are contraindicated during pregnancy. There is a significant placental transport of vitamin A between mother and fetus, and recommended intakes are increased by 10% during pregnancy (770 μg/day). However, Vitamin A is critical for the fetal growth due to its involvement in protein synthesis, vision and cell differentiation. Although pregnant women are susceptible to vitamin A deficiency throughout gestation, susceptibility is at its highest during the third trimester of pregnancy due to accelerated fetal development and the physiological increase in blood volume during this period[40]. Therefore, low maternal vitamin A might be associated with fetal wastage and intrauterine growth retardation, by which some studies suggest that subclinical vitamin A deficiency, is a problem during the third trimester of pregnancy. Serum concentration of retinol <20 μg/dL appears to indicate a deficient status, and is associated with an increased risk of preterm delivery and maternal anemia [41]. According to the WHO, ~19 million pregnant women are thought to be affected by this nutritional deficiency. Because vitamin A deficiency during pregnancy and postpartum periods can severely affect both maternal and infant health, vitamin A supplementation is sometimes suggested[42]. Noteworthy, however, is the legitimate and serious concern about toxic and teratogenic effects of high-dose vitamin A supplementation during these critical periods of growth and development. Researchers have continued to study the putative effects of vitamin A supplementation on maternal

and infant health during the reproductive cycle whether the health promoting or potentially detrimental ones [21, 30, 31].

C. Dietary Intake in Lebanon

Lebanon is a highly urbanized Mediterranean country, characterized by its healthy traditional cuisine that is a collection of olive oil as principle fat, minimally processed vegetarian recipes and plenty of fruits, vegetables, cereals, legumes and nuts[43]. A national cross-sectional study conducted at the American University of Beirut showed that the Lebanese dietary pattern is associated with better diet quality and healthier lifestyle behaviors while the Western pattern implicated a lower quality diet[44]. However, with the current development and westernization, the Lebanese Mediterranean diet has been witnessing a conversion into a pattern of high in saturated fat, sugar, and refined foods with lower fiber content. Consumer tastes and demands have had implications on the traditional Lebanese foods and dietary habits. These changes affected the percent distribution of macronutrients in the Lebanese diet, by which it seems that a duality is appearing between modernization and the strong adherence to culture and tradition[43].

In a cross-sectional study for assessment of traditional food intake in Lebanon using validated tools, the daily intake of traditional dishes was quantified in a representative population sample of 566 Lebanese adults, aged 20–85 years, selected in 5 areas of Lebanon. This study suggested that the modern Lebanese population preserved a prominent place for the traditional food: 57 % of the Lebanese population consumes more than 9 traditional dishes per week. As mentioned before, this diet is characterized, as in most of the Mediterranean regions, by a dominating contribution of

fruits and vegetables (42 %), cereals (34 %), bread (14 %), pastries (5 %) and legumes (7 %) in the daily food ration. The Lebanese population covers almost all their needs in vitamins and minerals[45]. The Lebanese daily food ration however, presents a strong trend today to evolve towards diets rich in lipids on the detriment of carbohydrates. In addition to that, carbohydrates consumed in the form of wholegrain cereal in the past, they are now replaced by refined and transformed cereal. The Lebanese are thus becoming more influenced by the western model in their lifestyle and eating patterns. Food and Agriculture Organization food balance sheets (FAO 2009) show an increased energy availability (9.84 MJ in 1961 vs. 13.24 MJ/capita/day in 2003), an increase in energy from lipids (23% in 1961 vs. 31% in 2003) and a decrease in energy from carbohydrates (67% in 1961 and 57% in 2003), during the past four decades[46]. Therefore, Lebanon seems to be going through a late nutrition transition phase of coexistence between the tradition and the modernity. With this increased contribution of fat to daily energy intake, the low intake of fish, fruits and vegetables, a cross-sectional study by Nasreddine et al that investigated and assessed the food consumption pattern of the adult Lebanese population living in Beirut by means of a quantitative food-frequency questionnaire, suggests that the adult Lebanese population is at risk of cardiovascular diseases, obesity and other non-communicable diseases[47].

CHAPTER 2

OBJECTIVES AND SPECIFIC AIMS

The main aim of this study is to assess the dietary and nutrient intake, gestational weight gain, food security, and sociodemographic/economic characteristics of pregnant women before and during their pregnancy; and examine a relationship between these variables. More specifically, the objectives of this study are:

- Investigate gestational weight gain and its association with its determinants among pregnant women
- Examine nutrient intake among pregnant women including Energy, proteins and micronutrients and its association with sociodemographic and demographic characteristics
- Examine diet quality of pregnant women with respect to the recommendations for a healthy pregnancy outcome
- Assess food security status among pregnant women.

The outcomes of this study may constitute the foundation of effective interventions to ensure optimal pregnancy health and birth outcomes as well as the growth and development of children by developing evidence-based nutrition and lifestyle guidelines for pregnant women before and during their pregnancy.

CHAPTER 3

MATERIALS AND METHODS

A. Study Design

This study is a part of a longitudinal three-year cohort study (MINA cohort) of pregnant women and their children residing in Lebanon. The Study population includes all pregnant women attending obstetrics and gynecology (OBGYN) clinics of the following health-care centers in Lebanon:

The American University of Beirut Medical Center (AUBMC) and primary health centers in Beirut. These health centers represent the both private and governmental hospitals in Beirut, Lebanon, respectively

B. Study Participants

Women in the OBGYN clinic's waiting room were approached before they entered for their appointments. Trained surveyors explained the background, objectives and methods of the study to those who were pregnant in their first trimester. In addition, they explained to the pregnant women that their refusal to participate in the study would not affect their appointments.

Women who agreed to participate in the study were interviewed directly for the first time (1st trimester) and contacted to schedule the rest of the interviews for data collection in later stages of pregnancy.

Women who agreed to participate in the study signed informed consent forms, prior to data collection (Appendix B). Also, they were provided with copies of these

forms that included the contact details of the study principle investigator and the IRB office at AUB. Participants were assured that if they decided to withdraw from the study for any reason, this would not affect their relationship with their physician.

Study participants were selected per the below set inclusion and exclusion criteria.

Inclusion criteria for pregnant women:

- Within the first trimester of pregnancy (between 0-13 weeks of gestation)
- Pregnant with a singleton
- Of Lebanese and non-Lebanese nationality living in Lebanon for more than 5 years
- Not planning on permanently leaving either of the countries during the timeframe of the study
- Absence of a chronic illness preconception (diabetes, hypertension, kidney disease, cancer, and other chronic diseases or infections such as autoimmune disorders, human immunodeficiency virus, and hepatitis)

Exclusion criteria: Pregnant women excluded from the study if they were:

- Carrying twins or multiple babies
- Had a history of a chronic illness
- Had a history of multiple gestations (twins or triplets)
- Had previously given birth to babies with physical malformations, mental retardations, and/or inborn errors of metabolism

C. Ethics

The MINA cohort protocol was approved by the Institutional Review Board (IRB) at the American University of Beirut (Protocol ID: NUT. FN. 12). The challenge

was to ensure sufficient ethical oversight of the study, while respecting the interests, status, and procedures of each of the ethical review bodies that have jurisdiction over the study conduct. Participants were asked to provide signed consent to participate in the study at the time of recruitment. In addition to the main consent form, participants were given the option to give a written consent for obtaining delivery and birth data from medical records, sharing the collected data with researchers that are not part of the study, as well as storage and use of left-over samples for future research. Subjects were informed that they can still participate in the study even if they decline consenting for the additional options. Participants were given a copy of the signed consent form.

D. Study Protocol

Pregnant women recruited during their first trimester (0-13 weeks of gestation) were interviewed once during each trimester at the OBGYN clinics of the selected health care facilities in Lebanon. Prenatal assessments consisted of anthropometric measurements and administration of questionnaires for the collection of maternal factors including dietary intake and supplement use before pregnancy, as well as dietary intake, supplement use, and lifestyle practices during pregnancy. In addition, sociodemographic and socioeconomic characteristics as well as household food security data were collected once during the first trimester of pregnancy. Additionally, questions to assess maternal exposure, knowledge, attitudes, and intentions towards infant feeding practices were asked during the third trimester visit.

E. Data Collection

Data collection for this study included multi-component questionnaires as well as anthropometric measurements. Below is a brief description of the data collection tools and methods used in the study.

1. Questionnaires Used in Data Collection

Multicomponent questionnaires were developed to be used for the collection of data. The content validity of these questionnaires was confirmed by a panel of experts consisting of two neonatal physicians, one nutrition epidemiologist, and two clinical nutritionists. The original version of the questionnaires was written in English, translated to Arabic then back-translated to English to ensure parallel-form reliability. The original and the back translated questionnaire versions were reviewed for consistency in meaning by two bilingual experts. A pilot testing of these questionnaires was conducted to ensure that the wording was appropriate and would yield the required data. The interview typically lasted an hour. The interviewer was a research dietitian trained in the methodology to be used prior to the start of the fieldwork. 3 questionnaires were used in this study, one for each visit resembling each trimester through-out the pregnancy.

In Visit 1 (V1), the questionnaire constituted of 8 sections as follows:

I. Anthropometric Measurements during Pregnancy (1st Trimester)

II. General Information about the Current Pregnancy

III. Dietary Practices and Supplement Use before and during Pregnancy

IV. Lifestyle Practices before and during pregnancy

V. Dietary Intake before Pregnancy

VI. Dietary Intake during Pregnancy

VII. Household Food Security

VIII. Socio-Demographic/Economic and Geographical Characteristics of the Household

In Visit 2 (V2), the questionnaire constituted of 5 sections as follows:

I. Anthropometric Measurements during Pregnancy (2^{nd} Trimester)

II. General Information about the Current Pregnancy

III. Dietary Practices and Supplement Use during Pregnancy

IV. Lifestyle Practices during pregnancy

V. Dietary Intake during Pregnancy

In Visit 3 (V3), the questionnaire constituted of 6 sections as follows:

I. Anthropometric Measurements during Pregnancy (3^{rd} Trimester)

II. General Information about the Current Pregnancy

III. Dietary Practices and Supplement Use during Pregnancy

IV. Lifestyle Practices during pregnancy

V. Dietary Intake during Pregnancy

VI. Maternal Exposure, Knowledge, Attitudes, and Intentions Regarding Infant Feeding Practices

a. <u>Maternal Sociodemographic and Lifestyle Questionnaire</u>

This questionnaire was used to collect sociodemographic information including the mother's age, place of residence, occupation, education, living arrangements,

income, consanguinity, and lifestyle practices during and after pregnancy. In addition, a section on maternal knowledge and attitudes towards infant feeding practices and intentions to breastfeed was included in this questionnaire.

b. Dietary intake Assessment Questionnaire of the Mothers

Dietary intake of mothers was evaluated using a culture-specific food frequency questionnaire (FFQ). Supplement use was also assessed. Participants were required to report their usual frequency of consumption of each food from a list of different food items which were listed using generic names. Foods with similar nutritional qualities are grouped together for ease of use. The trained research dietitian conducted the FFQ interview one food item per section at a time, asking about: the food usual portion size intake as well as the frequency of the intake (per day/week/ month or rarely/never). The FFQ consisted of 98 food items as normally consumed and included several culture specific composite dishes that may contain multiple ingredients. The foods and beverages were also categorised into groups. A reference portion, expressed in household measures or grams, was specified for each food item. The individual was asked to estimate the number of items per day, week, month or year he/she consumed the food item. In addition, the FFQ dedicated an open ended section in which participants provided extra foods or beverages that they child consumed on a regular basis. A two-dimensional food portion visual chart was used (Two-dimensional food portion visual chart) in the purpose of aiding participants in defining the portion size they consumed. Common household measures, measuring cups, spoons were shown in their actual size to assist individual in the estimation process as well. Standardized portion sizes were also used for specific foods such as breads, soda cans, kaak, canned

meats, chocolate bars, manaakich, croissants, and packed Lebanese food items. The FFQ to be completed by study participants during the first visit (1st trimester) referred to food intake during the three months-period prior to the participant's pregnancy while the remaining FFQs referred to the three months preceding the interview.

The Nutritionist Pro software (version 7.1.0, 2018, First Data Bank, Nutritionist Pro, Axxya Systems, San Bruno, CA) was used for the analysis of dietary intake data, including the estimated intakes of energy, macronutrients, and micronutrients. To cover Lebanese traditional foods commonly consumed among our target population, standardized recipes for composite and mixed dishes were added to the Nutritionist Pro Software using single food items from the USDA database.

c. Sociodemographic/Economic Characteristics of the Household

In addition to maternal factors, data about the father's as well as the household's characteristics were also collected and included paternal education, occupation, income, and the household food security. Household food security was assessed using the Household Food Insecurity Access Scale (HFIAS) tool that was previously validated and applied successfully in a wide range of countries[48, 49]. In Lebanon, an Arabic version of the HFIAS was shown to be a valid and reliable tool to assess food insecurity in rural Lebanon [49].

2. Anthropometric Assessment

In addition to data collected by questionnaires, anthropometric measurements for mothers were obtained.

Maternal anthropometric assessments followed standard techniques and encompass height, weight, and waist circumference.

Weight was measured to the nearest 0.1kg using a SECA-calibrated electronic weighing scale (Hamburg, Germany) in light clothing and with bare feet or wearing stockings. Measurements were taken twice and the average of the 2 values was adopted. Height was measured to the nearest 0.5cm, with bare foot and waist circumference was measured using a non-stretchable measuring tape, to the nearest 0.5cm at the level of the umbilicus, midway between the lower part of the ribcage and the iliac crest.

BMI was calculated as weight (kg)/height (m_2) and interpreted according to the WHO criteria as follows:

- Underweight: BMI < 18.5 kg/m^2
- Normal weight: BMI= 18.5–24.9 kg/m^2
- Overweight: BMI= 25.0- 29.9 kg/m^2
- Obesity*:* BMI ≥ 30.0 kg/m^2

3. Statistical Analysis

The data collected were entered and analysed using the Statistical Package for the Social Sciences (SPSS) version 22.0. Frequencies, means and standard deviation (SD) were used to describe socio-demographics, and anthropometric characteristics of the pregnant women and their husbands.

Independent t-test and Chi-square test were used to compare continuous and categorical variables. Categorical variables were expressed as percentages and continuous variables were expressed as means. Pearson's correlation coefficient was

used to examine the association between the nutrient intakes and gestational weight gain.

Normality of the variables was examined using standard tests and, when needed, appropriate transformation was applied. For variables with normal distribution, the mean, standard deviation, and Student's *t* test were used. The frequency and the chi-square test (χ^2) or Fisher's exact test were used for categorical variables.

4. List of Variables Used in the Analysis

Variables of interest for the present analysis were derived from the questionnaire of the 3 visits. Description of the variables used in this study is shown in Table 3.1.

Table 3.1. List of Variables

Variable	**Type**	**Description/coding**
Anthropometric Measures during Pregnancy		
Weight (Kg)	Continuous	
Height (cm)	Continuous	
Waist Circumference (cm)	Continuous	
General information about current pregnancy		
Gestational Week	Continuous	
Pre-pregnancy Weight	Continuous	
First Pregnancy	Categorical	Yes. No.
Previous Miscarriages	Categorical	Yes. No.
Number of children	Continuous	
Last delivery date (MM/YYYY)	Continuous	
Dietary Practices and supplement before and during pregnancy		
Supplement intake prior to pregnancy	Categorical	Yes. No.
Supplement intake during 1st trimester of pregnancy	Categorical	Yes. No.
Who prescribed the supplements during 1st trimester of pregnancy	Categorical	OBGYN Physician OBGYN Nurse Dietitian

		Family Member Friend Self Other
OBGYN aware of supplement intake	Categorical	Yes. No.
Dietary intake before pregnancy		
Cereals and cereal-based products Pasta and other cereals Potatoes and potato – based products Vegetables Fruits Fruit juices Meat – cured meat Meat – Offals Meat – Poultry Meat – Eggs Meat – Fish and seafood Pulses, Nuts and Seeds Milk and Dairy products Yogurt and Yogurt – based products Pizzas and Pies Mixed Dishes Fats and Oils (Added on bread) Fats and Oils (Used on frying) Sugar and sugar derivatives Cakes and Pastries Honey, Jam, Molasses and Halaweh Alcoholic beverages Non-Alcoholic beverages Miscellaneous (Ketchup, Mustard, Thyme, Pickles...)	Continuous	Food Frequency Questionnaire
Any other foods/Beverages not mentioned	Categorical	Yes. No.
Household food security (In the past 4 weeks)		
did you worry that your household would not have enough food?	Categorical	No. Yes.
How often did this happen?	Categorical	Rarely (1-2 times) Sometimes (3-10 times) Often (>10 times)
Were you or any household member not able to eat the kinds of food you preferred because of a lack of resources?	Categorical	No. Yes.
How often did this happen?	Categorical	Rarely (1-2 times) Sometimes (3-10 times) Often (>10 times)
Did you or any household member have to eat limited variety of food due to lack of resources?	Categorical	No. Yes.
How often did this happen?	Categorical	Rarely (1-2 times)

		Sometimes (3-10 times) Often (>10 times)
Did you or any household member have to eat some foods that you did not want to eat because of lack of resources to obtain other type of food?	Categorical	No. Yes.
How often did this happen?	Categorical	Rarely (1-2 times) Sometimes (3-10 times) Often (>10 times)
Did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	Categorical	No. Yes.
How often did this happen?	Categorical	Rarely (1-2 times) Sometimes (3-10 times) Often (>10 times)
Did you or any household member have to eat fewer meals in a day because there was not enough food?	Categorical	No. Yes.
How often did this happen?	Categorical	Rarely (1-2 times) Sometimes (3-10 times) Often (>10 times)
Was there ever no food to eat of any kind in your household because of lack of resources?	Categorical	No. Yes.
How often did this happen?	Categorical	Rarely (1-2 times) Sometimes (3-10 times) Often (>10 times)
Did you or any household member go to sleep at night hungry because there was not enough food?	Categorical	No. Yes.
How often did this happen?	Categorical	Rarely (1-2 times) Sometimes (3-10 times) Often (>10 times)
Did you or any household member go a whole day and night without eating anything because there was not enough food?	Categorical	No. Yes.
How often did this happen?	Categorical	Rarely (1-2 times) Sometimes (3-10 times) Often (>10 times)
Socio-demographic/economic and geographic characteristics of the household		
DOB (DD/MM/YYY)	Continuous	
Highest educational level	Categorical	No schooling Primary school Intermediate school High school Technical diploma University degree Refused to answer

Specialized in health – related major	Categorical	Yes. No.
What kind of work do you do	Categorical	Housewife/homemaker Employee, full time Employee, part – time Self – employed other
How soon after delivery do you expect to return to work	Categorical	After 49 days After 70 days After 3 months Don't know Not planning to return
Which area of Lebanon do you live	Categorical	Beirut Mount Lebanon South Nabatiyeh North Bekaa
Related to husband	Categorical	Yes. No.
Husband's highest educational level	Categorical	No schooling Primary school Intermediate school High school Technical diploma University degree Refused to answer
Husband's work	Categorical	Not working Not working but looking for job Employee, full time Employee, part – time Self – employed other
Own your house	Categorical	Yes. No.
Family monthly income	Categorical	<600,000L.L 600,001-999,999 L.L 1,000,000-1,499,000L.L 1,500,000-1,999,000L.L 2,000,000-2,499,000L.L 2,500,000-2,999,000L.L ≥3,000,000L.L Don't know/Not sure Refused to answer

CHAPTER 4

RESULTS

A. Population characteristics

The study population consists of 152 Lebanese singleton pregnant women. Table 4.1 shows the socio-demographic and anthropometric characteristics of the study population. On Average, women who participated in the MINA cohort study in Lebanon were 29.82±4.96y of age, 162.7±6.16cm tall, and 82.5±11.2cm of waist circumference. Their average pre-pregnancy body mass index BMI; 23.08±3.79 Kg/m^2, with the majority being within the normal range (67.2%), 26.6% of them being overweight or obese, and 6.3% under the recommended BMI range. Almost one-third of the participants (37%) were having their first child, and they all were enrolled in the study in their first trimester. The majority of the participating women had a high education level (85.2% had a university degree or a diploma) and were not specialized in a health-related major (77.1%), similar to their husbands with 81.3% of them having a university degree or a diploma. More than half of the participants were working women (60%), and nearly half of them lived in Beirut (49.6%) and had a total monthly income of more than 3,000,000 L.L (44.1%).

Table 4.1. Population Characteristics[†]

	Total
	Mean ±S.E or N(%)
Weight Characteristics	
Pre-Pregnancy Body Mass Index (BMI)[a]	
Underweight	8(6.3)
Normal range	86(67.2)
Overweight/Obese	34(26.6)
Gestational Weight Gain	
Below	8(16.7)
Adequate	22(45.8)
Above	18(37.5)
Height (cm)	162.7±6.16
Waist Circumference (cm)	82.5±11.2
Socio-demographic Characteristics	
Mother's age (years)	29.82±4.96
<30	65(50.8)
30-39	59(46.1)
≥40	4(3.1)
First Child	
Yes	50(36.8)
No	86(63.2)
Mother's education	
Primary school or less	2(1.6)
Intermediate/High school	16(12.5)
University degree/diploma	109(85.2)
Refused to answer	1(0.8)
Mothers who specialized in a health-related major	
Yes	30(22.9)
No	101(77.1)
Husband Related	
Yes	11(8.5)
No	119(91.5)
Mothers' employment status	
Housewife	50(39.7)
Employed	76(60.3)

Father's education	
Primary school or less	4(3.1)
Intermediate/High school	18(14.1)
University degree/diploma	104(81.3)
Refused to answer	2(1.6)
The house that you live in is	
Self-owned	94(75.2)
Other	31(24.8)
Living Area	
Beirut	63(49.6)
Outside Beirut	64(50.4)
Monthly income	
<1,000,000 L.L.	5(3.9)
1,000,001-2,000,000 L.L.	17(13.4)
2,000,001-3,000,000 L.L.	16(12.6)
>3,000,000 L.L.	56(44.1)
Don't know/refused to answer	33(26)
Food Security	
Food Secure	130 (100)
Food Insecure	0 (0)

†Column total may be different because of missing data.
[a] BMI classification: Underweight (BMI < 18.5), Normal (BMI: 18.5-24.9), and Overweight (BMI ≥ 25) (WHO, 2013).

B. Socio-Demographic Characteristics Among Levels of Weight Gain Adequacy

Table 4.3 below shows the socio-demographic characteristics of the study population according to levels of pregnancy weight gain adequacy. There were no significant difference between socio-demographic characteristics and weight gain adequacy except for the first child pregnancy (Table 4.4), by which multiparous women were 23% more likely to have adequate weight gain during pregnancy, as seen in tables 4.3 and 4.4. [0.23*(0.059,0.890)].

Table 4.2. Weight Gain Adequacy in Association With Parity

Parity	Inadequate gestational weight gain
First Child	1
Not First Child	0.23

Table 4.3. Socio-Demographic Characteristics Among Levels of Weight Gain Adequacy†

	Total (n=48)	**Inadequate (n =26)**	**Adequate (n =22)**	**Significance**
Mother's age (years)				0.63
<30	26(59.1)	14(56)	12(63.2)	
30-39	18(40.9)	11(44)	7(36.8)	
≥40	0(0)	0(0)	0(0)	
	Total	**Inadequate**	**Adequate**	**Significance**
First Child				0.028
Yes	14(29.8)	4(16)	10(45.5)	
No	33(70.2)	21(84)	12(54.5)	
Mother's education				0.۷
Primary school or less Intermediate/HS	۸(18.2) 36(81.8)	5(20) 20(80)	3(15.8) 16(84.2)	
University degree/diploma/Refused				
Mothers who specialized in a health-related major				0.861
Yes	11(25)	6(24)	5(26.3)	
No	33(75)	19(76)	14(73.7)	
Husband Related				0.128
Yes	3(7)	3(12)	0(0)	
No	40(93)	22(88)	18(100)	
Mothers' employment status				0.437
Housewife	14(32.6)	9(37.5)	5(26.3)	
Employed	29(67.4)	15(62.5)	14(73.7)	

Father's education Primary school or less Intermediate/HS University degree/diploma/Refused	٧(15.9) 37(84.1)	4(16) 21(84)	3(15.8) 16(84.2)	0.٩٨٥
The house that you live in is Self-owned Other	31(73.8) 11(26.2)	18(78.3) 5(21.7)	13(68.4) 6(31.6)	0.47
Living Area Beirut Outside Beirut	19(43.2) 25(56.8)	11(44) 14(56)	8(42.1) 11(57.9)	0.9
Monthly income <3,000,000 L.L. >3,000,000 L.L. Don't know/refused to answer	12(27.3) 23(52.3) 9(20.5)	5(20) 16(64) 4(16)	7(36.8) 7(36.8) 5(26.3)	0.2

†Column total may be different because of missing data.

Table 4.4. Odds of Gaining Weight Inadequately During Pregnancy vs. Sociodemographic Characteristics

	OR	95% C.I	
Mother's Age	0.742	0.219	2.519
First Child	0.229	0.059	0.890
Mother's Education	1.512	0.379	6.026
Specialized in a health-related major	0.884	0.224	3.490
Mother's Employment status	1.680	0.452	6.249
Father's Education	1.190	0.651	2.177
Own House	1.662	0.416	6.636
Monthly Income	0.887	0.483	1.629

C. Dietary Intake and Nutritional Adequacy Among the Study Subjects

Table 4.5. Nutrient Intake in the 1st Pregnancy Trimester Compared to RDA Recommendations

Nutrients V1 (n=133)	**Mean±S.E**	**Below Recommendation N(%)**	**Above Recommendations N(%)**	**Recommended ***
Proteins	78.35±2.89	18(13.5)	115(86.5)	46 g
Vitamin A	520.69±31.76	106(79.7)	27(20.3)	700µg
Folate	356.91±14.67	94(70.7)	39(29.3)	400µg
Calcium	851.66±36.6	94(70.7)	39(29.3)	1000mg
Iron	14.12±0.54	107(80.5)	26(19.5)	18mg
Zinc	10.74±0.44	46(34.6)	87(65.4)	8mg
Energy Intake	2197±89.99			2200Kcal

*Recommendation based on Recommended Dietary Allowance (RDA)

Table 4.5 above shows the average intake of pregnant women right before pregnancy (Visit 1), compared to the recommended nutrient intake, in addition to the number of participants consuming these nutrients below and above the recommendation. The participants' average intake of protein (78.35±2.89) and zinc (10.74±0.44) were above the RDA recommendations, while the average intake of Energy (2197±89.99) and folate (356.91±14.67) almost met the recommended levels. The average intake of Vitamin A (520.69±31.76), calcium (851.66±36.6) and iron (14.12±0.54) appeared to be notably below the recommended values for having a health and successful pregnancy. Our analysis showed that the majority of the participants (86.5%) were consuming proteins above the recommendations, 65.4% were consuming Zinc above the recommendations, while 70 to 80% of them had intakes below the

recommended levels for Vitamin A (79.7%), Folate (70.7%), Calcium (70.7%) and iron (80.5%).

Table 4.6. Nutrient Intake in the 2nd Pregnancy Trimester Compared to RDA Recommendations

Nutrients V2 (n=98)	**Mean±S.E**	**Below Recommendation N(%)**	**Above Recommendations N(%)**	**Recommended ***
Proteins	71.77±3.26	59(60.2)	39(39.8)	71 g
Vitamin A	464.81±30.46	86(87.8)	12(12.2)	770µg
Folate	335±15.12	91(92.9)	7(7.1)	600µg
Calcium	764.97±36.89	78(79.6)	20(20.4)	1000mg
Iron	12.9±0.59	95(96.9)	3(3.1)	27mg
Zinc	9.73±0.45	70(71.4)	28(28.6)	11mg
Energy Intake Energy Increase	2038.9±86.09 -208.79±85.77	75(76.5)	23(23.5)	+340Kcal

During the 2nd Visit (V2) which resembles the intakes of the 2nd trimester (Table 4.6), pregnant women's average intake of proteins (71.77±3.26) was in-line with the recommended value (71g). However, the average intakes of the all micronutrients studied: Vitamin A (464.81±30.46), Folate (335±15.12), Calcium (764.97±36.89), Iron (12.9±0.59) and Zinc (9.73±0.45) were below the following recommendations 770µg, 600µg, 1000mg, 27mg and 11mg respectively. 60.2% of the participants were consuming proteins below the recommended levels, and the clear majority of them were consuming Vitamin A (87.8%), Folate (92.9), Calcium (79.6), Iron (96.9) and Zinc (71.4) below the recommended levels as well.

The average Energy intake during the 2nd trimester was 2038.9±86.09, decreased by an average of -208.79±85.77 from the first visit (2197±89.99), not meeting the recommendations of +340Kcal during the 2nd trimester, by which 76.5% of the participants did not meet this increase in energy recommendations.

Table 4.7. Nutrient Intake in the 3rd Pregnancy Trimester Compared to RDA Recommendations

Nutrients V3 (n=73)	**Mean±S.E**	**Below Recommendation N(%)**	**Above Recommendations N(%)**	**Recommended ***
Proteins	68.98±2.87	43(58.9)	30(41.1)	71 g
Vitamin A	484.58±35.99	65(89)	8(11)	770µg
Folate	331.07±14.47	70(95.9)	3(4.1)	600µg
Calcium	800.46±41.38	56(76.7)	17(23.3)	1000mg
Iron	12.42±0.5	73(100)	0(0)	27mg
Zinc	9.55±0.42	49(67.1)	24(32.9)	11mg
Energy Intake **Energy Increase**	2055.16±89.65 -248.53±115.6	73(100)	0(0)	+452Kcal

*Recommendation based on Recommended Dietary Allowance (RDA)

In the 3rd trimester (V3), the average protein intake dropped a little (68.98±2.87) but was still meeting the recommended value(71g). The averages of all the other nutrients were below the recommendations and almost the same as the intakes during the 2nd trimester as seen in table 4.7, Vitamin A (484.58±35.99), Folate (331.07±14.47), Calcium (800.46±41.38), Iron (12.42±0.5), and Zinc (9.55±0.42). The mean Energy intake remained the same as the 2nd trimester (2055.16±89.65), with an average energy difference of -248.53±115.6 Kcal, below the recommended increase in energy of +452Kcal. None of the participants increased their energy intake as the recommended value.

Table 4.8. Adequacy of Nutrient Intake of the Study Subjects With Intakes Less Than Two-Thirds of RDA During Each Pregnancy Trimester. †

	Inadequate[a] < 2/3 of the RDA	Adequate[b]	Recommended*
Nutrients	**N (%)**		
Proteins			
V1	3(2.3)	130(97.7)	46g
V2	17(17.3)	81(82.7)	71 g
V3	11(15.1)	62(84.9)	71g
Vitamin A			
V1	81(60.9)	52(39.1)	700 µg
V2	66(67.3)	32(32.7)	770µg
V3	46(63)	27(37)	770µg
Folate			
V1	43(32.3)	90(67.7)	400µg
V2	74(75.5)	24(24.5)	600µg
V3	58(79.5)	15(20.5)	600µg
Calcium			
V1	50(37.6)	83(62.4)	
V2	43(43.9)	55(56.1)	1000mg
V3	30(41.1)	43(58.9)	
Iron			
V1	57(42.9)	76(57.1)	18mg
V2	81(82.7)	17(17.3)	27mg
V3	63(86.3)	10(13.7)	27mg
Zinc			
V1	15(11.3)	118(88.7)	8mg
V2	33(33.7)	65(66.3)	11mg
V3	20(27.4)	53(72.6)	11mg

†Column total may be different because of missing data.
*Recommendation based on Recommended Dietary Allowance (RDA)
[a] Inadequate intakes of nutrients were considered to be intakes below two-third of the RDA recommendations
[b] Adequate intakes of nutrients were considered to be intakes above two-thirds of the RDA recommendations

The descriptive analysis of pregnant women's nutrient intake below two-thirds the RDA throughout their pregnancy showed inadequacy in various nutrients (table 4.8).

In the first visit (V1) right before the pregnancy, Vitamin A intake below two-thirds the recommendation (700 µg) had the highest percentage of participants with 60.9%, while protein (2.3%) and zinc (11.3%) intakes had the lowest percentage of participants consuming below two-thirds the RDA recommendations, 46g and 8mg respectively. The rest of the micronutrients (Folate, Calcium and Iron) studied had percentages between 30 and 45% below two-thirds the RDA recommendations (400 µg, 1000mg and 18mg respectively).

During the 2nd trimester (V2), iron intake below two-thirds the recommendation (27mg) had the highest percentage of participants with 82.7%, followed by folate (75.5%) and Vitamin A (67.3%) by which they are recommended in the values of 600 µg and 770 µg respectively. The percentage of participants with intakes below 2/3 the recommended was lowest for proteins (17.3%), followed by zinc (33.7%) and Calcium (43.9%).

The result analysis for the nutrient intake during the third trimester (V3) showed values very similar to those in the second trimester by which iron intake below two-thirds the recommendation (27mg) had the highest percentage of participants with 86.3%, followed by folate (79.5%) and Vitamin A (63%), and the percentage of participants with intakes below 2/3 the recommended was lowest for proteins (15.1%), followed by zinc (27.4%) and Calcium (41.1%).

Overall, the percentage of pregnant women with intakes below two-thirds of the RDA was consistent throughout the three visits for Calcium and Vitamin A with minimal changes. Participants consuming calcium below two-third the recommendations were between 37 and 44% throughout the whole pregnancy, similar to participants who were consuming vitamin A below two-third the recommendations

(60 – 67%). On the other hand, participants who consumed less than two-third the recommendations for proteins, folate, iron and zinc increased dramatically, by which these percentages witnessed an over 2-fold increase between V1 and V2, for proteins, percentages increased from 2.3% to 17.3%, for folate 32.3% to 75.5%, for iron 42.9% to 82.7% and for zinc 11.3% to 33.7%. Then these percentages remained similar between V2 and V3.

D. Daily Food Group Consumption Among the Study Participants

Mean estimates (g/day) of daily intake per food item and the percentage contribution of each food item to the average daily intake (on a weight basis) of the pregnant women were calculated. The mean consumption value for each of the 19 food groups in each visit and the contribution of each food group to daily energy intake are shown in Table 4.9.

In V1, prior to pregnancy, cereals and cereal-based products together contributed 92.2 g/day and provided 13.68 % of total energy intake, while other pasta and cereal products contributed to 6.5%. Potato and potato-based products contributed to 63.79g/day providing 9% of total energy intake. The average intake of sugar and sugar derivatives suck as jam, honey etc. was 49.68g and contributed to 9.5% of total energy intake. The mean consumption value of vegetables was 89.97g /day and contributed 0.9% to energy intake. While the mean consumption of fruits and fruit juices combined was 311.83 g/day and contributed to energy intake 9.48%. The sum of consumption of fruits and vegetables is 401g/day which matches the FAO/WHO recommendations of consuming 400g/day of fruits and vegetables. Meat and poultry consumed in V1 provided 8.79% of energy intake with 82.65g/day. Poultry contributed to almost half the

intake (44.75g/day), followed by meat and cured meat (34.76g/day) and offal's meat with the lowest contribution of 3.15g/day. The sum of eggs consumption was 14.38g/day contribution 1.2% to the average energy intake. Fish intake was 19.68g/day contribution to 1.61% of the energy intake, which lower than the recommended amount. Overall, meat, poultry, fish and eggs supplied 116.71 g/day of protein intake. Milk and dairy products contributed 82.1g/day, in addition to 74.1 g/day of yogurt products, providing 9.27% of daily energy intake. The mean intake estimates for added fats and oils

(excluding those used in cooking) was 20.51 g/day, giving 8.79% of daily energy intake, and other fats like nuts and seed were providing 67.85 g/day, contributing 7.62% of energy intake. The average intake of alcoholic beverages was negligible (1.54g/day) contributing to 0.06% of energy intake, while non-alcoholic beverages contributed to 4.11% of daily energy intake.

After pregnancy, the intakes of some food groups increased such as fruits and fruit juices, fats and oils, non-alcoholic beverages and dairy products providing 11.51%, 9.7%, 2.54% and 6.73% in the 2nd trimester, and 12.19%, 11.01%,13.17% and 6.81% in 3rd trimester, respectively.

Other food groups maintained almost similar contribution to the daily energy intakes before and after pregnancy like cereal-based products and sugar and sugar derivatives.

Most of protein providing food groups (meat, poultry, fish and eggs) decreased in the contribution to the daily energy intake after pregnancy, by which in meat and poultry decreased by 10g/day in the 3rd trimester of pregnancy, and fish and seafood decreased by 4-5g/day. Vegetables consumption decreased by around 10g/day as well,

but the total fruits and vegetables consumption remained above 400g/day as recommended.

We compared these food groups intakes with a previous study by L. Nasreddine et al, 2005 [47] that described the eating pattern among Lebanese adults in terms of quantities and types of foods most commonly consumed (Table 4.10). We found out that as per percentage contribution to the daily energy intakes, our study participants' (pregnant women) food groups contribution varied in certain areas by which the consumption of eggs, fish, fruits, sugars, fats and oils contributed more to the daily energy intakes in our study than that in the Lebanese general population (0.7%, 1%, 6.7%, 6% and 6.8% respectively). On the other hand, our study showed less contribution of vegetables to the daily energy intake (0.8-0.9%) than that in the general Lebanese population (5.5%) and similar findings to the contribution of meat, poultry, milk and dairy products as the Lebanese general population (8.8% and 10.9% respectively).

Table 4.9. Daily Food Group Consumption (grams, % kcal) of Subjects

	Visit 1 – Total (n =133)		**Visit 2 – Total (n =98)**		**Visit 3 – Total (n =73)**	
Food Groups	**(g/day)**	**% E /day**	**(g/day)**	**% E /day**	**(g/day)**	**% E /day**
	Mean ± SE					
Cereals & cereal-based products	92.2±6.37	13.68±0.96	97.42±7.77	15.75±1.38	90.5±7.21	13.53±1.12
Pasta & other cereals	91.25±5.57	6.5±0.46	89.77±6.07	6.56±0.44	88.09±8.15	6.2±0.48
Potato & potato-based products	63.79±6.68	9.07±0.74	55.4±5.52	8.71±0.74	47.45±5.01	7.73±0.86
Vegetables	89.97±7.15	0.91±0.07	77.35±6.58	0.8±0.07	80.23±5.83	0.9±0.08
Fruits and Fruit Juice	311.83±19.11	9.48±0.58	379.3±29	11.51±0.82	413.63±30.43	12.19±0.69
Meat and Poultry	82.65±4.35	8.79±0.45	81.34±7.49	9±0.65	71.33±5.09	7.87±0.51
Eggs	14.38±1.58	1.2±0.12	12.99±2.03	1.24±0.2	16.33±2.47	1.46±0.22
Fish & seafood	19.68±2.05	1.61±0.17	15.9±2.32	1.4±0.2	16.64±3.07	1.41±0.25

Pulses, nuts, seeds	67.85±6.03	7.62±0.52	51.76±4.2	6.03±0.47	45.31±4.88	5.17±0.5
Milk & dairy products	82.1±8.43	6.29±0.42	92.31±10.84	6.73±0.51	111.72±16.81	6.81±0.58
Yogurt, yogurt-baes products	74.07±7.63	2.98±0.27	67.71±6.61	3.02±0.31	67.54±12.68	2.59±0.31
Pizzas & pies	23.64±4.61	2.81±0.47	21.8±6.67	2.51±0.63	19.33±3.18	2.54±0.4
Mixed dishes	56.95±4.66	2.23±0.17	47.6±3.89	2±0.15	61.98±7.15	2.76±0.38
Fats and Oils	20.51±1.2	8.79±0.45	21.84±1.44	9.7±0.51	27.01±4.35	11.01±0.96
Sugar & sugar derivatives (honey, jam..etc.)	49.68±4.26	9.51±0.58	40±3.26	8.53±0.69	50.76±4.82	10.2±0.88
Cakes & pastries	21.55±4.11	3.85±0.59	18.17±2.3	3.57±0.37	19.89±2.18	4.11±0.45
Alcoholic beverages	1.54±0.6	0.06±0.02	0.99±0.99	0.05±0.05	1.06±1.06	0.02±0.02
Non-alcoholic beverages	1399.78±74.9	4.11±0.35	1464.22±88.83	2.54±0.33	1598.23±92	3.17±0.4
Miscellaneous	10.85±1.61	0.5±0.06	7±1.24	0.38±0.04	5.7±0.8	0.31±0.05

Table 4.10. Lebanese Population Food Group Consumption

Food Group	Consumption (g/day)	Contribution to energy intake (%)
Meat and Poultry	91.7 ± 44.6 (87.6–95.9)	8.8
Fish	19.7 ± 17.3 (18.1–21.3)	1.0
Eggs	12.1 ± 13.6 (10.9–13.4)	0.7
Milk & dairy products	243.1 ± 141.2 (229.9–256.2)	10.9
Vegetables raw	146.5 ± 66.0 (140.4–152.7)	2.3
Vegetable-based dishes	98.9 ± 48.4 (94.4–103.4)	3.2
Potato & potato-based products	63.5 ± 37.5 (60.0–67.0)	6.5
Fruits and Fruit Juice*	285.5 ± 110.7 (275.2–295.9)	6.7
Pulses, nuts, seeds	52.4 ± 30.1 (49.6–55.2)	5.6
Cereals & cereal-based products	178.3 ± 91.2 (169.8–186.8)	18.9
Bread and toast	146.2 ± 65.8 (140.1–152.4)	16.1
Fats and oils added at table†	20.4 ± 8.4 (19.6–21.7)	6.8

Sugar & sugar derivatives (honey, jam..etc.)	33.9 ± 29.6 (31.2–36.7)	6.0
Sodas and prepacked juices	242.1 ± 216.7 (221.9–262.3)	4.5
Caffeinated beverages	213.7 ± 164.1 (198.4–229.0)	0.17
Alcoholic beverages	33.6 ± 70.9 (27.0–40.2)	0.7

Consumption values are mean ^ standard deviation (95% confidence interval).
* Fruit juices contribute 65 g to the total value of 285.5 g daily.
† The values are for table-added fats and oils such as butter, mayonnaise, sesame paste and olive oil, as well
as fats and oils used in frying. It excludes fats and oils consumed with cooked dishes and other composite products.

CHAPTER 5

DISCUSSION

A. Weight Gain and Parity

Considering the sample population in this study and the fact that the women participating are of a good educational and socioeconomic background, we studied the socioeconomic status with the weight gain during pregnancy. The findings showed one significant relationship between primiparity and gestational weight gain by which the odds of gaining weight adequately during pregnancy were 23% higher in multiparous women, meaning that parity is associated with adequate weight gain rather than increased weight gain. It is understood from previous studies that there is a tendency of pregnancy weight gain to increase with age which was not the case in this study, however, Thomson and Billewicz (1965) [50] showed that parity added little to the weight gain tendency to increase with age. Another study found no clear effect of parity on weight gain[51]. It is important to note that although most studies agree that weight gain tendency increases with age, the independent effect of parity remains uncertain. Perhaps due to the small sample sizes or unaccounted for confounding variables causing inaccurate associations. It is important to study the independent effect of parity on weight gain by controlling other variables.

B. Sociodemographic Characteristics and Weight Gain

In light of the adverse outcomes for mother and offspring related to inadequate GWG, we aimed to identify whether any of the sociodemographic characteristics were

significantly associated with GWG. Our results didn't show any association between other sociodemographic characteristics studied and weight gain. Again, this might be due to the small sample size. According to a systematic review on the influence of sociodemographic status on gestational weight gain[52], low educational attainment is likely to be associated with women gaining weight outside the IOM (Institute of Medicine) recommendations, which was not reflected in this study since most of the participants have high educational status. With this said, even with a proper education, almost half of the well-educated participants did not gain weight adequately during their pregnancy as shown in table 4.1, meaning that general education alone might not be as helpful as some might suggest.

C. Dietary Adequacy

Studies suggest that the demands of gestation can exacerbate nutrient deficiencies with health consequences on the mother and fetus. In this study, we found an alarming suboptimal intakes in the major nutrients of concern during pregnancy, and these intakes appeared to decrease further through-out the pregnancy period. The average energy intake decreased from the 1st trimester to the 3rd trimester, which might be the reason behind the inadequate intake of proteins in the 3rd trimester by which half the women were consuming proteins less that the recommended levels. According to the institute of medicine, 2005 [53], during the second and third trimesters, an estimated 21 g d−1 of protein is deposited in maternal, foetal and placental tissues, therefore the increased need for protein intake during pregnancy should be taken seriously to avoid adverse side effects. Increased energy and protein intake has been shown to reduce the risk of preterm birth and stillbirth, low birthweight and small head circumference at birth [54]. A case-control study investigated finding an association of maternal energy

and protein intake with preterm birth, they found a statistically significant lower mean (SD) energy intake [cases 1624 (249) Kcal vs. controls 1911 (341) Kcal; P<0.001] and protein intake [cases 32.1 (6.1) vs. controls 37.2 (7.0); P<0.001] among women who delivered preterm neonates. Maternal energy and protein intake had significant positive correlation with neonatal weight, length, foot length, head circumference and chest circumference[55]. In fact, one study suggests that protein requirements of healthy pregnant women during early and late gestation are higher than the current recommendations[56], by which they randomly provided twenty-nine women a different test protein intake and found out that the estimated average requirement (EAR) for protein in early and late gestation was determined to be 1.22g/kg/day and 1.52 g/kg/day respectively, this is considered higher than the EAR of 0.88g/kg/day currently recommended. However, this theory needs to be further tested and studied on a larger sample.

Some micronutrient intakes were found to be consumed in low amounts (Below two-third the RDA recommendations) in most participants. A study found that after adjustment for age, ethnicity, pre-pregnancy body mass index, and intervention group, change in energy intake was positively related to change in intake of all micronutrients [57]. Even though this finding might be partly due to a decreased overall energy consumption, it is essential to explore other reasons behind these low intakes, given that they did not appear in later stages of pregnancy only, but from the beginning even before the decrease in the overall energy intakes. According to a systematic review and meta-analysis of micronutrients intakes during pregnancy in developed countries[58], pregnant women are at risk of suboptimal micronutrient intakes by which folate, iron and Calcium intakes were consistently below nutrient recommendations. This aligns

with the results we found in our study taking into consideration that the women are of high socioeconomic status relatively, by which over 80% of the pregnant women in our study consumed iron levels below the two-third of the recommended values, 70-80% of the participants had folate intakes below two-thirds the RDA recommendations during pregnancy, and around 40% had calcium intakes below two-third the recommendations as well. In addition to a substantial percentage of women consuming low vitamin A intakes (60-70%). Another study on Greek population found that sufficient micronutrients appear to be received in adequate amount from diet, except for folic acid and iron, which were also found to be under-consumed in our sample population[59]. Maternal undernutrition contributes to 800 000 neonatal deaths annually through small for gestational age births; stunting, wasting, and micronutrient deficiencies are estimated to underlie nearly 3·1 million child deaths annually[60]. According to a prospective study on the effect of iron deficiency on birth outcome, iron-deficiency anemia was associated with significantly lower energy and iron intakes early in pregnancy and the odds of low birth weight were tripled and of preterm delivery more than doubled with iron deficiency during pregnancy [61]. In addition to that, the influence of folate nutritional status on various pregnancy outcomes has long been recognized, whether we are talking about megaloblastic anemia or risk of neural tube defects, folate intakes are of high importance and recognition for researchers. In a large Swedish cohort with and without a history of spontaneous abortion, George et al [62]reported that women with lower plasma folate had a greater risk for miscarriage than did those with higher plasma folate. A cohort study conducted in Nepal to follow-up on 676 children aged 7 to 9 who had been born to women in 4 to 5 groups of a community-based, double-blind, randomized controlled trial of prenatal

micronutrient supplementation earlier in rural Nepal, showed that aspects of intellectual functioning including working memory, inhibitory control, and fine motor functioning among offspring were positively associated with prenatal iron/folic acid supplementation[63]. All these findings highlight the concerns regarding low iron and folate intake, increasing the risk of Lebanese pregnant women of having multiple pregnancy and birth outcome complications. According to another cohort study that assessed women's duet through 24-hour recall in Tanzania[64], iron intake was significantly associated with reduced risk of stillbirth and Higher Ca intake was associated with reduced risk of preterm birth (relative risk; 95 % CI: 0·76; 0·65, 0·88) and extreme preterm birth (0·63; 0·47, 0·86). Women in the highest Ca intake quartile had reduced risk of neonatal mortality (0·59; 0·37, 0·92). Iron, folate and calcium appeared to be consumed in our study in lower amounts than recommended, which urges us to question the overall diet of Lebanese pregnant women population and its effects on birth outcome.

D. Food Group Consumption

The dietary patterns derived in this study showed similarities to patterns identified in other studies conducted on the Lebanese general population, however, some differences were identified. The consumption of foods that are important sources of micronutrients, such as dairy products, meat, fresh fruits and green leafy vegetables is essential for infants' wellbeing and birth outcomes. A study was conducted in India over the intake of micronutrient-rich foods and its associated with the Size of babies at birth in rural Indian mothers[65], the findings revealed that birth size was strongly associated with the consumption of milk ($P < 0.05$) and of green leafy

vegetables ($P < 0.001$) and fruits ($P < 0.01$). In our study, Vegetables and Dairy products intakes were relatively low, by which vegetables consumption was 75-80g/day and dairy products consumption contributed to less than 7% of total energy intakes. In addition to that, we found that over 50% of the participants calcium intakes were below two-third the recommendations, and the average intake of all the micronutrients studied was below the 100% RDA recommendations. In an observational cohort study to assess the possible benefits and hazards to a child's development of different levels of maternal seafood intake during pregnancy[66], the results suggested that maternal seafood intake during pregnancy of less than 340 g per week was associated with increased risk of their children being in the lowest quartile for verbal intelligence quotient (IQ) compared with mothers who consumed more than 340 g per week. In addition to that, the lower the intake of seafood during pregnancy, the higher the risk of suboptimum developmental outcome. These findings reject the advice to limit seafood consumption, rather they show that risks from the loss of nutrients were greater than the risks of harm from exposure to trace contaminants in 340 g seafood eaten weekly. In our study, seafood consumption was contributing to 1.4% of the total energy intakes with around 15 to 16g/day. These sparse numbers might be due to fear of consuming fish and seafood products during pregnancy and lack of awareness regarding the topic. Between 1990 and 2010, mean global fruit intake increased by +5.3 g/day. By region, intake nominally increased in 18 of 21 regions, however, Lebanon was among the regions that witnessed decrease in the fruit intake by -17.6g/day[67]. Contrary to that, our study showed a sufficient intake of fruits through-out the pregnancy period, probably providing the bulk of the micronutrients.

Protein intake appeared to drop after pregnancy due to less consumption of meat, poultry, fish and eggs. This might be due to pregnancy symptoms like nausea and vomiting, in addition to decreased overall energy intakes.

Overall, our study population were consuming lower total energy intake than the recommended, which explains the decreased intakes of certain food groups, therefore decreased level of nutrients provided by these food groups.

E. Food Security

Studies have found that household food insecurity plays an important role in gestational weight gain among other issues of health impact like nutrient deficiencies[68]. All the participants in this study were food secure, unsurprisingly, considering they come from a high socio-economic status with over 50% having monthly income >3,000,000 L.L. Given the following, the suboptimal intakes we found in essential pregnancy nutrients were not expected. These findings suggest that being food secure does not necessarily mean nutrient secure, by which people lacking the knowledge required to consume the right quantities and qualities of food, might lead to troubling health outcomes regardless of their food security. It is also important to assess individual-level dietary restraints since many women tend to follow a non-scientific diet during pregnancy with the purpose of preventing weight gain. On the other hand, a study to describe the relationship of new measures of hunger and food insecurity to household food supplies and individual food and nutrient intake in women aged 14-40 years, found that a significant decrease in the frequency of consumption of fruits and vegetables and the amount of food in the household and a significant increase in scores indicative of disordered eating patterns were associated with a worsening of food

insecurity status. Potassium and fiber intake and fruit consumption differed significantly between the food secure and food insecure groups. The percentage of respondents consuming less than the Recommended Dietary Allowance for vitamin C and fewer than five fruits and vegetables per day was significantly greater among food insecure respondents than food secure respondents[69]. Another cross-sectional survey of Mexican – American families suggests that limited education and low income were negatively correlated with food security[70]. In the presence of such results, it is important to highlight the need for advanced research with regards to this topic in specific (Food security vs. Nutrient security).

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

The findings of this study showed alarming levels of suboptimal nutrient intakes, which might lead to deleterious maternal/offspring health outcomes.

In summary, the reported food intakes among Lebanese pregnant women did not meet dietary intake recommendations for Energy, Protein, Vitamin A, folate, iron, zinc or calcium. It is important that health professionals working with women during the preconception and childbearing life stages reassure women to adjust their dietary intakes to meet nutrient intake recommendations, otherwise micronutrient supplementation is required.

It is also important to assess individual-level dietary restraints during pregnancy since many women tend to follow a non-scientific diet with the purpose of preventing weight gain.

Further studies are needed to assess the intakes of women during pregnancy followed by contextualized interventional methods based on the background of the sample population. It would be a promising idea to involve mobile health in the support of healthier pregnancies.

Interventions to prevent excessive gestational gain may need to start before pregnancy. Women at risk for inadequate gain would also benefit from interventions directed toward modifiable factors during pregnancy.

A nutrition-focused program that promoted and facilitated husbands' engagement during their wives' pregnancies had significant impact on women's intake of micronutrient supplements and dietary diversity[71]. Therefore, targeting husbands in

healthier pregnancy interventions might be as important as targeting pregnant women themselves, by which establishing knowledge, attitude, self-efficacy and support from the husbands through designing activities to engage men in maternal nutrition programs might be translated into positive and healthier overall pregnancies.

APPENDICES

APPENDIX A

ENGLISH QUESTIONNAIRES

RESEARCH QUESTIONNAIRE; PROTOCOL NUMBER: NUT.FN.12

1866 AUB American University of Beirut الجامعة الأميركية في بيروت

Faculty of Agricultural and Food Sciences
Department of Nutrition and Food Sciences

Mother and Child Cohort: Towards Curbing the Epidemic of Noncommunicable Diseases in Lebanon

VISIT 1

(1st Trimester of Pregnancy)

Interviewer's Name: _____	**Date** (DD/MM/YYYY): ___/___/_____
Subject ID Number: _____	**Day of the Week:** _____
Health-Care Center (AUBMC / RHUH)	**Interview Start Time:** _____

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I. ANTHROPOMETRIC MEASUREMENTS DURING PREGNANCY

1. **Weight:** _____ Kg
2. **Height:** _____ Cm
3. **Waist Circumference:** _____ cm
4. **Blood Pressure (SBP/DBP):** ____/____ mmHg

II. GENERAL INFORMATION ABOUT THE CURRENT PREGNANCY

5. **In which gestational week are you?** _____weeks
6. **What was your pre-pregnancy weight?** _____Kg
7. **Which of the following symptoms are you currently experiencing (circle all that apply)?**
   1. Nausea
   2. Vomiting
   3. Heartburn
   4. Constipation
   5. Edema (swelling of hands or feet)
   6. Food cravings
   7. Non-food cravings (clay, ice, soap, etc.)
   8. Food aversions
   9. Loss of appetite
   10. Increase in appetite
   11. None of the above

8. **Are you pregnant with your <u>first</u> child?**
   1. Yes (**go to section III**)
   2. No

9. **Have you had previous miscarriages?**
   1. Yes, *please specify how many*: _____
   2. No

10. **How many children do you have?** _____

11. **When was your last delivery (MM/YYYY)?** ___/_____

III. DIETARY PRACTICES AND SUPPLEMENT USE BEFORE AND DURING PREGNANCY

12. **Do you have an allergy to any of the following foods (circle all that apply)?**
    1. Wheat
    2. Cow milk
    3. Eggs
    4. Fish
    5. Shellfish (shrimp, crab, lobster, etc.)
    6. Corn
    7. Peanuts
    8. Other nuts
    9. Soy products
    10. Other, *please specify*: _____

13. **How many times per week did you eat breakfast <u>before getting pregnant</u>?**
    1. Everyday
    2. 3-6 times a week
    3. < 3 times a week
    4. Never

14. How many times per week do you <u>currently</u> eat breakfast (during your 1st trimester of pregnancy)?

1. Everyday
2. 3-6 times a week
3. < 3 times a week
4. Never

15. <u>Prior to becoming pregnant</u>, were you taking any vitamin/mineral/herbal supplements?

1. Yes, *please specify brand and dose/day*:
   _____
2. No

16. <u>During your 1st trimester of pregnancy</u>, did you continue/start taking any vitamin / mineral / herbal supplements?

1. Yes *please specify brand and dose/day*:
   _____
2. No

17. <u>During your 1st trimester of pregnancy</u>, who prescribed the vitamin/mineral/herbal supplements to you?

1. Your OBGYN physician
2. OBGYN Nurse
3. Dietitian
4. Family member
5. Friend
6. Self
7. Other, *please specify*: _____

18. Is your OBGYN physician aware that you are taking supplements during pregnancy?

1. Yes
2. No

IV. LIFESTYLE PRACTICES BEFORE AND DURING PREGNANCY

Smoking

19. <u>Before getting pregnant</u>, how many of the following did you usually smoke?

1. I do not smoke
2. Cigarettes: _____ per day; _____ per week; _____ per month
3. Cigars: _____ per day; _____ per week; _____ per month
4. Narghili: _____ per day; _____ per week; _____ per month

20. <u>During your 1st trimester of pregnancy</u>, how many of the following do you usually smoke?

1. I do not smoke
2. Cigarettes: _____ per day; _____ per week; _____ per month
3. Cigars: _____ per day; _____ per week; _____ per month
4. Narghili: _____ per day; _____ per week; _____ per month

Alcohol Intake

21. <u>During your 1st trimester of pregnancy</u>, how many drinks of the following do you usually drink?

1. I do not drink
2. Beer: _____(bottles/day); _____(bottles/week); _____(bottles/month)
3. Wine: _____(glasses/day); _____(glasses/week); _____(glasses/month)
4. Champagne: _____(glasses/day); _____(glasses/week); ____(glasses/month)
5. Liquor, *please specify*: _____(type)
   _____ (bottles or glasses/day)
   _____ (bottles or glasses/week)
   _____ (bottles or glasses/month)
6. Other, *please specify*: _____ (type)
   _____ (bottles or glasses/day)
   _____ (bottles or glasses/week)
   _____ (bottles or glasses/month)

V. DIETARY INTAKE BEFORE PREGNANCY

22. **Food-Frequency Questionnaire**. Please think about your eating patterns during the year before you got pregnant. Please indicate your usual intake of each of the following food items **per day, week,** or **month.** Please be as precise as you can in your recall. The accuracy of the study results depends on the accuracy of your answers.

CODE	FOOD ITEM	REFERENCE PORTION	USUAL PORTION	FREQUENCY OF CONSUMPTION
1	**CEREALS AND CEREAL-BASED PRODUCTS**			
1.1	White bread	1 large Arabic loaf/ 1 medium Arabic loaf/ 1 baguette		□ D □ W □ M □ Never
1.2	Brown/whole wheat bread	1 large Arabic loaf/ 1 medium Arabic loaf/ 1 baguette		□ D □ W □ M □ Never
1.3	Ka'ak products	1 finger sized		□ D □ W □ M □ Never
1.4	Toast and crackers	1 regular toast		□ D □ W □ M □ Never
1.5	Regular breakfast cereals	Side A/ 1 small box (35 g)		□ D □ W □ M □ Never
1.6	Bran or whole grain breakfast cereals	Side A/ 1 small box (35 g)		□ D □ W □ M □ Never
2	**PASTA AND OTHER CEREALS**			
2.1	Bulgur, cooked	Side A		□ D □ W □ M □ Never
2.2	Pasta/noodles, cooked	Side A		□ D □ W □ M □ Never
2.3	Rice and rice-based products	Side A		□ D □ W □ M □ Never
3	**POTATOES AND POTATO- BASED PRODUCTS**			
3.1	French Fries	Side A		□ D □ W □ M □ Never

3.2	Potato	1 portion, medium		□ D □ W □ M □ Never
3.3	Potato chips, regular	S / M / L bag		□ D □ W □ M □ Never
3.4	Potato chips, light	S / M / L bag		□ D □ W □ M □ Never
4	**VEGETABLES**			
4.1	Vegetables, canned (mixed)	Side A		□ D □ W □ M □ Never
4.2	Vegetables, raw	Side A		□ D □ W □ M □ Never
4.3	Salad, green	Side A		□ D □ W □ M □ Never
5	**FRUITS**			
5.1	Fresh fruits	Side A/ 1 medium portion		□ D □ W □ M □ Never
5.2	Canned fruits	Side A/ 1 medium portion		□ D □ W □ M □ Never
5.3	Dried fruits	Side A		□ D □ W □ M □ Never
5.4	Fruit-based desserts (cocktails)	Side A		□ D □ W □ M □ Never
6	**FRUIT JUICES**			
6.1	Fruit Juices, Canned	Side A/ 1 regular (240 mL)		□ D □ W □ M □ Never
6.2	Fruit Juices, Fresh	Side A		□ D □ W □ M □ Never
7	**MEAT- Cured Meat**			
7.1	Cured meat, except ham (luncheon meat, hotdog)	Side B/ Regular cured Meat slice/ Hotdog size		□ D □ W □ M □ Never
7.2	Ham	Regular cured ham slice		□ D □ W □ M □ Never
7.3	Meat (beef), cooked, low fat	Side B		□ D □ W □ M □ Never
7.4	Meat (beef), cooked, medium - high fat	Side B		□ D □ W □ M □ Never
7.5	Meat (lamb), cooked, high fat	Side B		□ D □ W □ M □ Never

8	**MEAT- Offals**			
8.1	Organ meat (liver, heart, brain, etc.)	Side B		□ D □ W □ M □ Never
9	**MEAT- Poultry**			
9.1	Poultry	Leg/thigh/breast/ Side B		□ D □ W □ M □ Never
9.2	Poultry, breaded (nuggets, escalope)	Nuggets/ Side B		□ D □ W □ M □ Never
10	**MEAT- Eggs**			
10.1	Eggs, whole	1 egg		□ D □ W □ M □ Never
11	**MEAT- Fish and Seafood**			
11.1	Fish	Side B		□ D □ W □ M □ Never
11.2	Fish, canned with oil (tuna, sardines)	1 large can/ 1 small can		□ D □ W □ M □ Never
11.3	Fish, canned without oil (in water)	1 large can/ 1 small can		□ D □ W □ M □ Never
11.4	Shellfish	Shrimp: 1 medium Calamari: 1 medium Crab stick: 1 stick		□ D □ W □ M □ Never
12	**PULSES, NUTS AND SEEDS**			
12.1	Beans, Chickpeas, Fava Beans, Lentils, Seeds	Side A		□ D □ W □ M □ Never
12.2	Nuts	Side A		□ D □ W □ M □ Never
12.3	Falafel	1 falafel piece		□ D □ W □ M □ Never
12.4	Olives	1 medium olive		□ D □ W □ M □ Never

13	**MILK AND DAIRY PRODUCTS**			
13.1	Cheese (low fat / light/white)	1 square/triangular portion/ Side A or B		□ D □ W □ M □ Never
13.2	Cheese (high fat/yellow)	1 square/triangular portion/ Side A or B		□ D □ W □ M □ Never
13.3	Cheese (processed, creamy)	1 square/triangular portion/Side A or B		□ D □ W □ M □ Never
13.4	Full fat milk, milk-based beverages	Side A/ 1 carton of flavored milk		□ D □ W □ M □ Never
13.5	Low fat milk, milk-based beverages	Side A/ 1 carton of flavored milk		□ D □ W □ M □ Never
14	**YOGURT AND YOGURT- BASED PRODUCTS**			
14.1	Labneh, regular	Side A		□ D □ W □ M □ Never
14.2	Labneh, low fat and skim (0-2%)	Side A		□ D □ W □ M □ Never
14.3	Yogurt, regular	Side A/ 1 regular ayran bottle		□ D □ W □ M □ Never
14.4	Yogurt, light	Side A/ 1 regular ayran bottle		□ D □ W □ M □ Never
15	**PIZZAS AND PIES**			
15.1	Pies, 'Manaeesh'	1 large/ 1 bouchee		□ D □ W □ M □ Never
15.2	Pies, small (e.g.: fatayer spinach, sambousek)	1 small		□ D □ W □ M □ Never
15.3	Pizza	Side A or B/ 1 small bouchee		□ D □ W □ M □ Never

16	**MIXED DISHES**						
16.1	Artichoke, eggplant, cauliflower cooked	Side A		□ D	□ W	□ M	□ Never
16.2	Chicory, fried with onions	Side A		□ D	□ W	□ M	□ Never
16.3	Eggplant, zucchini, cabbage, grape leaves * stuffed with rice & meat	Side A/ 1 medium portion		□ D	□ W	□ M	□ Never
16.4	Stew (Jews mallow, okra, peas, spinach) *without rice	Side A		□ D	□ W	□ M	□ Never
17	**FATS AND OILS (ADDED ON BREADS)**						
17.1	Butter/ghee	Side A		□ D	□ W	□ M	□ Never
17.2	Mayonnaise, regular	Side A		□ D	□ W	□ M	□ Never
17.3	Olive oil	Side A		□ D	□ W	□ M	□ Never
17.4	Tahini	Side A		□ D	□ W	□ M	□ Never
17.5	Vegetable oil	Side A		□ D	□ W	□ M	□ Never
18	**FATS AND OILS (USED IN FRYING)**						
18.1	Butter/ghee	Side A		□ D	□ W	□ M	□ Never
18.2	Olive oil	Side A		□ D	□ W	□ M	□ Never
18.3	Vegetable ghee	Side A		□ D	□ W	□ M	□ Never
18.4	Vegetable oil	Side A		□ D	□ W	□ M	□ Never
19	**SUGAR AND SUGAR DERIVATIVES**						
19.1	Sugar	Side A		□ D	□ W	□ M	□ Never
19.2	Candy	1 small		□ D	□ W	□ M	□ Never
19.3	Chocolate	1 medium bar/ Side B		□ D	□ W	□ M	□ Never
19.4	Chocolate spread	Side A		□ D	□ W	□ M	□ Never

20	**CAKES AND PASTRIES**			
20.1	Cakes and pastries	Side B		□ D □ W □ M □ Never
20.2	Arabic sweets	Side B		□ D □ W □ M □ Never
20.3	Biscuits	Side B/ 1 medium		□ D □ W □ M □ Never
20.4	Croissant	Side B/ 1 large		□ D □ W □ M □ Never
20.5	Doughnuts	Side B/ 1 medium		□ D □ W □ M □ Never
21	**HONEY, JAM, MOLASSES AND HALAWAH**			
21.1	Jam	Side A		□ D □ W □ M □ Never
21.2	Sugar derivatives (molasses, halawa, honey)	Side A		□ D □ W □ M □ Never
21.3	Ice cream, regular	1 scoop/ 1 stick		□ D □ W □ M □ Never
21.4	Ice cream, low fat	1 scoop/ 1 stick		□ D □ W □ M □ Never
21.5	Pudding, regular (custard, mhalabiye)	Side A/ 1 medium container		□ D □ W □ M □ Never
21.6	Pudding, low fat	Side A/ 1 medium container		□ D □ W □ M □ Never
22	**ALCOHOLIC BEVERAGES**			
22.1	Beer	Side A		□ D □ W □ M □ Never
22.2	Spirit drinks (e.g.Whiskey, Rum, Vodka.)	Side A		□ D □ W □ M □ Never
22.3	Wine	Side A		□ D □ W □ M □ Never

23	**NON-ALCOHOLIC BEVERAGES**			
23.1	Coffee instant, Nescafe, Turkish,	Side A		□ D □ W □ M □ Never
23.2	Tea	Side A		□ D □ W □ M □ Never
23.3	De-caffeinated coffee or herbal tea	Side A		□ D □ W □ M □ Never
23.4	Energy & sports drinks	Side A/ 1 can (330 mL)		□ D □ W □ M □ Never
23.5	Soda, Regular	Side A/ 1 can (330 mL)		□ D □ W □ M □ Never
23.6	Diet Soda	Side A/ 1 can (330 mL)		□ D □ W □ M □ Never
23.7	Water	Side A/ 1 Liter		□ D □ W □ M □ Never
24	**MISCELLANEOUS**			
24.1	Ketchup	Side A		□ D □ W □ M □ Never
24.2	Mustard	Side A		□ D □ W □ M □ Never
24.3	Zaatar (thyme & sesame)	Side A		□ D □ W □ M □ Never
24.4	Pickles	1 medium cucumber/ Side A		□ D □ W □ M □ Never

23. Are there any other foods and/or beverages that were not mentioned above that you usually eat at least once per week?

1. Yes, *please specify*:

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

2. No

VI. DIETARY INTAKE DURING PREGNANCY

24. **24-Hour Dietary Recall.** Please recall what you ate and drank the previous day from the time you woke up until the next morning.

Time	Food eaten	Amount	Method of preparation

Time	Food eaten	Amount	Method of preparation

25. Was yesterday a usual day?

1. Yes
2. No, *please specify*: _____

VII. HOUSEHOLD FOOD SECURITY

26. Household Food Insecurity Access Scale (HFIAS) Measurement Tool

NUMBER	QUESTION	RESPONSE OPTIONS
HFIAS_1	In the past 4 weeks, did you worry that your household would not have enough food?	1. No 2. Yes
HFIAS_2	How often did this happen?	1. Rarely (1 or 2 times in the past 4 weeks) 2. Sometimes (3 to 10 times in the past 4 weeks) 3. Often (more than 10 times in the past 4 weeks)
HFIAS_3	In the past 4 weeks, were you or any household member not able to eat the kinds of food you preferred because of a lack of resources?	1. No 2. Yes
HFIAS_4	How often did this happen?	1. Rarely (1 or 2 times in the past 4 weeks) 2. Sometimes (3 to 10 times in the past 4 weeks) 3. Often (more than 10 times in the past 4 weeks)
HFIAS_5	In the past 4 weeks, did you or any household member have to eat a limited variety of food due to a lack of resources?	1. No 2. Yes
HFIAS_6	How often did this happen?	1. Rarely (1 or 2 times in the past 4 weeks) 2. Sometimes (3 to 10 times in the past 4 weeks) 3. Often (more than 10 times in the past 4 weeks)
HFIAS_7	In the past 4 weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	1. No 2. Yes
HFIAS_8	How often did this happen?	1. Rarely (1 or 2 times in the past 4 weeks) 2. Sometimes (3 to 10 times in the past 4 weeks) 3. Often (more than 10 times in the past 4 weeks)

HFIAS_9	In the past 4 weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	1. No 2. Yes
HFIAS_10	How often did this happen?	1. Rarely (1 or 2 times in the past 4 weeks) 2. Sometimes (3 to 10 times in the past 4weeks) 3. Often (more than 10 times in the past 4 weeks)
HFIAS_11	In the past 4 weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?	1. No 2. Yes
HFIAS_12	How often did this happen?	1. Rarely (1 or 2 times in the past 4 weeks) 2. Sometimes (3 to 10 times in the past 4weeks) 3. Often (more than 10 times in the past 4weeks)
HFIAS_13	In the past 4 weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	1. No 2. Yes
HFIAS_14	How often did this happen?	1. Rarely (1 or 2 times in the past 4 weeks) 2. Sometimes (3 to 10 times in the past 4 weeks) 3. Often (more than 10 times in the past 4 weeks)
HFIAS_15	In the past 4 weeks, did you or any household member go to sleep at night hungry because there was not enough food?	1. No 2. Yes
HFIAS_16	How often did this happen?	1. Rarely (1 or 2 times in the past 4 weeks) 2. Sometimes (3 to 10 times in the past 4 weeks) 3. Often (more than 10 times in the past 4 weeks)
HFIAS_17	In the past 4 weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	1. No 2. Yes
HFIAS_18	How often did this happen?	1. Rarely (1 or 2 times in the past 4weeks) 2. Sometimes (3 to 10 times in the past 4weeks) 3. Often (more than 10 times in the past 4 weeks)

Adapted from: Coates, Jennifer, Anne Swindale, and Paula Bilinsky 2007 *Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide, ver. 3. Food and Nutrition Technical Assistance Program (FANTA)*. Washington, DC : USAID.

VIII. SOCIO-DEMOGRAPHIC/ECONOMIC AND GEOGRAPHIC CHARACTERISTICS OF THE HOUSEHOLD

27. What is your date of birth (DD/MM/YYYY)? ___/___/_____

28. What is the highest educational level that you have achieved?

1. No schooling
2. Primary school
3. Intermediate school
4. High school
5. Technical diploma
6. University degree
7. Refused to answer

29. Did you specialize in a health-related major (medicine, biology, public health, pharmacy, etc.) (skip if woman did <u>not</u> receive a technical diploma or university degree and go to question 32)

1. Yes
2. No

30. What kind of work do you do?

1. Housewife/homemaker (**go to question 32**)
2. Employee, full-time
3. Employee, part-time
4. Self-employed, *please specify:* _____
5. Other, *please specify*: _____

31. If you work, how soon after your delivery do you expect to return to work?

1. After 49 days (~1 month and a half)
2. After 70 days (~2 months and a half)
3. After 3 months
4. Don't know
5. Not planning to return to work

32. Which area of Lebanon do you live in?

1. Beirut
2. Mount Lebanon
3. South
4. Nabatiyeh
5. North
6. Bekaa

33. Are you related to your husband (i.e first cousins, second cousins, distant family ties, etc.)?

1. Yes, *please specify*: _____
2. No

34. What is your husband's age? _____ years

35. What is the highest educational level that your husband has achieved?

1. No schooling
2. Primary school
3. Intermediate school
4. High school
5. Technical diploma
6. University degree
7. Refused to answer

36. What kind of work does your husband do?

1. Not working
2. Not working, but looking for a job
3. Employee, full-time
4. Employee, part-time
5. Self-employed, please specify _____
6. Other, *please specify*: _____

37. What is the total number of individuals living in your house (this includes relatives or family members that frequently live with you on a semi-permanent basis)?

_____

38. How many rooms are there in your house (this excludes the kitchen, bathrooms, hallways, garage, and open balconies)? _____

39. Do you and/or your husband own the house you currently live in?

1. Yes
2. No

40. How many cars does your household own (this includes cars owned by yourself, your husband, and any of your children)? _____

41. What is the monthly income of the family (L.L.) (this includes the sum of salaries of the woman and her husband, income coming from relatives, and income coming from renting a house, land, or other assets)?

1. Less than 600,000 (less than $ 400)
2. 600,001 – 999,999 ($401 – $666.9)
3. 1,000,000 – 1,499,000 ($ 667 – $999.9)
4. 1,500,000 – 1,999,000 ($ 1,000 - $1,332.9)
5. 2,000,000 – 2,499,000 ($ 1333 - $ 1,666.9)
6. 2,500,000 – 2,999,000 ($1,667 – $1,999.9)
7. Greater or equal to 3,000,000 (greater or equal to $ 2,000)
8. Don't know/Not sure
9. Refused to answer

Thank you very much for answering the above questions.

I would like to finally ask you about the date and time of when you will visit the laboratory to have a routine blood test done, as I need to be with you to ask the nurse to collect an additional blood sample for our study.

Date: ____/____/_____

Time: ____:____

Interview End Time: _____

Faculty of Agricultural and Food Sciences
Department of Nutrition and Food Sciences

Mother and Child Cohort: Towards Curbing the Epidemic of Noncommunicable Diseases in Lebanon

VISIT 2
(2nd Trimester of Pregnancy)

Interviewer's Name: _____	**Date** (DD/MM/YYYY): ____/____/_____
Subject ID Number: _____	**Day of the Week:** _____
Health-Care Center (AUBMC / RHUH)	**Interview Start Time:** _____

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I. ANTHROPOMETRIC MEASUREMENTS DURING PREGNANCY

1. **Weight:** _____ Kg

2. **Blood Pressure (SBP/DBP):** ____/____ mmHg

II. GENERAL INFORMATION ABOUT THE CURRENT PREGNANCY

3. **In which gestational week are you?** _____weeks

4. **Which of the following symptoms are you currently experiencing (circle all that apply)?**
    1. Nausea
    2. Vomiting
    3. Heartburn
    4. Constipation
    5. Edema (swelling of hands or feet)
    6. Food cravings
    7. Non-food cravings (clay, ice, soap, etc.)
    8. Food aversions
    9. Loss of appetite
    10. Increase in appetite
    11. None of the above

III. DIETARY PRACTICES AND SUPPLEMENT USE DURING PREGNANCY

5. **How many times per week do you <u>currently</u> eat breakfast (during your 2nd trimester of pregnancy)?**
    1. Everyday
    2. 3-6 times a week
    3. < 3 times a week
    4. Never

6. **<u>During your 2nd trimester of pregnancy</u>, did you continue/start taking any vitamin / mineral / herbal supplements?**
    1. Yes, *please specify brand and dose/day:*
    _____
    2. No

IV. LIFESTYLE PRACTICES DURING PREGNANCY

Smoking

7. **<u>During your 2nd trimester of pregnancy</u>, how many of the following do you usually smoke?**
    1. I do not smoke
    2. Cigarettes: _____ per day; _____ per week; _____ per month
    3. Cigars: _____ per day; _____ per week; _____ per month
    4. Narghili: _____ per day; _____ per week; _____ per month

Physical Activity **[Adapted from the PPAQ developed by:** Chasan-Taber et al (2004)]

During this trimester, when you are NOT at work, how much time do you usually spend:

8. Preparing meals (cooking, setting the table, washing dishes)

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

9. Dressing, bathing, feeding children while you are sitting

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

10. Dressing, bathing, feeding children while you are standing

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

11. Playing with children while you are sitting or standing

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

12. Playing with children while you are walking or running

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

13. Carrying children

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

14. Taking care of an older adult

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

15. Sitting and using a computer or writing, while not at work

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

16. Watching TV or a video

1. None
2. Less than ½ hour per day
3. ½ to almost 2 hour per day
4. 2 to almost 4 hours per day
5. 4 to almost 6 hours per day
6. 6 or more hours per day

17. Sitting and reading, talking, or on the phone, while <u>not</u> at work

1. None
2. Less than ½ hour per day
3. ½ to almost 2 hour per day
4. 2 to almost 4 hours per day
5. 4 to almost 6 hours per day
6. 6 or more hours per day

18. Playing with pets

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

19. Light cleaning (making beds, doing laundry, ironing, putting things away)

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

20. Shopping (for food, clothes, or other items)

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

21. Heavier cleaning (vacuuming, mopping, sweeping, washing windows)

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

22. Raking or gardening

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

23. Walking <u>slowly</u> to go to places (such as to the bus, work, visiting). ***Not for fun or exercise***

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

24. Walking <u>quickly</u> to go to places (such as to the bus, work, school). ***Not for fun or exercise***

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

25. Driving or riding in a car or bus

1. None
2. Less than ½ hour per day
3. ½ to almost 1 hour per day
4. 1 to almost 2 hours per day
5. 2 to almost 3 hours per day
6. 3 or more hours per day

26. Walking <u>slowly</u> for fun or exercise

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

27. Walking more quickly for fun or exercise

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

28. Walking quickly up hills for fun or exercise

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

29. Jogging

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

30. Participating in a prenatal exercise class

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

31. Swimming

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

32. Dancing

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

33. Doing other things for fun or exercise? ***Please tell us what they are:*** _____

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

34. Doing other things for fun or exercise? ***Please tell us what they are:*** _____

1. None
2. Less than ½ hour per week
3. ½ to almost 1 hour per week
4. 1 to almost 2 hours per week
5. 2 to almost 3 hours per week
6. 3 or more hours per week

35. Sitting at work or in class (skip to question 40 if the woman does not work for wages or as a volunteer, or is not a student; i.e. is a homemaker, out of work, or unable to work)

1. None
2. Less than ½ hour per day
3. ½ to almost 2 hours per day
4. 2 to almost 4 hours per day
5. 4 to almost 6 hours per day
6. 6 or more hours per day

36. Standing or <u>slowly</u> walking at work <u>while carrying things</u> (heavier than a 4 kg bag of rice)

1. None
2. Less than ½ hour per day
3. ½ to almost 2 hour per day
4. 2 to almost 4 hours per day
5. 4 to almost 6 hours per day
6. 6 or more hours per day

37. Standing or slowly walking at work while not carrying anything

1. None
2. Less than ½ hour per day
3. ½ to almost 2 hour per day
4. 2 to almost 4 hours per day
5. 4 to almost 6 hours per day
6. 6 or more hours per day

38. Walking quickly at work while carrying things (heavier than a 4 kg bag of rice)

1. None
2. Less than ½ hour per day
3. ½ to almost 2 hour per day
4. 2 to almost 4 hours per day
5. 4 to almost 6 hours per day
6. 6 or more hours per day

39. Walking quickly at work while not carrying anything

1. None
2. Less than ½ hour per day
3. ½ to almost 2 hour per day
4. 2 to almost 4 hours per day
5. 4 to almost 6 hours per day
6. 6 or more hours per day

V. DIETARY INTAKE DURING PREGNANCY

40. Food-Frequency Questionnaire. Please think about your eating patterns since you became pregnant. Please indicate your usual intake of each of the following food items **per day**, **week**, or **month.** Please be as precise as you can in your recall. The accuracy of the study results depends on the accuracy of your answers.

CODE	FOOD ITEM	REFERENCE PORTION	USUAL PORTION	FREQUENCY OF CONSUMPTION
1	**CEREALS AND CEREAL-BASED PRODUCTS**			
1.1	White bread	1 large Arabic loaf/ 1 medium Arabic loaf/ 1 baguette		□ D □ W □ M □ Never
1.2	Brown/whole wheat bread	1 large Arabic loaf/ 1 medium Arabic loaf/ 1 baguette		□ D □ W □ M □ Never
1.3	Ka'ak products	1 finger sized		□ D □ W □ M □ Never
1.4	Toast and crackers	1 regular toast		□ D □ W □ M □ Never
1.5	Regular breakfast cereals	Side A/ 1 small box (35 g)		□ D □ W □ M □ Never
1.6	Bran or whole grain breakfast cereals	Side A/ 1 small box (35 g)		□ D □ W □ M □ Never
2	**PASTA AND OTHER CEREALS**			
2.1	Bulgur, cooked	Side A		□ D □ W □ M □ Never
2.2	Pasta/noodles, cooked	Side A		□ D □ W □ M □ Never
2.3	Rice and rice-based products	Side A		□ D □ W □ M □ Never
3	**POTATOES AND POTATO- BASED PRODUCTS**			
3.1	French Fries	Side A		□ D □ W □ M □ Never

3.2	Potato	1 portion, medium		□ D	□ W	□ M	□ Never
3.3	Potato chips, regular	S / M / L bag		□ D	□ W	□ M	□ Never
3.4	Potato chips, light	S / M / L bag		□ D	□ W	□ M	□ Never
4	**VEGETABLES**						
4.1	Vegetables, canned (mixed)	Side A		□ D	□ W	□ M	□ Never
4.2	Vegetables, raw	Side A		□ D	□ W	□ M	□ Never
4.3	Salad, green	Side A		□ D	□ W	□ M	□ Never
5	**FRUITS**						
5.1	Fresh fruits	Side A/ 1 medium portion		□ D	□ W	□ M	□ Never
5.2	Canned fruits	Side A/ 1 medium portion		□ D	□ W	□ M	□ Never
5.3	Dried fruits	Side A		□ D	□ W	□ M	□ Never
5.4	Fruit-based desserts (cocktails)	Side A		□ D	□ W	□ M	□ Never
6	**FRUIT JUICES**						
6.1	Fruit Juices, Canned	Side A/ 1 regular (240 mL)		□ D	□ W	□ M	□ Never
6.2	Fruit Juices, Fresh	Side A		□ D	□ W	□ M	□ Never
7	**MEAT- Cured Meat**						
7.1	Cured meat, except ham (luncheon meat, hotdog)	Side B/ Regular cured Meat slice/ Hotdog size		□ D	□ W	□ M	□ Never
7.2	Ham	Regular cured ham slice		□ D	□ W	□ M	□ Never
7.3	Meat (beef), cooked, low fat	Side B		□ D	□ W	□ M	□ Never
7.4	Meat (beef), cooked, medium - high fat	Side B		□ D	□ W	□ M	□ Never
7.5	Meat (lamb), cooked, high fat	Side B		□ D	□ W	□ M	□ Never

8	**MEAT- Offals**			
8.1	Organ meat (liver, heart, brain, etc.)	Side B		□ D □ W □ M □ Never
9	**MEAT- Poultry**			
9.1	Poultry	Leg/thigh/breast/ Side B		□ D □ W □ M □ Never
9.2	Poultry, breaded (nuggets, escalope)	Nuggets/ Side B		□ D □ W □ M □ Never
10	**MEAT- Eggs**			
10.1	Eggs, whole	1 egg		□ D □ W □ M □ Never
11	**MEAT- Fish and Seafood**			
11.1	Fish	Side B		□ D □ W □ M □ Never
11.2	Fish, canned with oil (tuna, sardines)	1 large can/ 1 small can		□ D □ W □ M □ Never
11.3	Fish, canned without oil (in water)	1 large can/ 1 small can		□ D □ W □ M □ Never
11.4	Shellfish	Shrimp: 1 medium Calamari: 1 medium Crab stick: 1 stick		□ D □ W □ M □ Never
12	**PULSES, NUTS AND SEEDS**			
12.1	Beans, Chickpeas, Fava Beans, Lentils, Seeds	Side A		□ D □ W □ M □ Never
12.2	Nuts	Side A		□ D □ W □ M □ Never
12.3	Falafel	1 falafel piece		□ D □ W □ M □ Never
12.4	Olives	1 medium olive		□ D □ W □ M □ Never

13	**MILK AND DAIRY PRODUCTS**			
13.1	Cheese (low fat / light/white)	1 square/triangular portion/ Side A or B		□ D □ W □ M □ Never
13.2	Cheese (high fat/yellow)	1 square/triangular portion/ Side A or B		□ D □ W □ M □ Never
13.3	Cheese (processed, creamy)	1 square/triangular portion/Side A or B		□ D □ W □ M □ Never
13.4	Full fat milk, milk-based beverages	Side A/ 1 carton of flavored milk		□ D □ W □ M □ Never
13.5	Low fat milk, milk-based beverages	Side A/ 1 carton of flavored milk		□ D □ W □ M □ Never
14	**YOGURT AND YOGURT- BASED PRODUCTS**			
14.1	Labneh, regular	Side A		□ D □ W □ M □ Never
14.2	Labneh, low fat and skim (0-2%)	Side A		□ D □ W □ M □ Never
14.3	Yogurt, regular	Side A/ 1 regular ayran bottle		□ D □ W □ M □ Never
14.4	Yogurt, light	Side A/ 1 regular ayran bottle		□ D □ W □ M □ Never
15	**PIZZAS AND PIES**			
15.1	Pies, 'Manaeesh'	1 large/ 1 bouchee		□ D □ W □ M □ Never
15.2	Pies, small (e.g.: fatayer spinach, sambousek)	1 small		□ D □ W □ M □ Never
15.3	Pizza	Side A or B/ 1 small bouchee		□ D □ W □ M □ Never

16	**MIXED DISHES**				
16.1	Artichoke, eggplant, cauliflower cooked	Side A		□ D	□ W □ M □ Never
16.2	Chicory, fried with onions	Side A		□ D	□ W □ M □ Never
16.3	Eggplant, zucchini, cabbage, grape leaves * stuffed with rice & meat	Side A/ 1 medium portion		□ D	□ W □ M □ Never
16.4	Stew (Jews mallow, okra, peas, spinach) *without rice	Side A		□ D	□ W □ M □ Never
17	**FATS AND OILS (ADDED ON BREADS)**				
17.1	Butter/ghee	Side A		□ D	□ W □ M □ Never
17.2	Mayonnaise, regular	Side A		□ D	□ W □ M □ Never
17.3	Olive oil	Side A		□ D	□ W □ M □ Never
17.4	Tahini	Side A		□ D	□ W □ M □ Never
17.5	Vegetable oil	Side A		□ D	□ W □ M □ Never
18	**FATS AND OILS (USED IN FRYING)**				
18.1	Butter/ghee	Side A		□ D	□ W □ M □ Never
18.2	Olive oil	Side A		□ D	□ W □ M □ Never
18.3	Vegetable ghee	Side A		□ D	□ W □ M □ Never
18.4	Vegetable oil	Side A		□ D	□ W □ M □ Never
19	**SUGAR AND SUGAR DERIVATIVES**				
19.1	Sugar	Side A		□ D	□ W □ M □ Never
19.2	Candy	1 small		□ D	□ W □ M □ Never
19.3	Chocolate	1 medium bar/ Side B		□ D	□ W □ M □ Never
19.4	Chocolate spread	Side A		□ D	□ W □ M □ Never

20	**CAKES AND PASTRIES**			
20.1	Cakes and pastries	Side B		□ D □ W □ M □ Never
20.2	Arabic sweets	Side B		□ D □ W □ M □ Never
20.3	Biscuits	Side B/ 1 medium		□ D □ W □ M □ Never
20.4	Croissant	Side B/ 1 large		□ D □ W □ M □ Never
20.5	Doughnuts	Side B/ 1 medium		□ D □ W □ M □ Never
21	**HONEY, JAM, MOLASSES AND HALAWAH**			
21.1	Jam	Side A		□ D □ W □ M □ Never
21.2	Sugar derivatives (molasses, halawa, honey)	Side A		□ D □ W □ M □ Never
21.3	Ice cream, regular	1 scoop/ 1 stick		□ D □ W □ M □ Never
21.4	Ice cream, low fat	1 scoop/ 1 stick		□ D □ W □ M □ Never
21.5	Pudding, regular (custard, mhalabiye)	Side A/ 1 medium container		□ D □ W □ M □ Never
21.6	Pudding, low fat	Side A/ 1 medium container		□ D □ W □ M □ Never
22	**ALCOHOLIC BEVERAGES**			
22.1	Beer	Side A		□ D □ W □ M □ Never
22.2	Spirit drinks (e.g.Whiskey, Rum, Vodka.)	Side A		□ D □ W □ M □ Never
22.3	Wine	Side A		□ D □ W □ M □ Never

23	**NON-ALCOHOLIC BEVERAGES**			
23.1	Coffee instant, Nescafe, Turkish,	Side A		□ D □ W □ M □ Never
23.2	Tea	Side A		□ D □ W □ M □ Never
23.3	De-caffeinated coffee or herbal tea	Side A		□ D □ W □ M □ Never
23.4	Energy & sports drinks	Side A/ 1 can (330 mL)		□ D □ W □ M □ Never
23.5	Soda, Regular	Side A/ 1 can (330 mL)		□ D □ W □ M □ Never
23.6	Diet Soda	Side A/ 1 can (330 mL)		□ D □ W □ M □ Never
23.7	Water	Side A/ 1 Liter		□ D □ W □ M □ Never
24	**MISCELLANEOUS**			
24.1	Ketchup	Side A		□ D □ W □ M □ Never
24.2	Mustard	Side A		□ D □ W □ M □ Never
24.3	Zaatar (thyme & sesame)	Side A		□ D □ W □ M □ Never
24.4	Pickles	1 medium cucumber/ Side A		□ D □ W □ M □ Never

41. Are there any other foods and/or beverages that were not mentioned above that you usually eat at least once per week?

1. Yes, *please specify*:

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

2. No

42. 24-Hour Dietary Recall. Please recall what you ate and drank the previous day from the time you woke up until the next morning.

Time	Food eaten	Amount	Method of preparation

Time	Food eaten	Amount	Method of preparation

43. Was yesterday a usual day?

1. Yes
2. No, *please specify*: _____

Interview End Time: _____

RESEARCH QUESTIONNAIRE; PROTOCOL NUMBER: NUT.FN.12

Faculty of Agricultural and Food Sciences
Department of Nutrition and Food Sciences

Mother and Child Cohort: Towards Curbing the Epidemic of Noncommunicable Diseases in Lebanon

VISIT 3
(3rd Trimester of Pregnancy)

Interviewer's Name: _____	**Date** (DD/MM/YYYY): ___/___/_____
Subject ID Number: _____	**Day of the Week:** _____
Health-Care Center (AUBMC / RHUH)	**Interview Start Time:** _____

TABLE OF CONTENTS

I. ANTHROPOMETRIC MEASUREMENTS DURING PREGNANCY

1. **Weight:** _____ Kg

2. **Blood Pressure (SBP/DBP):** ____/____ mmHg

II. GENERAL INFORMATION ABOUT THE CURRENT PREGNANCY

3. **In which gestational week are you?** _____weeks

4. **Which of the following symptoms are you currently experiencing (circle all that apply)?**
    1. Nausea
    2. Vomiting
    3. Heartburn
    4. Constipation
    5. Edema (swelling of hands or feet)
    6. Food cravings
    7. Non-food cravings (clay, ice, soap, etc.)
    8. Food aversions
    9. Loss of appetite
    10. Increase in appetite
    11. None of the above

III. DIETARY PRACTICES AND SUPPLEMENT USE DURING PREGNANCY

5. **How many times per week do you <u>currently</u> eat breakfast (during your 3rd trimester of pregnancy)?**
    1. Everyday
    2. 3-6 times a week
    3. < 3 times a week
    4. Never

6. **<u>During your 3rd trimester of pregnancy</u>, did you continue/start taking any vitamin / mineral / herbal supplements?**
    1. Yes, *please specify brand and dose/day*:
    _____
    2. No

IV. LIFESTYLE PRACTICES DURING PREGNANCY

Smoking

7. **<u>During your 3rd trimester of pregnancy</u>, how many of the following do you usually smoke?**
    1. I do not smoke
    2. Cigarettes: _____ per day; _____ per week; _____ per month
    3. Cigars: _____ per day; _____ per week; _____ per month
    4. Narghili: _____ per day; _____ per week; _____ per month

V. DIETARY INTAKE DURING PREGNANCY

8. **Food-Frequency Questionnaire**. Please think about your eating patterns during your 3rd trimester. Please indicate your usual intake of each of the following food items **per day**, **week**, or **month.** Please be as precise as you can in your recall. The accuracy of the study results depends on the accuracy of your answers.

CODE	FOOD ITEM	REFERENCE PORTION	USUAL PORTION	FREQUENCY OF CONSUMPTION
1	**CEREALS AND CEREAL-BASED PRODUCTS**			
1.1	White bread	1 large Arabic loaf/ 1 medium Arabic loaf/ 1 baguette		□ D □ W □ M □ Never
1.2	Brown/whole wheat bread	1 large Arabic loaf/ 1 medium Arabic loaf/ 1 baguette		□ D □ W □ M □ Never
1.3	Ka'ak products	1 finger sized		□ D □ W □ M □ Never
1.4	Toast and crackers	1 regular toast		□ D □ W □ M □ Never
1.5	Regular breakfast cereals	Side A/ 1 small box (35 g)		□ D □ W □ M □ Never
1.6	Bran or whole grain breakfast cereals	Side A/ 1 small box (35 g)		□ D □ W □ M □ Never
2	**PASTA AND OTHER CEREALS**			
2.1	Bulgur, cooked	Side A		□ D □ W □ M □ Never
2.2	Pasta/noodles, cooked	Side A		□ D □ W □ M □ Never
2.3	Rice and rice-based products	Side A		□ D □ W □ M □ Never
3	**POTATOES AND POTATO- BASED PRODUCTS**			
3.1	French Fries	Side A		□ D □ W □ M □ Never

3.2	Potato	1 portion, medium		□ D □ W □ M □ Never
3.3	Potato chips, regular	S / M / L bag		□ D □ W □ M □ Never
3.4	Potato chips, light	S / M / L bag		□ D □ W □ M □ Never
4	**VEGETABLES**			
4.1	Vegetables, canned (mixed)	Side A		□ D □ W □ M □ Never
4.2	Vegetables, raw	Side A		□ D □ W □ M □ Never
4.3	Salad, green	Side A		□ D □ W □ M □ Never
5	**FRUITS**			
5.1	Fresh fruits	Side A/ 1 medium portion		□ D □ W □ M □ Never
5.2	Canned fruits	Side A/ 1 medium portion		□ D □ W □ M □ Never
5.3	Dried fruits	Side A		□ D □ W □ M □ Never
5.4	Fruit-based desserts (cocktails)	Side A		□ D □ W □ M □ Never
6	**FRUIT JUICES**			
6.1	Fruit Juices, Canned	Side A/ 1 regular (240 mL)		□ D □ W □ M □ Never
6.2	Fruit Juices, Fresh	Side A		□ D □ W □ M □ Never
7	**MEAT- Cured Meat**			
7.1	Cured meat, except ham (luncheon meat, hotdog)	Side B/ Regular cured Meat slice/ Hotdog size		□ D □ W □ M □ Never
7.2	Ham	Regular cured ham slice		□ D □ W □ M □ Never
7.3	Meat (beef), cooked, low fat	Side B		□ D □ W □ M □ Never
7.4	Meat (beef), cooked, medium - high fat	Side B		□ D □ W □ M □ Never
7.5	Meat (lamb), cooked, high fat	Side B		□ D □ W □ M □ Never

8	**MEAT- Offals**			
8.1	Organ meat (liver, heart, brain, etc.)	Side B		□ D □ W □ M □ Never
9	**MEAT- Poultry**			
9.1	Poultry	Leg/thigh/breast/ Side B		□ D □ W □ M □ Never
9.2	Poultry, breaded (nuggets, escalope)	Nuggets/ Side B		□ D □ W □ M □ Never
10	**MEAT- Eggs**			
10.1	Eggs, whole	1 egg		□ D □ W □ M □ Never
11	**MEAT- Fish and Seafood**			
11.1	Fish	Side B		□ D □ W □ M □ Never
11.2	Fish, canned with oil (tuna, sardines)	1 large can/ 1 small can		□ D □ W □ M □ Never
11.3	Fish, canned without oil (in water)	1 large can/ 1 small can		□ D □ W □ M □ Never
11.4	Shellfish	Shrimp: 1 medium Calamari: 1 medium Crab stick: 1 stick		□ D □ W □ M □ Never
12	**PULSES, NUTS AND SEEDS**			
12.1	Beans, Chickpeas, Fava Beans, Lentils, Seeds	Side A		□ D □ W □ M □ Never
12.2	Nuts	Side A		□ D □ W □ M □ Never
12.3	Falafel	1 falafel piece		□ D □ W □ M □ Never
12.4	Olives	1 medium olive		□ D □ W □ M □ Never

13	**MILK AND DAIRY PRODUCTS**			
13.1	Cheese (low fat / light/white)	1 square/triangular portion/ Side A or B		□ D □ W □ M □ Never
13.2	Cheese (high fat/yellow)	1 square/triangular portion/ Side A or B		□ D □ W □ M □ Never
13.3	Cheese (processed, creamy)	1 square/triangular portion/Side A or B		□ D □ W □ M □ Never
13.4	Full fat milk, milk-based beverages	Side A/ 1 carton of flavored milk		□ D □ W □ M □ Never
13.5	Low fat milk, milk-based beverages	Side A/ 1 carton of flavored milk		□ D □ W □ M □ Never
14	**YOGURT AND YOGURT- BASED PRODUCTS**			
14.1	Labneh, regular	Side A		□ D □ W □ M □ Never
14.2	Labneh, low fat and skim (0-2%)	Side A		□ D □ W □ M □ Never
14.3	Yogurt, regular	Side A/ 1 regular ayran bottle		□ D □ W □ M □ Never
14.4	Yogurt, light	Side A/ 1 regular ayran bottle		□ D □ W □ M □ Never
15	**PIZZAS AND PIES**			
15.1	Pies, 'Manaeesh'	1 large/ 1 bouchee		□ D □ W □ M □ Never
15.2	Pies, small (e.g.: fatayer spinach, sambousek)	1 small		□ D □ W □ M □ Never
15.3	Pizza	Side A or B/ 1 small bouchee		□ D □ W □ M □ Never

16	**MIXED DISHES**						
16.1	Artichoke, eggplant, cauliflower cooked	Side A		□ D	□ W	□ M	□ Never
16.2	Chicory, fried with onions	Side A		□ D	□ W	□ M	□ Never
16.3	Eggplant, zucchini, cabbage, grape leaves * stuffed with rice & meat	Side A/ 1 medium portion		□ D	□ W	□ M	□ Never
16.4	Stew (Jews mallow, okra, peas, spinach) *without rice	Side A		□ D	□ W	□ M	□ Never
17	**FATS AND OILS (ADDED ON BREADS)**						
17.1	Butter/ghee	Side A		□ D	□ W	□ M	□ Never
17.2	Mayonnaise, regular	Side A		□ D	□ W	□ M	□ Never
17.3	Olive oil	Side A		□ D	□ W	□ M	□ Never
17.4	Tahini	Side A		□ D	□ W	□ M	□ Never
17.5	Vegetable oil	Side A		□ D	□ W	□ M	□ Never
18	**FATS AND OILS (USED IN FRYING)**						
18.1	Butter/ghee	Side A		□ D	□ W	□ M	□ Never
18.2	Olive oil	Side A		□ D	□ W	□ M	□ Never
18.3	Vegetable ghee	Side A		□ D	□ W	□ M	□ Never
18.4	Vegetable oil	Side A		□ D	□ W	□ M	□ Never
19	**SUGAR AND SUGAR DERIVATIVES**						
19.1	Sugar	Side A		□ D	□ W	□ M	□ Never
19.2	Candy	1 small		□ D	□ W	□ M	□ Never
19.3	Chocolate	1 medium bar/ Side B		□ D	□ W	□ M	□ Never
19.4	Chocolate spread	Side A		□ D	□ W	□ M	□ Never

20	**CAKES AND PASTRIES**			
20.1	Cakes and pastries	Side B		□ D □ W □ M □ Never
20.2	Arabic sweets	Side B		□ D □ W □ M □ Never
20.3	Biscuits	Side B/ 1 medium		□ D □ W □ M □ Never
20.4	Croissant	Side B/ 1 large		□ D □ W □ M □ Never
20.5	Doughnuts	Side B/ 1 medium		□ D □ W □ M □ Never
21	**HONEY, JAM, MOLASSES AND HALAWAH**			
21.1	Jam	Side A		□ D □ W □ M □ Never
21.2	Sugar derivatives (molasses, halawa, honey)	Side A		□ D □ W □ M □ Never
21.3	Ice cream, regular	1 scoop/ 1 stick		□ D □ W □ M □ Never
21.4	Ice cream, low fat	1 scoop/ 1 stick		□ D □ W □ M □ Never
21.5	Pudding, regular (custard, mhalabiye)	Side A/ 1 medium container		□ D □ W □ M □ Never
21.6	Pudding, low fat	Side A/ 1 medium container		□ D □ W □ M □ Never
22	**ALCOHOLIC BEVERAGES**			
22.1	Beer	Side A		□ D □ W □ M □ Never
22.2	Spirit drinks (e.g. Whiskey, Rum, Vodka.)	Side A		□ D □ W □ M □ Never
22.3	Wine	Side A		□ D □ W □ M □ Never

23	**NON-ALCOHOLIC BEVERAGES**			
23.1	Coffee instant, Nescafe, Turkish,	Side A		□ D □ W □ M □ Never
23.2	Tea	Side A		□ D □ W □ M □ Never
23.3	De-caffeinated coffee or herbal tea	Side A		□ D □ W □ M □ Never
23.4	Energy & sports drinks	Side A/ 1 can (330 mL)		□ D □ W □ M □ Never
23.5	Soda, Regular	Side A/ 1 can (330 mL)		□ D □ W □ M □ Never
23.6	Diet Soda	Side A/ 1 can (330 mL)		□ D □ W □ M □ Never
23.7	Water	Side A/ 1 Liter		□ D □ W □ M □ Never
24	**MISCELLANEOUS**			
24.1	Ketchup	Side A		□ D □ W □ M □ Never
24.2	Mustard	Side A		□ D □ W □ M □ Never
24.3	Zaatar (thyme & sesame)	Side A		□ D □ W □ M □ Never
24.4	Pickles	1 medium cucumber/ Side A		□ D □ W □ M □ Never

9. Are there any other foods and/or beverages that were not mentioned above that you usually eat at least once per week?

1. Yes, *please specify*:

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

_____ (food/beverage), _____ (serving size), _____ (serving/ week)

2. No

10. 24-Hour Dietary Recall. Please recall what you ate and drank the previous day from the time you woke up until the next morning.

Time	Food eaten	Amount	Method of preparation

Time	Food eaten	Amount	Method of preparation

11. Was yesterday a usual day?

1. Yes
2. No, *please specify*: _____

VI. Maternal Exposure, Knowledge, Attitudes, and Intentions Regarding Infant Feeding Practices

Exposure to Breastfeeding [**Adapted from:** Tarrant and Dodgson, 2007; Kavanagh et al., 2012]

12. Were you ever breastfed as a child?

1. Yes
2. No
3. Unsure

13. Do you know anyone who has breastfed?

1. Yes, *please specify:* _____
2. No

14. Have you ever witnessed a woman breastfeeding?

1. Yes
2. No

Knowledge about Breastfeeding [**Adapted from:** Grossman et al. (1990)]

The Infant Feeding Knowledge Test	Yes	No
15. Breastfeeding cuts down on the mother's bleeding after delivery		
16. Breast milk makes up a complete diet for a baby. No extras (food, vitamins, etc.) are needed until the baby is close to one year of age		
17. If your breasts are small, you might not have enough milk to feed the baby		
18. When a mother is sick with the flu or a bad cold, she can usually continue to breastfeed her baby		
19. Babies who are breastfed tend to get fewer allergies than babies who get formula		
20. The pill is the best way to keep from getting pregnant while you are breastfeeding		
21. You shouldn't try to breastfeed if you are planning to go back to work or school since you won't be able to be with your baby for feedings		

22. The more often you breastfeed, the more milk you will have for your baby		
23. Babies who are breastfed tend to get fewer infections than babies who get formula		
24. Many women are not able to make enough milk to feed their baby		

25. The best food for a newborn baby is:

1. Breast milk
2. Formula
3. Breast milk and water

26. Because babies may get a bad reaction to certain foods, breastfeeding mothers should never eat:

1. Pizza or other spicy foods
2. Coffee, tea, or other drinks with caffeine
3. All of the above
4. None of these are correct

27. After a baby loses weight following birth, he/she will probably gain it back faster if:

1. He/she is breastfed
2. He/she is bottle-fed
3. Neither is correct

28. You shouldn't try to breastfeed if you:

1. Have twins
2. Have a c-section
3. Drink a lot of alcoholic beverages

29. Breastfeeding mothers' nipples get sore if:

1. The baby's feeding position is not right
2. The mother has light-colored skin
3. This is the first baby she has breastfed

30. When you breastfeed, the best way to tell if the baby is getting enough milk is by:

1. He/she does not suck on his/her fist after he/she is done nursing
2. He/she does not cry
3. He/she has 6 or more wet diapers in 24 hours

31. When you breastfeed:

1. You may get your figure back easier
2. You nearly always gain weight
3. You may feel weak when you feed your baby

32. If you breastfeed:

1. No one else can help her with the baby since you have to feed him/her
2. More of your time will be taken up by the baby than if you bottle-feed
3. It will be very difficult to feed the baby in public places
4. None of the above are correct

33. Breastfeeding will probably make:

1. Your breasts sag
2. Your breasts larger after you stop breastfeeding your baby
3. No difference in the size or shape of your breasts

34. Breastfed babies need:

1. Only breast milk for the first 4 to 6 months
2. A bottle of formula every day or so
3. Extra water on a daily basis

Attitudes towards Breastfeeding [**Adapted from**: De La Mora et al. (1999)]

The Iowa Infant Feeding Attitude Scale	SD	D	N	A	SA
35. The nutritional benefits of breast milk last only until the baby is weaned from breast milk	5	4	3	2	1
36. Formula-feeding is more convenient than breastfeeding	5	4	3	2	1
37. Breastfeeding increases mother/ infant bonding	1	2	3	4	5
38. Breast milk is lacking in iron	5	4	3	2	1
39. Formula fed babies are more likely to be overfed than are breastfed babies	1	2	3	4	5
40. Formula feeding is the better choice if the mother plans to work outside the home	5	4	3	2	1
41. Mothers who formula feed miss one of the great joys of motherhood	1	2	3	4	5
42. Women should not breastfeed in public places such as in restaurants	5	4	3	2	1
43. Babies fed breast milk are healthier than babies who are fed formula	1	2	3	4	5
44. Breastfed babies are more likely to be overfed than formula fed babies	5	4	3	2	1
45. Fathers feel left out if a mother breastfeeds	5	4	3	2	1
46. Breast milk is the ideal food for babies	1	2	3	4	5
47. Breast milk is more easily digested than formula	1	2	3	4	5
48. Formula is as healthy for an infant as breast milk	5	4	3	2	1
49. Breastfeeding is more convenient than formula feeding	1	2	3	4	5
50. Breast milk is less expensive than formula	1	2	3	4	5
51. A mother who occasionally drinks alcohol should not breastfeed her baby	5	4	3	2	1

SD= Strong Disagreement; **D**= Disagreement; **N**= Neutral; **A**= Agreement; **SA**= Strong Agreement

Intentions to Breastfeed [**Adapted from**: Nommsen-Rivers and Dewey (2009)]

	The Infant Feeding Intentions (IFI) Scale	Very much agree	Somewhat agree	Unsure	Somewhat disagree	Very much disagree
52.	I am planning to only formula feed my baby (I will not breastfeed at all)	0	1	2	3	4
53.	I am planning to at least give breastfeeding a try	4	3	2	1	0
54.	When my baby is 1 month old, I will be breastfeeding without using any formula or other milk	4	3	2	1	0
55.	When my baby is 3 months old, I will be breastfeeding without using any formula or other milk	4	3	2	1	0
56.	When my baby is 6 months old, I will be breastfeeding without using any formula or other milk	4	3	2	1	0

57. What is/are the primary reason (s) for <u>not intending</u> to breastfeed your child?

Primary Reason (s)	Yes	No
1. Don't like breastfeeding		
2. Breastfeeding is embarrassing		
3. Breastfeeding is painful and discomforting		
4. Cannot breastfeed when tired and fatigued		
5. Cannot breastfeed when lacking sleep		
6. Lack of breastfeeding-friendly public places		
7. Lack of support from husband		
8. Lack of support from others (family members, friends)		
9. Infant formula is healthier than breastmilk		
10. Have a history of problems with milk production		
11. Breastmilk is insufficient to adequately satisfy my baby		
12. Cannot breastfeed due to my medical problems		
13. Baby will not accept my breast		
14. Need to go back to work		
15. Other, *please specify*:		

58. What is/are the primary reason (s) that is/are <u>encouraging</u> you to breastfeed your child?

Primary Reason (s)	Yes	No
1. Breastfeeding is beneficial to the child		
2. Breastfeeding is beneficial to the mother		
3. Previous breastfeeding experience encourages it further		
4. Doctor's advice		
5. Husband's advice		
6. Advice from others (family, friends)		
7. High cost of formula milk		
8. Breastmilk is healthier/more nutritious than formula milk		
9. Other, *please specify*:		

Interview End Time: _____

APPENDIX B

CONSENT FORM

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It is important that you read the below information carefully to understand the objectives, procedures, benefits, and risks related to the project, before agreeing to participate in the study. While you are reading, please feel free to ask any questions if you need any clarification about what is stated in this form or if you need any additional information.

1. Title of Research

Mother and Child Cohort: Towards Curbing the Epidemic of Non-communicable Diseases in Lebanon

2. Principal Investigators

- Dr. Farah Naja, American University of Beirut

3. Why Are We Inviting You to Join this Research?

The investigators at AUB are conducting this research at the American University of Beirut Medical Center (AUBMC), the Makassed General Hospital and at 8 Primary Health Centers (PHC) in Beirut.

We are inviting you to join because you are in your first trimester of pregnancy and are visiting the obstetrics and gynecology (OBGYN) clinics at the AUBMC, MGH or PHC.

4. What Should You know about the Invitation?

You have been offered a letter of introduction about this study by registration personnel at the OBGYN's private clinics at AUBMC or Makassed General Hospital or the Primary Health Centers included in this study. When approached by the research assistant about your interest in this study, you have indicated that you'd like to know further information about it. Now we will tell you more about our research and answer your questions.

- Whether or not you join is your decision (you can accept or refuse no matter who is inviting you to participate)
- You are free to ask any questions you want before deciding
- You can say yes but change your mind later
- You can say no and your decision will not affect, in any way, your relationship with your physician and the healthcare team of this hospital or health care center.

5. Who Can You Talk To?

- If you have questions or concerns, or if you think the research has hurt you in any way, you can contact:
  Dr. Farah Naja
  Tel: 009611350000, ext: 4504
  Email: fn14@aub.edu.lb
- If you have questions about your rights as a volunteer, or you want to talk to someone outside the research team, please contact:
  Biomedical Sciences Institutional Review Board, American University of Beirut, Lebanon
  Tel: 00961 1 374374, ext: 5445
  Email: irb@aub.edu.lb

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6. Why Are We Doing this Research?

Obesity, diabetes, hypertension, cancer and other non-communicable diseases are increasing in Lebanon. We would like to know what the effect is of dietary intake early in life (starting in the womb and up to the age of two) on childhood growth patterns and obesity, as these affect the risk of non-communicable diseases later in life.

7. How Long Will the Research Take?

You will be in the research throughout your pregnancy and until your child becomes 2 years old. The study will last for the next 3 years.

8. How Many People Will Take Part?

We plan to recruit 250 participants by direct approaching. The research will include 125 subjects from AUBMC and 125 subjects from Makassed General Hospital and 8 PHCs included in this research study (the Makassed Horj Medical Center, Zarif Medical Center, the Child and Mother Welfare Medical Center, Dar Al Fatwa Health Care Center, the Makhzoumi Medical Center Al Mazraa as well as the 3 PHCCs under the supervision of the Health Directorate Rafik Hariri Foundation: Tariq Jdidi, Zarif and Ras El Nabe'.

9. What Happens if You Take Part?

If you agree to join this study, a total of 9 visits with one of our research team members will take place throughout the 3-year study period. These visits will be distributed according to the timeline below.

During Pregnancy: We will see you for a total of 3 times while you are at your routine visits to your obstetrician. Each visit should not take longer than 30 to 45 minutes, while you are waiting in the OBGYN clinic waiting room.

Visit 1: *During your 1st trimester*

We will assess your:
- Weight, height, and waist circumference
- Blood pressure
- Pre-pregnancy weight, dietary intake (FFQ), and supplement use
- Current dietary intake (24hr), supplement use, and lifestyle practices (smoking and alcohol intake)

We will also ask you some questions relating to your household such as:
- Education, occupation, etc.
- Household food security

Also, during one of your 1st trimester visits to the laboratory to conduct routine blood tests, we will withdraw an additional blood sample (15 ml) to assess your micronutrient status of:
- hemoglobin and ferritin
- vitamins: A, D, B9 (folate) and B12
- lead
- zinc

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We will also request from you to provide us with a urine sample (20 ml) to assess the levels of iodine and creatinine in urine.

Before visit 2, we will call you by phone at a time convenient for you to conduct a 24-hour dietary recall, which should not take more than 15-20 minutes.

Visit 2: *During your 2nd trimester*

We will measure your:
- Weight
- Blood pressure
- Current dietary intake (FFQ and 24h), supplement use, and lifestyle practices (smoking, alcohol intake, and physical activity)

After visit 2, you will be contacted by phone at a time convenient for you to collect three 24-hour dietary recalls (one 24-hour recall per week for 3 consecutive weeks), with each not taking more than 15-20 minutes.

Visit 3: *During your 3rd trimester*

We will measure your:
- Weight
- Blood pressure
- Current dietary intake (FFQ and 24h), supplement use, and lifestyle practices (smoking and alcohol intake)
- Exposure, knowledge, attitudes, and intentions towards infant feeding practices

Just After Delivery: We will visit your physician at the hospital and ask him/her to provide the research team with the below information, which will be accessed only by your physician from your medical records and/or from each physician's private clinic records.

We will obtain information about your:
- Pre-and post-delivery weights
- Oral glucose tolerance test results
- Baby's birth outcomes (sex, gestational age, birth date, weight, length, and head circumference)
- Delivery method
- Occurrence of complications during pregnancy
- Occurrence of complications during delivery

After Delivery: We will see you and your child for a total of 6 visits.. Visits will be scheduled at your convenience and will take place in your home. Each visit should not take longer than 30 to 45 minutes.

Visits 4: *At 4 months post-partum*

We will measure your:
- Weight, waist circumference, and percent body fat
- Dietary intake (FFQ and 24hr) and supplement use

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We will also measure your child's:
- Weight, length, head circumference, and mid-upper arm circumference
- Feeding practices
- Dietary intake and supplement use

Visit 5: *At 6 months post-partum*

We will measure your:
- Weight, waist circumference, and percent body fat
- Dietary intake (24hr), supplement use, lifestyle practices (smoking and alcohol intake)
- Household food insecurity

We will also measure your child's:
- Weight, length, head circumference, and mid-upper arm circumference
- Feeding practices
- Dietary intake and supplement use

Visit 6: *At 9 months post-partum*

We will measure your:
- Weight, waist circumference, and percent body fat

We will also measure your child's:
- Weight, length, head circumference, and mid-upper arm circumference
- Feeding practices
- Dietary intake and supplement use

Visit 7: *At 12 months post-partum*

We will measure your:
- Weight, waist circumference, and percent body fat
- Dietary intake (24hr) and supplement use
- lifestyle practices (smoking, alcohol intake, and physical activity level)

We will also measure your child's:
- Weight, length, head circumference, and mid-upper arm circumference
- Feeding practices
- Dietary intake and supplement use

We will also assess the eating environment at home.

Visit 8: *At 18 months post-partum*

We will measure your:
- Weight, waist circumference, and percent body fat
- Dietary intake (FFQ and 24hr) and supplement use

We will also measure your child's:
- Weight, length, head circumference, and mid-upper arm circumference
- Feeding practices
- Dietary intake and supplement use

We will also assess the eating environment at home.

Visit 9: *At 24 months post-partum*

We will measure your:
- Weight, waist circumference, and percent body fat
- Dietary intake (24hr) and supplement use
- Lifestyle practices (smoking, alcohol intake, and physical activity)

We will also measure your child's:
- Weight, length, head circumference, and mid-upper arm circumference
- Feeding practices
- Dietary intake and supplement use

We will also assess the eating environment at home.

10. Could the Research Be Bad for You?

There are no foreseeable risks resulting from your participation in this study. Your participation will not cause you any physical or emotional harm. Some of the questions we will ask may bother you, but you can choose not to answer if you feel that your personal/family privacy is being invaded.

Also, although blood samples will be withdrawn once during the 1st trimester, the frequency and magnitude of this risk are considered no greater than minimal ("minimal risk means that the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests"). AUBMC will cover the cost of treating, on its premises, medical adverse events resulting directly from the medication and/or medical procedures of this research study. Otherwise, it will not cover for the costs of medical care for any medical condition or issue.

Note that in case the researchers encounter a significantly abnormal result with one of the blood tests that are not usually done as part of routine care; they will alert the treating physician and subjects of this matter.

11. Could the Research Be Good for You?

We cannot promise any major benefit to you or to your child from your participation in this study.

If you agree to take part in this research, we will provide you with monetary compensation for transport and your time spent during the research visits. You will receive $ 15 on each of visits 1, 3, 7, and 9. During visit 1 upon consenting, you will also receive one gift (toy) for your child.

At the end of the 3-year study period, and based on the findings of the study, we will develop a nutrition education manual which will help increase nutrition knowledge and enhance health for both mothers and

young children. We will contact you to provide you with a copy of this manual.

Your overall participation in this study will help in gathering important data on the nutritional status of pregnant women in Lebanon, as well as information on the nutritional status and growth patterns of young children. This information will help us understand the factors increasing the risk of non-communicable diseases in the country. This information will, therefore, also help us in planning diet-related interventions for the prevention of these diseases.

12. What Happens to the Collected Information about You?

The data you provide us for this study will be kept strictly confidential. We will use a code to identify you in our records instead of using your name. Your records will be monitored and may be audited without violating confidentiality. We will not identify you personally in any reports or publications arising from this research.

The filled consent forms will be locked in a cabinet at the principal investigator's office, while the questionnaires will be kept in a locked cabinet in a research office for this study. Electronic versions of the data will also be secured and locked by a password. Access to your collected information will be limited to the following people:

- Study investigators and members of the research team
- Representatives of the Institutional Research Board (IRB) at AUB who make sure the study is done properly and that your rights and safety are protected

❖ We would like to obtain your consent to contact you by phone for conducting the multiple 24-hour recalls during your 2nd trimester of pregnancy. You may join this study even if you do not allow us to contact you for conducting the multiple 24-hour recalls. Please indicate your choice on the appropriate line below:

_____ I **ALLOW** you to contact me for conducting the multiple *24-hour recalls*

_____**I DO NOT ALLOW** you to contact me for conducting the multiple *24-hour recalls*

❖ We would also like to obtain your consent to access the following information from your physician:
- Your pre-and post-delivery weights
- Your oral glucose tolerance test results
- Your baby's birth outcomes (sex, gestational age, birth date, weight, length, and head circumference)
- Your delivery method
- Occurrence of complications during pregnancy
- Occurrence of complications during delivery

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Please indicate your choice on the appropriate line below:

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_____**I ALLOW** you to *access my information from my physician*

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_____**I DO NOT ALLOW** you to *access my information from my physician*

- We may use part or all of the collected information from this study in other projects in the future. This might include sharing the collected information with other researchers, in or outside AUB. Before doing so, we will make sure to destroy all links between your identity and the data about you.

  You may join this study even if you do not allow the use of your collected information to be shared with other researchers and/or used in future research. Please indicate your choice on the appropriate line below:

  _____I **ALLOW** the use of my collected information (biochemical, anthropometric, dietary, lifestyle, sociodemographic/economic, household food security, etc.) to be *shared with other researchers and/or used in future research*

  _____I **DO NOT ALLOW** the use of my collected information (biochemical, anthropometric, dietary, lifestyle, sociodemographic/economic, household food security, etc.) to be *shared with other researchers and/or used in future research*

13. What if You Don't Want to Join?

Please acknowledge that your participation in this study is voluntary. If you do not wish to participate in this study, you are free to say no. Refusing to take part in this study will not affect, in any way, your relationship with your physician and the healthcare team of this hospital.

14. What if You Join but Change Your Mind?

You are free to stop participating at any time during the course of the study. If you decide to stop participating, please contact us. We will ask you if you would like to share with us the main reasons behind your decision. Please note that once you decide to stop participation, we will destroy all data and blood samples connected to you, unless they have been already analyzed or de-identified (i.e. having removed any link between them and your identity).

15. What Else Should You Know?

This research is being funded by the Qatar National Research Fund.
If you are willing to participate in this study, and if your pregnancy proceeds normally, you can continue to participate in this study.

16. Additional Choices

During the study, your blood samples will be analyzed at the AUBMC. If you allow us to, we would like to keep any samples left over by the end of the study for the purpose of future research related to the prevention and treatment of noncommunicable diseases and/or sharing them with other researchers who were not part of this study. We will store these leftover samples at the Nutrition and Food Sciences Department at AUB. You can change your mind about allowing the use of your left over samples in future research and/or sharing with other researchers at any time. If you do not allow us to store your left-over samples for later use, we will destroy them and they will not be used for any purpose.

You may join this study even if you do not allow the use of your left-over samples for future research and/or sharing with other researchers. Please indicate your choice on the appropriate line below:

_____I **PERMIT** the storage and use of my left-over samples for future research and/or sharing with other researchers

_____I **PERMIT** the storage of my leftover samples but request to be contacted to seek permission of use for future research and/or sharing with other researchers

_____I **DO NOT ALLOW** the storage nor the use of my left-over samples for future research and/or sharing with other researchers

We would also like your permission to contact you about participating in future studies. You may still join this study even if you do not permit future contact beyond the study period. You may also change your mind about this choice. Please indicate your choice on the appropriate line below:

_____**YES**, you may contact me

_____**NO**, you may **NOT** contact me

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Signature Page for a Capable Adult	
Participant	
I have read and understood the above information. *I voluntarily agree to join this cohort study described in this form.*	
Full Name of Participant	
Signature of Participant	Date Time
Telephone Number	
Person Obtaining Consent	
I document that: • *I (or another member of the research team) have fully explained this research to the volunteer* • *I have personally evaluated the volunteer's understanding of the research and obtained their voluntary agreement*	
Full Name of Person Obtaining Consent	
Signature	Date Time
Witness (if applicable)	
I document that the information in this form (and any other written information) was accurately explained to the participant, who appears to have understood and freely given consent to join the research.	
Full Name of Witness	
Signature of Witness	Date Time

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Signatures: Research with Children
Mother or Father
I voluntarily agree for my child to join the research described in this form
Full Name of Mother/Father
Signature of Mother/Father Date Time
Person Obtaining Consent
I document that: • *I (or another member of the research team) have fully explained this research to the parent(s).* • *I have personally evaluated parental understanding of the research and obtained their voluntary agreement.*
Full Name of Person Obtaining Consent
Signature Date Time
Witness (if applicable)
I document that the information in this form (and any other written information) was accurately explained to the parent(s), who appear(s) to have understood and freely given consent.
Full Name of Witness
Signature of Witness Date Time

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APPENDIX C

IRB APPROVAL

APPROVAL OF RESEARCH

August 16, 2013

Farah Naja, MD
American University of Beirut Medical Center
Email Address: fn14@aub.edu.lb

Dear Dr. Naja:

On August 16, 2013, the IRB reviewed the following protocol:

Type of Review:	Follow up, Expedited
Project Title:	Mother and Child cohort: Towards Curbing the Epidemic of Noncommunicable Diseases in Qatar and Lebanon
Investigator:	Farah Naja
IRB ID:	NUT.FN.12
Funding Agency:	Qatar National Research Fund
Documents reviewed:	1. Your letter received August 15, 2013 in response to the IRB letter dated August 6, 2013 2. The modified IRB Application 3. The Modified Study proposal (version received August 15, 2013) 4. The modified English & Arabic informed consent forms (version dated August 13, 2013, received August 15, 2013)

On August 16, 2013, the IRB reviewed the above mentioned documents and found your response adequate.

This is to grant you approval to the modified study proposal (version received Aug 15, 2013), the modified English and Arabic informed consent forms (version dated Aug 13, 2013, received Aug 15, 2013), the English & Arabic questionnaire for data collection during pregnancy at 1st, 2nd and 3rd trimesters of pregnancy (version dated July 26, 2013), the questionnaire for data collection just after deliver (version dated July 26, 2013), the English & Arabic questionnaire for data collection after delivery at 4, 6, 9, 12, 18 and 24 months post-partum (version dated July 26, 2013), the letter to OBGYN physicians, the oral script for OBGYN physicians, the phone script for research assistants & the food portion size illustration; for a period ending **August 16, 2014** inclusive.

Before **June 16, 2014** or within 30 days of study close, whichever is earlier, you are to submit a completed "FORM: Continuing Review Progress Report" and required attachments to request continuing approval or study closure.

If continuing review approval is not granted before the expiration date of **August 16, 2014** approval of this research expires on that date.

Kindly note that this approval does not grant permission for contacting patients who were enrolled in previous studies, unless it is specified in the signed consent form or if the principal

investigator or research team member has a primary patient-physician relationship. In all other circumstances, the IRB needs to grant approval for alternative mechanisms.

Attached are stamped approved consent documents. Use copies of these documents to document consent.

The American University of Beirut and its Institutional Review Board, under the Institution's Federal Wide Assurance with OHRP, comply with the Department of Health and Human Services (DHHS) Code of Federal Regulations for the Protection of Human Subjects ("The Common Rule") 45CFR46, subparts A, B, C, and D, with 21CFR56; and operate in a manner consistent with the Belmont report, FDA guidance, Good Clinical Practices under the ICH guidelines, and applicable national/local regulations.

Sincerely,

Mona Nabulsi, MD
Vice-Chairperson of the IRB

Cc: Fuad Ziyadeh, MD, FACP, FASN
Professor of Medicine and Biochemistry
Chairperson of the IRB

Ali K. Abu-Alfa, MD, FASN
Professor of Medicine
Director, Human Research Protection Program

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