DIETARY PATTERN, ANTENATAL CARE ATTENDANCE AND BIRTH OUTCOME AMONG PREGNANT WOMEN AT MAIGANA WARD, SOBA LOCAL GOVERNMENT AREA KADUNA STATE, NIGERIA.

BY

LAKKA HAJARA DURKWA
P13SCBC8087

DEPARTMENT OF BIOCHEMISTRY,
FACULTY OF LIFE SCIENCES
AHMADU BELLO UNIVERSITY, ZARIA
NIGERIA

APRIL, 2019

DIETARY PATTERN, ANTENATAL CARE ATTENDANCE AND BIRTH OUTCOME AMONG PREGNANT WOMEN AT MAIGANA WARD, SOBA LOCAL GOVERNMENT AREA KADUNA STATE, NIGERIA.

BY

LAKKA HAJARA DURKWA

P13SCBC8087

A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES,
AHMADU BELLO UNIVERSITY, ZARIA
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE IN NUTRITION

DEPARTMENT OF BIOCHEMISTRY,

FACULTY OF LIFE SCIENCES

AHMADU BELLO UNIVERSITY, ZARIA

NIGERIA

APRIL, 2019

DECLARATION

I hereby declare that the work in this dissertation entitled "**DIETARY PATTERN, ANTENATAL CARE ATTENDANCE AND BIRTH OUTCOME AMONG PREGNANT WOMEN AT MAIGANA WARD, SOBA LOCAL GOVERNMENT AREA KADUNA STATE, NIGERIA"** has been performed by me in the Department of Biochemistry under the supervision of Mr. O. A. Owolabi and Dr. A B. Sallau.The information herein derived from literature has been duly acknowledged in the text and a list of references provided. No part of this dissertation was previously presented for another degree or diploma at this or any institution.

_____ _____ _____

Name of student Signature Date

CERTIFICATION

This dissertation entitled "**DIETARY PATTERN, ANTENATAL CARE ATTENDANCE AND BIRTH OUTCOME AMONG PREGNANT WOMEN AT MAIGANA WARD, SOBA LOCAL GOVERNMENT AREA KADUNA STATE**, **NIGERIA**" by Hajara,Durkwa LAKKA meets the regulations governing the award of the degree of Master of Science in Nutrition of the Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

Mr. O. A. Owolabi _____ _____

Chairman, Supervisory Committee Signature Date

Dr. A .B. Sallau _____ _____

Member, Supervisory Committee Signature Date

Prof. M. N. Shuaibu _____ _____

Head of Department Signature Date

Prof. S. Z. Abubakar _____ _____

Dean, School of Postgraduate Studies Signature Date

DEDICATION

I dedicate this work to my parents, Mr. and Mrs. B. LakkaDurkwa for nurturing me to become who I am today despite the challenges of life. I also dedicate this work to my siblings, Martha,Charity, Jeremiah and Margaret for their encouragement, advice and support.

ACKNOWLEDGEMENTS

I appreciate God for the sufficient grace and mercy granted to me throughout my period of study; I ascribe glory, honor and praise to Him alone.

My profound gratitude to my project supervisors, Mr. O. A. Owolabi and Dr. A.B Sallau for their untiring efforts, corrections, close supervision and suggestions during the course of this work. Your assistance made this work a success.

I thank my Head of Department, Prof. M. N. Shuaibu and the entire academic and nonacademic staff of the Department of Biochemistry for their individual and collective support.

Finally, I appreciate my Parents for their relentless sacrifice and efforts towards the success of my work. I will also not forget to appreciate my family members, in-laws and dear friends, for their prayers and support. Special thanks to my in-law Dr. IdrisBdliya for the unconditional love, prayers encouragement and support. Mercy, Jacob, Bitrus, Hyelhira, Sophia,Yusuf, Emmanuella and Norah I appreciate you all my nieces and nephews.

ABSTRACT

Infant weight at birth is an important indicator of maternal health and nutrition, during pregnancy and a predictor of infant growth and survival. The effect of dietary intake, antenatal care attendance on birth outcome among randomly selected pregnant women in their third trimester in Maigana Ward of Soba Local Government Area, of Kaduna state was evaluated. Socio-economic/information, nutritional status, dietary intake, micronutrient status, antenatal care attendance score and baby's birth weight at delivery were determined using standard methods. The socioeconomic characteristics of the pregnant women evaluated included; age, marital status, highest educational attainment, occupation and monthly income, 10% of the pregnant women were between age 11-15years, while 73% were between age 16-30years, 68% had no formal education and (53%) were poor, earning less than #350 per day. Their nutritional status revealed that 9.7% were under weight (MUAC<23.3cm), 31.1% were normal (MUAC 23.3 – 25.0 cm) and 59.2% were overweight (MUAC >25cm). Strong significant correlation was found between MUAC and maternal weight with birth weight of neonates (r=0.816, p=0.000 and r=0.648, p=0.000) respectively. The dietary pattern of the pregnant women reveals cereal, vegetable soup and sauces were frequently consumed more at 22.1 and 21%, 2-3 times/day while meat, fish and poultry, fruits and other plants were consumed less at 3 and 4.9%, once a day respectively. The antenatal care attendance and compliance status indicated that 76.7% were below compliance, 16.5% had minimal compliance and 6.8% had desired compliance. The mean micronutrient serum concentration (µmol) were 4.02, 2.52 and 0.45 for iron(Fe),zinc(Zn) and vitamin A respectively, leaving 73.1%, 96.2% and all (100%) deficient of the micronutrients. The incidence of low birth weights was 16.5%. Factors that have significant association with low birth weight are Age ($\chi 2$=58.609, p=0.000), occupation ($\chi 2$=13.019, p=0.011) monthly income ($\chi 2$=15.484, p=0.008) Iron level ($\chi 2$=7.344, p=0.007) and maternal nutritional status(χ^2=40.713, p=0.000) .This study establish that nutritional status, socioeconomic status (age, occupation, monthly income), and antenatal compliance score of the pregnant women were determinants of their birth outcome in Maigana ward of Soba LGA

TABLE OF CONTENT

DECLARATION iii
CERTIFICATION iv
DEDICATION v
ACKNOWLEDGEMENTS vi
LIST OF TABLES xi
LIST OF FIGURE xii
LIST OF ABBREVIATIONS xiii
ABSTRACT vii
CHAPTER ONE 1
1.0 INTRODUCTION 1
1.1 Background of Study 1
1.2 ` Statement of Research Problem 4
1.3 Significances of the Findings 6
1.4 Justification 6
1.5 Aim and Objectives 7
1.5.1 Aim 7
1.5.2 Specific objectives 7
CHAPTER TWO 9
2.0 LITERATURE REVIEW 9
2.1 Pregnancy 9
2.1.1 Dietary intake during pregnancy 9
2.2 Birth Outcomes 11
2.3 Factors Influencing Pregnancy Outcomes 13
2.3.1 Maternal nutrition 13
2.3.2 Antenatal care (ANC) attendance 17
2.3.3 Malaria in pregnancy 20
2.3.4 Maternal age 20
2.4 Effects of Some Environmental Factors on Pregnancy Outcome 22
2.5 Contributing factors of adverse pregnancy Outcome (Low Birth Weight) 23

2.5.1: Optimizing pregnancy outcomes with healthy lifestyle choices 25
CHAPTER THREE 28
3.0 MATERIALS AND METHODS 28
3.1 MATERIALS 28
3.1.1 Chemicals 28
3.1.2 Anthropometric measurement materials 28
3.2 METHODS 28
3.2.1 Study area 28
3.2.1.1 Illustrated map of Kaduna State 29
3.2.2 Study design 31
3.2.3 Study population 31
3.2.4 Sample size 31
3.2.5 Sampling procedure 32
3.2.6 Ethical considerations 32
3.2.7 Field data collection 32
3.2.8 Anthropometric measurements 33
3.2.9 Dietary intake 33
3.2.10 The Antenatal care (ANC) score and compliance 34
3.2.11 Collection of blood sample 34
3.2.12 Determination of micronutrient status 34
3.2.12.1*Determination of vitamin A* 34
3.2.12.2 Determination of serum iron and zinc by atomic absorption spectrophotometer (AAS) 35
3.2.13 Statistical analysis 36
CHAPTER FOUR 37
4.0 RESULTS 37
4.1 Socio-economic Characteristics of Pregnant women from Maigana Ward Soba LGA 37
4.2 Nutritional Status of Pregnant Women from Maigana Ward Soba LGA 37
4.3 Anthropometric Measurements of Pregnant Women from Maigana Ward Soba LGA 38
4.4: The Dietary Pattern of Pregnant Women in Maigana Ward Soba LGA of Kaduna State 42

4.5 Antenatal Care Attendance and Compliance Score of Pregnant Women from Maigana Ward Soba LGA 44

4.6: Parity of Pregnant Women in Maigana Ward Soba LGA of Kaduna State 44

4.7: Micronutrient Status of Pregnant Women in Maigana Ward, Soba LGA of Kaduna State 47

4.8 The Incidence and Contributing factors of Low Birth Weight in Maigana ward Soba LGA. 47

4.8.1 Effect of Socio-Economic Factors on Birth Weight of Neonates in Maigana Ward of Soba LGA of Kaduna State. 50

4.8.2 Effect of Micronutrient and Antenatal Care Compliance Score on Birth Weight of Neonates among Pregnant Women in Maigana Ward Soba LGA. 53

4.8.3 Effect of Maternal Nutritional Status on Birth Weight of Neonates in Maigana Ward, Soba LGA of Kaduna State. 53

CHAPTER FIVE 57

5.0 DISCUSSION 57

CHAPTER SIX 62

6.0 CONCLUSION AND RECOMMENDATIONS 62

6.1 CONCLUSION 62

6.2 RECOMMENDATIONS 63

REFERENCES 64

APPENDICES 73

LIST OF TABLES

Table 4. 1: Socio-economic Characteristics of Pregnant Women in Maigana Ward of Soba LGA, of Kaduna State..... 39

Table 4. 2: Nutritional Status of Pregnant women in Maigana Ward, Soba LGA, Kaduna State..... 40

Table 4. 3: Anthropometric Measurements of Pregnant Women from Maigana Ward Soba LGA 41

Table 4. 4: Dietary Pattern of Pregnant Women in Maigana Ward Soba LGA of Kaduna State..... 43

Table 4. 5: Antenatal Care Attendance and Compliance Status of Pregnant Women in Maigana Ward, Soba LGA, of Kaduna State..... 45

Table 4. 6: Parity of Pregnant Women in Maigana Ward, Soba LGA of Kaduna State. 46

Table 4. 7: Micronutrient Status of Pregnant Women in the study Area at third Trimester 48

Table 4. 8: Effect of socio Economic factors on Birth Weight of Neonates in Maigana Ward, Soba LGA of Kaduna State..... 52

Table 4. 9: Effect of Micronutrient and Antenatal Compliance Status on Birth Weight of Neonates in Maigana Ward, Soba LGA of Kaduna State..... 55

Table 4. 10: Effect of Maternal Nutritional Status on Birth Weight of Neonates in Maigana Ward, Soba LGA of Kaduna State..... 56

LIST OF FIGURES

Figure 2.1 Conceptual Framework for Causes of Malnutrition…….13

Figure 3. 1 1Illustrated map of Kaduna State showing the Soba Local Government Area30

Figure 4.1: Incidence of Low Birth weight among Neonates in Maigana wards, Soba LGA of Kaduna State ……49

LIST OF ABBREVIATIONS

%	Percentage
AAS	Atomic Absorption Spectrophotometer
ANC	Antenatal Care.
BMI	Body Mass Index
CSLAC	Civil Society Legislative Advocacy Centre
Fe	Iron
HF	Health facility
IOM	Institute of Medicine
LBW	Low Birth Weight
LGA	Local Government Area
NDHS	Nigeria Demographic Health Survey
RNG	Random Number Generator
SD	Standard deviation
SPSS	Statistical Package for Social Sciences
STD	Sexually Transmitted Diseases
UNICEF	United Nations Children Fund
WHO	World Health Organization
Zn	Zinc

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of Study

Good maternal nutrition is important for the health and reproductive performance of women, the health, survival, and development of their children (Mora and Nestel, 2000).Maternal nutrition has been identified as the mostimportant determinant of adverse pregnancy outcomes in Nigeria. It's also a major determinant of the baby's size at birth; it has a direct causal impact on the incidence of small size at birth (Ogunjuyigbe*et al*.,2008).

Birth weight is the first weight of a baby, taken immediately after birth (WHO 2004). Low birth weight is one of the poor outcomes of pregnancy that has caught the attention of the World Health Organization. Low birth weight (LBW) is defined as"weight of a live born infant of less than 2500g regardless of gestational age" (WHO, 2006). A child's birth weight or size at birth is "an important indicator of the child's vulnerability to the risk of childhood illnesses and the child's chances of survival" (NDHS, 2013). However, children's weight is to great extent determined by factors that operate in the uterus wall before they are born (Wilcox and Skaeven, 1992). An infant weight at birth is an important indicator of maternal health and nutrition prior to, during pregnancy and a predictor of infant growth and survival (WHO, 2006). At birth, foetus weight is accepted as a single parameter of the health and nutrition of the mother (Wilcox and Skaeven, 1992).

Dietary intake during pregnancy influences maternal health, as poor dietary practices during pregnancy have been linked to maternal complications (Grasham*et.al.*,2014). During pregnancy most especially second and third trimester, nutrient needs increase, energy requirements also increase by about 300 calories per day (Blount, 2005). During pregnancy the daily requirement of calcium is about 1000 mg, 75 to 100g of protein, the combination of sodium, potassium, water and iron is about 27 mg , at least 85 mg of vitamin C and 6-8mg per day of folic acid. Other practices such as alcohol consumption, use of drugs and tobacco smoking are considered harmful practices (Blount, 2005).

Undernourishment of foetus in the womb can lead to diminished potential andpredisposes infant to early death (UNICEF, 2014). Those who survive tend to have impaired immune function and increased risk of disease and are likely to remain undernourished, with reduced muscle strength, cognitive abilities and intelligent quotient throughout their lives. As adults, they are likely to suffer a higher incidence of diabetes and heart disease (UNICEF, 2014). Components leading to healthy pregnancy outcome include healthy pre pregnancy weight, appropriate weight gain and physical activity during pregnancy, consumption of a wide variety of foods, appropriate vitamin and mineral supplementation, avoidance of alcohol and other harmful substances, and safe food handling (Sandra, 2014).

Evidence shows that high maternal, prenatal, neonatal and child mortality rates are associated with inadequate and poor quality health services, these evidence also suggests that explicit, evidence-based, cost effective packages of interventions can improve the processes and outcomes of health care when appropriately implemented (UNICEF, 2000, CSLAC, 2001)

Antenatal care which is the care received from health professionals during pregnancy (Blount, 2005), contributes to the identification of pregnancy complications. The early initiation of regular care has been shown to directly reduce the incidence of low birth weight (Carey and Hamer, 1991).

Antenatal care is globally accepted and commonly understood to have a beneficial impact on pregnancy outcome, either through detecting and treatment of complications or by contributing to the reduction of modifiable maternal risk of delivering a preterm or growth retarded infant. (Magadi*et al*.,2000). It also provides an array of available medical nutritional and educational interventions intended to reducethe risk of low birth weight and other adverse pregnancy outcomes (Blooms and Wupis, 1999).Every day, approximately 830 women die from preventable causes related to pregnancy and childbirth and 99% of these maternal deaths occur in developing countries (UNICEF, 2014).

Most maternal deaths are preventable, as the health-care solutions to prevent or manage complications are well known (Moss *et al.*, 2002). All women need access to antenatal care in pregnancy, skilled care during childbirth, and care and support in the weeks after

childbirth. Maternal health and newborn health are closely linked. Approximately 2.7 million newborn babies die every year, and an additional 2.6 million are stillborn. It is particularly important that all births are attended by skilled health professionals, as timely management and treatment can make the difference between life and death for both the mother and the baby (UNICEF, 2014).

A woman's nutritional status has important implications for her health as well as for the health of her children. Malnutrition results in reduced productivity, increased susceptibility to infections, slow recovery from illness, and a heightened risk of adverse pregnancy outcomes (NDHS, 2013).

1.2 ` Statement of Research Problem

"Accordingto Sandra (2014), pregnancy is a critical period during which maternal nutrition and lifestyle choices are major influences on mother andchild health". Inadequate levels of key nutrients during crucial periods of fetal development may lead to reprogramming within fetal tissues, predisposing the infant to chronic conditions in later life (Sandra, 2014).

Pregnant women in sub-Sahara Africa are at high risk of malnutrition as a result of poverty, food insecurity, political and economical instabilities, frequent infections and pregnancies (Lartey 2008).

Maternal mortality remains a major challenge to health systems worldwide (NDHS, 2008). Globally, there were an estimated 289 000 maternal deaths in 2013, due to pregnancy related complications and childbirth due to lack of access to skilled routine and emergency care, a declineof 45% from1990 (NDHS, 2013). The sub-Saharan Africa region alone accounted for 62% (179 000) of global deaths followed by Southern Asia at 24% (69 000). At the country level, the two countries that accounted for one third of all global maternal deaths are India at 17% (50 000) and Nigeria at 14% (40 000) (WHO, 2015). The lifetime risk of maternal death indicates that 1 in 30 womenwill have a death related to pregnancy or childbearing, when compared withthat of the developed countries of 1 in 3300 women(WHO, 2015).

"In Nigeria the neonatal mortality rate is 528/day, one of the highest in the world, second to India. Infant and under-5 mortality rates in the past five years are 69 and 128deaths per 1,000 live births, respectively. At these mortality levels, one in every 15 Nigerian children die before reaching age one. One in every eight do not survive to their fifth birthday. Infant mortality has declined by 26 percent over the last 15 years,"(WHO, 2015).

Therefore an acceleration of the pace of progress is urgently required to achieve the SustainableDevelopment Goal (SDG) targets on maternal and child survival, particularly in high mortality countries in sub-Saharan Africalike Nigeria (WHO, 2015).Childhood mortality rates are higher in rural areas than in urban areas (WHO, 2015).In Nigeria, childhood mortality is highest in the North –West region of the country. There is

alsovariation in the incidence of low birth weight across the region of Nigeria, North-West has the highest incidence, with (27.2%), followed by North-East (13.6 %),South-South (11.6 %), North- Central is (7.5%), South-East (4.3%),while South –West has the lowest, (3.4%)(NDHS, 2013).

1.3 Significances of the Findings

To establish for the first time;

- The nutritional Status of pregnant women in Maigana ward, Soba LGA.
- The incidence of low birth weight in Maigana, Soba LGA.
- Antenatal attendance score among pregnant women in Maigana, Soba LGA.

1.4 Justification

Increasing numbers of women are now seeking care during childbirth in health facilities. Therefore, it is important to ensure a adequate care provision for both the mother and neonate.

Reliable information about the rates and trends in maternal mortality and pregnancy outcome is essential for resource mobilization, planning and as assessment of progress towards achieving Sustainable Development Goal (SDGs) 1, 2 and 3, (no poverty, zero hunger, good health and wellbeing respectively) (WHO, 2015).

This study was motivated by the high incidence of low birth weights in North-west of Nigeria and the attendantnegative consequences such as chronic disease and other health complications in between life. Hence at the end of the study, information derived will be good input to improving maternal dietary intake and pregnancy outcome,create awareness on the relationship between dietary intake and pregnancy outcome and also for policy makers (Government, Non GovernmentalOrganisation (NGO)) to formulate policies aimed at improving the maternal and child's health in the affected area in particular and Nigeria in general.

1.5 Aim and Objectives

1.5.1 Aim

The aim of this research is to assess the dietary pattern, antenatal care attendance, and birth outcome of pregnant women at Maigana ward, Soba Local Government Area (LGA) of Kaduna State.

1.5.2 Specific objectives

The specific objectives of the research were to:

i. Determine the social-economic and nutritional status of pregnant women at Maigana ward, Soba LGA.
ii. Assess dietary intake of the pregnant women in the study area
iii. Evaluate the antenatal care utilization of the pregnant women inMaigana ward Soba local LGA

iv. Determine micronutrient status of the pregnant women in the study area at third trimester

v. Determine the incidences and contributing factors of low birth weight in Maigana ward, Soba LGA.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Pregnancy

Pregnancy is a critical stage of development during which maternal nutrition can greatly influence obstetric and neonatal outcome (Kramer, 2003). Knowledge of the factors that influence pregnancy outcome will to a large extent determine the attitude and practice of women to pregnancy and its outcome. Improving the well-being of mothers, infants, and children is the key to the health of the next generation (Procter and Campbell, 2014). The maternal environment is an important determinant of birth weight and factors such as maternal under-nutrition, malaria, anaemia, STDs that prevent normal circulationacross the placenta cause shortage of nutrient and oxygen supply to the foetus and restricts the growth of the foetus. Maternal tetanus infection also increases the risk factor for low birth weight and it induces malnutrition by interrupting food intake via anorexia. Low maternal weight for height and low birth weight reflect inadequate food intake in women (Pojda and Kelly, 2000). Abuse during pregnancy is considered to be a potentially modifiable risk factor for low birth weight(Claire *et al.,* 2001**).**

2.1.1 Dietary intake during pregnancy

Pregnancy has been regarded as a maternal phase with requisite additional nutritional requirements; number of evidence suggests that the prenatal period constitutes a critical convergence of short- and long-term factors affecting the lifelong health of mother and child (Sandra, 2014). The study by Mora and Nestel(2000) showed that out of 200 million pregnant women each year, many pregnant women in developing countries suffer

from nutritional deficiencies. The aim of prenatal nutrition is to support a healthy uterine environment for optimal fetal development while supporting maternal health (Shapira,2008). The ideal prenatal diet should limit overconsumption for the mother and prevent under nutrition for the fetus (Sandra, 2014).

A study on dietary intake of expectant mother revealed that adequate dietary intake of mother's is necessary to ensure sufficient energy and nutrient intake for adequate growth of the fetus without depleting maternal stores and damaging mother's own tissues to maintain her pregnancy (Mridula*et al*., 2003). Sufficient nutrition intake during pregnancy has enormous potential for promoting the nutritional status of the mother and her child. Malnutrition resulting from inadequate dietary intake is associated with growth failure and development of protein-energy malnutrition, especially during the gestation (Kathleen and Drora, 2010). It was recognized that poor growth results not only from a deficiency of protein and energy but also from inadequate intake of micronutrients thatare vital during pregnancy. Pregnant women need additional protein for initial deposition of pregnancy related tissue and to maintain new tissue (Kathleen and Drora, 2010).

Maternal iron requirements are higher than average absorbable iron intakes. If a woman’s diet does not contain enough iron to meet these needs, the body can meet fetal requirements only by drawing upon maternal iron stores. The demands of the developing fetus may cause the mother to develop nutritional iron deficiency anemia. The World Health Organization indicates that, on average, 56% of pregnant women in developing countries are anemic and it is estimated that 82% of all pregnant women in the world suffers from zinc deficiency (WHO 2015). During pregnancy the daily requirement of calcium is about 1000 mg, 75 to 100g of protein, the combination of sodium, potassium,

water and iron is about 27 mg, at least 85 mg of vitamin C and 6-8mg per day folic acid (Blount, 2005).

2.2 Birth Outcomes

Birth outcomes are a category of measures that describe health at birth (UNICEF, 2004). These outcomes, such as low birth weight (LBW), represent a child's current and future morbidity or whether a child has a "healthy start" - and serve as a health outcome related to maternal health risk (WHO, 2004).Basedon epidemiological observations, infants weighing less than 2,500g are approximately 20 times more likely to die than heavier babies (Kramer,1987). More common in developing than developed countries, a birth weight below 2,500g contributes to a range of poor health outcomes. Low birth weight (newborns weighing less than 2,500 grams at birth), due to prematurity and/or restricted growth in *utero*, is also a major contributor of newborn and child deaths, as well as disability and non-communicable diseases globally (WHO, 2004). Low birth weight is usually caused by preterm birth (a low gestational age at birth, commonly defined as younger than 37 weeks of gestation) or the infant being small for gestational age (that is, a slow prenatal growth rate) or a combination of both. In general, risk factors in the mother that may contribute to low birth weight include, young age, multiple pregnancies, previous LBW infants, poor nutrition, heart disease or hypertension, drug addiction, alcohol abuse, and insufficient prenatal care. Environmental risk factors include smoking, lead exposure, and other types of air pollutions (WHO, 2004).

Medical risk factors for LBW before pregnancy are chronic conditions like hypertension, renal insufficiency, cardio-respiratory, autoimmune, endocrine or infectious disorders. The risk factors for LBW during pregnancy are hypertensive disorders, diabetes, malnutrition, bleeding, anemia, infection, placental or fetal anomalies and multiple pregnancies. In addition, a heavy physical workload during pregnancy may also negatively impact birth weight (UNFPA, 2005). Being small for gestational agecan be, without an underlying pathological cause, or due to intrauterine growth restriction, which can be secondary to many possible factors. For example, babies with congenital anomalies or chromosomal abnormalities are often associated with LBW. Problems with the placenta can prevent it from providing adequate oxygen and nutrients to the fetus. Infections during pregnancy that affect the fetus, such as rubella, cytomegalovirus, toxoplasmosis, and syphilis, may also affect the baby's weight (Barker 1992).

LBW is closely associated with fetal and prenatal mortality and Morbidity, inhibited growth and cognitive development, and chronic diseases later in life. At the population level, the proportion of babies with a LBW is an indicator of a multifaceted public-health problem that includes long-term maternal malnutrition, ill health, hard work and poor health care in pregnancy (WHO,2004). On an individual basis, LBW is an important predictor of newborn health and survival and is associated with higher risk of infant and childhood mortality(Stevens-Simon and Orleans, 1999).

2.3 Factors Influencing Pregnancy Outcomes

2.3.1 Maternal nutrition

Maternal nutrition during pregnancy and health of the offspring is the ability of mother to provide nutrients and oxygen for her baby, which is important for fetal health and its survival. Failure in supplying the adequate amount of nutrients to meet fetal demand can lead to fetal malnutrition (Matin-Gronet and ozanne, 2006). Dairy foods, such as milk, yogurt and cheese are good dietary sources of calcium, protein and vitamin D. In addition to a healthy diet, pregnant women also need to take a daily prenatal vitamin to obtain some of the nutrients that are hard to get from foods alone, such as folic acid and iron, according to America College of Obstetricians and Gynecologists (ACOG) (2018).

2.3.1.1 Causes of maternal malnutrition

Poor nutrition arises from multifaceted and interrelated determinants. These determinants are categorized into; immediate causes, underlying causes and basic causes (Figure 2.1). The immediate causes; inadequate dietary intake and disease, directly affect the individual with disease leading to nutrient loss and poor nutritional status.

Underlying causes can be grouped into three broad categories:

- Household food insecurity
- Inadequate care
- Unhealthy household environment and poor Public Health services

The basic causes are longer-term such as poverty as a major factor, along with gender inequalities, larger political, economic, social and cultural environments which affect institutions and leadership from community to national level.

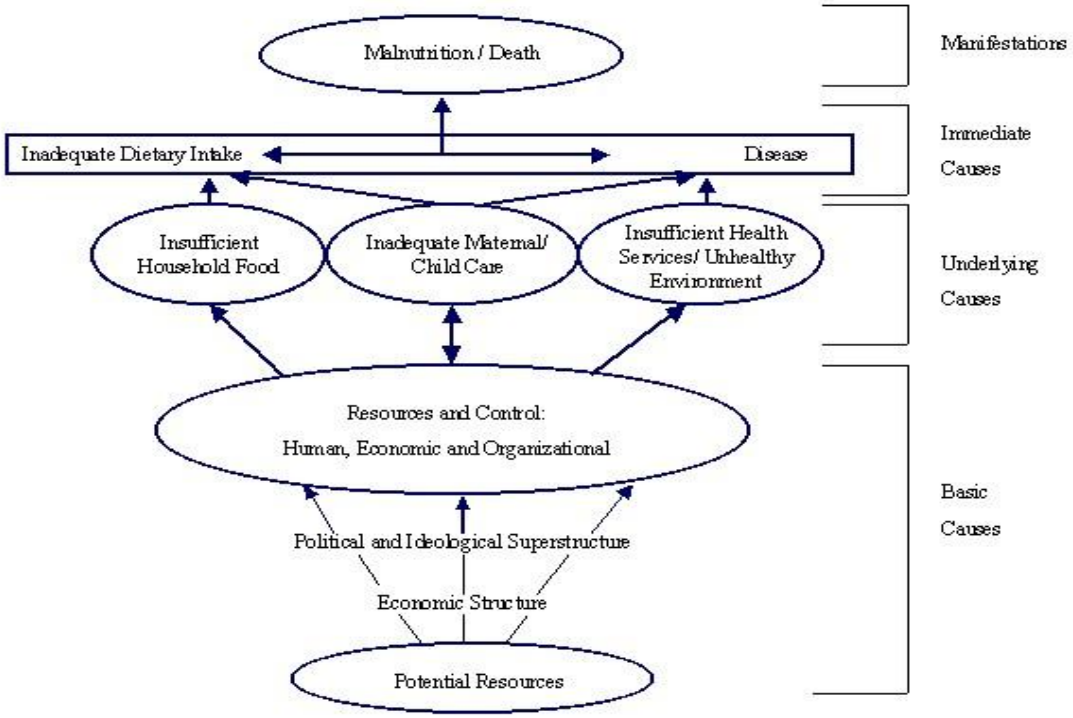


Figure 2.1 Conceptual Framework for Causes of Malnutrition. Source: UNICEF (1990)

Poor maternal nutrition before and during pregnancy impacts adversely on pregnancy outcome and infant survival, and can result in spontaneous abortion, stillbirth, congenital malformation, IUGR, preterm delivery and perinatal and neonatal death. Malnutrition also increases the risk of maternal infection, which further impacts on perinatal and neonatal morbidity and mortality because much of brain growth occurs during late pregnancy and early infancy, maternal malnutrition also can impair early childhood development (Lindsay *et al*., 2012).

Studies showed that intrauterine malnutrition have more serious consequences for children than postnatal malnutrition. Under-nutrition, as well as over-nutrition during pregnancy, was associated with adverse pregnancy outcomes (Shapira,2008). The Institute of Medicine (IOM) published recommended weight gains by pre-pregnancy BMI. Wasting in pregnant women can be defined as a Mid-upper arm circumference (MUAC)< 22cm. Low pre-pregnancy BMI is considered a risk factor for preterm birth and intra-uterine growth retardation (IOM, 2005). Pregnant women in developing countries attend antenatal clinics late, so the pre-pregnancy BMI is unknown and antenatal care can be based on pregnancy weight gain only. Women with short stature (145cm), low body weight (45kg), and/or MUAC < 22cm are considered to be at risk of adverse pregnancy outcomes. Weekly weight gains should range from 0.3kg to 0.5kgfor overweight women,ormore for underweight women from the second trimester (Kruger, 2005).

Poor nutrition mostly begins *in utero* and extends throughout the life cycle. This increases the risk to the individual's health and also the likelihood of damage to future generations through further foetal under nutrition. Under-nutrition, which is manifested in short maternal height and below-normal pre-pregnancy weight, pregnancy weight gain consists of the strongest predictors of giving birth to a low birth weight infant(Ogunjuyigbe*et al.,* 2008). Considering the potential influence of nutritional status of the mother on the health and survival of her child is important because of the biological link between her and the infant during pregnancy and lactation (Ogunjuyigbe*et al.,* 2008). Although the relationship between maternal nutrition and infant mortality is complex, it can be explained through maternal weight gain in pregnancy and birth weight of the infants(Ogunjuyigbe*et al.,* 2008).

Pregnant women need to increase food intake by at least 200 calories or even more if their pre-pregnancy weights were low. They need to gain at least 1kg per month during their second and third trimesters. As a result of the fear that eating too much may result in having big babies which may in turn make delivery difficult, these women may accept more nutritional education that focus on eating specific foods than just eating more food(Ojofeitimi*et al.,* 1982).

The main objective of food supplements during pregnancy is not to promote fetal overgrowth but to prevent low birth weight. It has been shown that increases in head circumference of an infant due to food supplements taken by the mother have not been too large (about 1-3mm) as to cause cephalo-pelvic disproportion which may lead to obstructed labour but evidence exists that food supplements actually reduce prenatal mortality (Ceesay*et al*., 1997). Women who do not gain approximately 1kg/month or

women who lose weight between consecutive visits endanger both themselves and the foetus(Ogunjuyigbe*et al.,* 2008). Although gaining a 1kg/month for pregnant women is attainable, most women in developing countries still do not gain this recommended amount of weight because many of them eat less during pregnancy for fear of the possibility of cephalo-pelvic disproportion. To them, a small sized baby is not considered a problem (Ogunjuyigbe*et al.,* 2008). Rajan and Oakley, (1990) in their study of women's view of the risk of low birth weight found that 37% of these women did not see any problem with low birth weight. They respond that smaller babies are easier in labour and delivery.

Another explanation that may be driving poor maternal nutrition which is positively associated with the high incidence of low birth weight in Nigeria is the restrictions placed on some foods where in effect these prohibited foods are common sources of essential nutrients for pregnant women (Ogunjuyigbe, *et al.*,2008).

2.3.2 Antenatal care (ANC) attendance

Antenatal care represents the care given to pregnant women before birth by skilled health personnel which includes health promotion, screening of risk factors, and treatment of diseases and pregnancy-related complications (WHO, 2000). The importance of antenatal care (ANC) for improving perinatal outcomes is well established. The antenatal period suitable gives opportunities for reaching pregnant women with a number of interventions that may be vital to their health, well-being and that of their infants (Theobald *et al*., 2010). The immerse benefits of antenatal care (ANC) to babies include increased growth, reduced risk of infection and increased survival (Ambetsa, 2012). Some elements of the ANC package (tetanus toxoid, screening for pre-eclampsia, screening and treatment of

asymptomatic bacteriuria and syphilis) have been shown to be cost-effective in a Sub-Saharan African context (Kruger, 2005). Although it cannot be concluded that ANC is the solution to high maternal and prenatal mortality in the developing world (since "few life-threatening complications can be prevented antenatally ensuring the provision of ANC may help progress to the Millennium Development Goals for maternal and child mortality (WHO, 2005).

There have been a number of studies in developing and transitional countries that have shown positive effects of ANC on perinatal outcome, including reduced rates of pre-term labour (Keith, 2005), low birth-weight (Kazaura*et al*., 2006) and also perinatal death (Moss *et al*., 2002). However much of the research delibration has been on the optimal number of ANC visits, which health-care professionals should provide care and the content of the ANC visits(Villar and Bergsjo, 2002). Focused antenatal care is the new model of ANC recommended by WHO that is based on four goal-oriented antenatal visits around 12, 26, 32, and 36 weeks of gestation (Villar and Bergsjo, 2002; WHO, 2009). The WHO now recommends four ANC visits for low risk pregnancies and prescribes the evidence-based content for each visit (Amosu, 2011). As well as the direct effect of ANC on perinatal outcomes (i.e. health benefits arising from the care itself), there may also be an indirect benefit associated with ANC, since women attending ANC are more likely to have their delivery assisted by a professional health care provider or in a health facility (Theobald and Napendaeli, 2010).

Antenatal care compliance is the attendance of at least four ANC visits by women with uncomplicated pregnancies, as recommended in the WHO focused ANC strategy (Villar

and Bergsjo, 2002). The health system determinants of Antenatal Care Compliance are categorised in to 6 variables which are ANC availability1. Type of ANC facility 2.typeof ANC provider3. Gender of ANC provider,ANC accessibility4. Time to ANC facility5. Cost of ANC service,ANC quality 6. Number of ANC services provided during ANC (nine most recommended are weight, blood pressure, blood test, urine test, HIV counseling and testing, iron supplementation, deworming, malaria prevention, and tetanus toxoid vaccination) (Villar and Bergsjo, 2002).

A study in Delta state found mothers with higher educational status, spouse's high education level and those who had income yielding occupations utilized more antenatal care services; while housewives, with no other occupation, and 11women with a parity of more than 4 children utilized antenatal care services less(Ambetsa, 2008).Another study in Osogbo, on timing of first ANC visit (booking clinic) found mean gestational age at booking was 20.3±6.2 weeks and prevalence of late entry to antenatal care was 82.6%. Maternal education and age were significant factors influencing late booking (Awusi, 2009). It has many aspects including at a minimum when it starts, the number and spacing of the visits, the content of each visit, the type of provider (e.g. doctors, midwives, traditional), the provider setting (for example; hospital, clinic or home), the assessment of risk status, the schedule of medical screening tests, and the use of specific medical, educational, nutritional and social support intervention services (Alexander and Korenbrot, 1995).

In conclusion prenatal care received by pregnant women has been identified as a means of identifying mothers at risk of preterm or growth-retarded infants and to provide several available medical, nutritional and educational interventions intended to alleviate the

incidence of low birth weight and other adverse pregnancy outcomes (Magadi*et al.*, 2000).

2.3.3 Malaria in pregnancy

Malaria infection during pregnancy is a major public health problem in tropical and subtropical regions throughout the world (WHO, 2015). The burden of malaria infection during pregnancy is caused mainly by *Plasmodiumfalciparum*, the most common malaria species in Africa (WHO, 2015). The symptoms and complications of malaria during pregnancy differ with the intensity of malaria transmission and thus with the level of immunity the pregnant woman has acquired (Adam *et al*, 2005). Pregnant women and the unborn children are particularly vulnerable to malaria, which is a major cause of prenatal mortality, low birth weight, and maternal anaemia (van Eijk*et al.*, 2006). Beyond the impact of malaria on children and pregnant women, it affects the general population. 100% of the total population of Nigeria is at risk of malaria and at least 50% of the total population suffers from at least one episode of malaria each year (WHO, 2006).

2.3.4 Maternal age

Studies have shown that advanced maternal age(variously defined, but generally including women over age 35 years at delivery) is associated with a high risk of adverse pregnancy outcomes when compared with younger (post-adolescent) women (O'Reilly-Green and Cohen, 1993,Johnson and Tough, 2012).

The sway of maternal age has assumed increasing importance in recent decades. In most of the develop countries the confluence of several social and demographic trends has resulted to an increasing number of women becoming pregnant late in their reproductive

lives (Cohen, 2014). The rise of feminism facilitated better educational opportunities and broader career choices for women, who now tend to marry later in life than did their parents (Cohen, 2014). These societal trends, combined with the availability of effective birth control and sophisticated treatments for infertility, have brought about an expanding population of women who first attempt pregnancy after age 35. Prim gravidity after 40 is very common and, usually with the help of assisted reproductive technology, women are getting pregnantin their sixth decade.While many pregnancies in older women are the result of personal choice, others are not voluntary. Infertility or illness can delay conception (Cohen, 2014).

A study byVaughan *et al*., (2014) examined the association between maternal age extremes and pregnancy outcome among 36, 916 nulliparus in an Irish tertiary-care hospital, and found that when compared with an optimal age group of 20–34 years, the age group <17 years have high risk of age preterm birth by about 80%. Newborns of mothers >40 wereabout 35% more likely to require intensive care, and 70% more likely to have an anomaly.

It is also important to remember that successful pregnancy does not only depend on the reproductive system. Ageing results in changes in all organs. Certainly the normal changes associated with ageing in the heart (muscle atrophy, lipofuscin deposition, reduced reserve), vasculature (loss of compliance, atherosclerosis) and lungs (reduced capacity) may be clinically unapparent until the burden of pregnancy is placed on these organs (Cohen, 2014).

2.4 Effects of Some Environmental Factors on Pregnancy Outcome

Low birth weight contributes about sixty to eighty percent of the infant mortalityrate in developing countries. Infant mortality due to low birth weight is usually directly causal, stemming from other medical complications such as preterm birth, poor maternal nutritional status, lack of prenatalcare, maternal sickness during pregnancy, and an unhygienic home environment(Andrews, 2008***).***

Environmental toxins, and elevated blood lead levels in pregnant women, below10 ug/dL can cause miscarriage, premature birth, and LBW in the offspring, the Centers for Disease Control and Prevention's has 10 ug/dL “level of concern”, this cut-off value really needs to arise more attentions and implementations in the future(Cleveland *et al*.,.2008).

Active maternal tobacco smokinghas well established adverse perinataloutcomes such as LBW, mothers who smoke during pregnancy are twice as likely to give birth to low-birth weight infants (Knopik, 2009). Review on the effects of passive maternal smoking, also referred to as environmental tobacco exposure (ETS), and demonstrated that increased risks of infants with LBW were more likely to be expected in ETS-exposed mothers(Salmasi*et, al*., 2010).

The combustion products of solid fuel in developing countries can cause many adverse health issues in people. Because a majority of pregnant women in developing countries, where rate of LBW is high, are heavily exposed to indoor air pollution, increased relative risk translates into substantial population attributable risk of 21% of LBW**(**Pope *et al*,.2010).

A correlation between maternal exposure to CO and low birth weight has been reported that the effect on birth weight of increased ambient CO was as large as the effect of the mother smoking a pack of cigarettes per day during pregnancy(Lewtas, 2007).It was observed that adverse reproductive effects (e.g., risk for LBW) were correlated with maternal exposure to air pollution combustion emissions in Eastern Europe and North America(Townsend and Maynard, 2002).Mercury is a known toxic heavy metal that could aftect fetal growth and health, and there has been evidence showing that exposure to mercury (via consumption of large oily fish) during pregnancy may be related to higher risks of LBW in the offspring(Gochfeld and Burger, 2005).

Kawada (2004) observed that, exposure of pregnant women to airplane noise could be associated with low birth weight. Aircraft noise exposure caused adverse effects on fetal growth leading to low birth weight and preterm infants(Matsui *et al*., 2003).

2.5 Contributing factors of adverse pregnancy Outcome (Low Birth Weight)

Women of low economic status have been associated with a high-risk of having low weight babies (Tuntiseranee*et al.,* 1999), examined the effect of socioeconomic determinants ofpregnancy outcomes for Thailand to find that mean birth weight correlated with family income even after adjusting for maternal characteristics and number of antenatal visits. In their view, socioeconomic status of the household is a major determinant of the weight of a baby at birth. The possibility that the association observed between adequate prenatal care utilization and lower incidence of low birth weights, may in part, reflect woman who decide to use prenatal care in the first trimesters and frequently (Butz*et al*., 1993).

Although some studies are inconclusive regarding the role of maternal education on pregnancy outcomes, it is expected that education and occupation impact negatively on poor pregnancy outcome as a result of their ability to improve women's status and access to information(Tuntiseranee*et al.,* 1999). On the contrary, some studies have found that the more educated a woman is, the more her likelihood of experiencing poor birth outcomes. A possible explanation for this is the finding from the study on Nigeria byAdetunji,(1995), suggesting that unemployment rate was high among secondary school graduates which impacted their socioeconomic status, thus reducing access to health care and suggested that educated mothers were more likely to use motorbikes also known as 'okada' on bumpy roads which cause intra-uterine vibrations, resulting in poor birth outcomes. From an individual point of view, demographic risk factors tend to impact birth weight smaller than would medical condition. These risk factors affect larger numbers of women and altering it is quite difficult. However, the higher incidence of very low birth weight among teenage mothers may be an indication that some demographic risk factors are partly amendable by population-based comprehensive and prenatal interventions. There is a fairly consistent relationship between some of the demographic risk factors such as sex, age, parity and birth intervals and low birth weight. Several authors(Magadi*et al*., 2000) have found birth order as an important factor influencing birth weightand first order births are on average more likely to be small babies than higher order births. Although it is expected that short birth intervals will increase the risk of adverse outcomes,studies (Voorhoeve*et al*., 1984), have reported a reverse relationship. Ebimoyi*et al*.,(1991) found that, in Nigeria, low birth weight was common with some ethnic groups, female infants, teenage and educationally

disadvantaged mothers. In the same light, Ozumba and Okafor(2006), on Eastern Nigeria have shown that complications that arise during pregnancy such as haemorrhage, malaria, multiple gestation, pregnancy induced hypertension and anemiapredisposes to low birth weight babies.

Like other human development indicators, low birth weight tends to regenerate into a poor health trap for the child, not just as an infant but also as an adult because of the inter-generational effect. Akesode*et al*.,*(*1994) have shown this effect in their study of perinatal mortality in Nigeria where they find that low birth weight is one of the major causes of early neonatal death. They emphasised the need for increased utilization, improvement, and regionalization of antenatal and perinatal care services.

2.5.1: Optimizing pregnancy outcomes with healthy lifestyle choices

Physical activity during pregnancy benefits a woman's overall health. In a low-risk pregnancy, moderately intense activity does not increase risk of LBW, preterm delivery, or miscarriage (Sandra, 2014). Recreational moderate and vigorous physical activity during pregnancy is associated with a 48% lower risk of hyperglycemia, specifically among women with pre pregnancy BMI <25 (Deierlein*et al*,.2012).

Iron deficiency with resultant anemia is the most prevalent micronutrient deficiency worldwide, affecting primarily pregnant or lactating women and young children.(Gautam*et al*.,2008).Iron deficiency is considered as the most common cause of anaemia in Sub-Saharan Africa (VanderJagt*et al*., 2007).During the first two trimesters of pregnancy, iron-deficiency anemia increases the risk for preterm labour, LBW, and infant mortality (Gautam*et al*,.2008). Maternal and fetal demand for iron increases during pregnancy; this increase cannot be met without iron supplementation.These supplements

provide200 mg per day of ferrous sulphate and 5 mg per day offolic acid.(Gautam*et al,*.2008).

Dietary guidance for America recommends (2010)Folic acid before and during pregnancy because of its preventive properties against neural tube defects. All women, including adolescents, who are capable of becoming pregnant, should consume 400 mg/day folic acid from fortified foods and/or dietary supplements, in addition to eating food sources of folate.Pregnant women are advised to consume 600 mg dietary folate equivalents daily from all food sources. Dietary folate equivalents adjust for the difference in bioavailability of food folate compared with synthetic folic acid. One dietary folate equivalent is equal to 1 ug foodfolate, which is equal to 0.6 ug folic acid derived from supplements and fortified foods taken with meals(MacMillan*et al.*,2008).

The function of vitamin D during pregnancy for both mother and fetus is not fully defined at present(Hollis *et al*., 2011).Although vitamin D supplementation during pregnancy has been suggested as an intervention to protect against adverse gestational outcomes, which includes LBW(Thorne-Lyman and Fawzi,2012),the need, safety, and effectiveness of vitamin D supplementation during pregnancy remain controversial (Hollis *et al*., 2011). The IOM recommends600 IU per day of vitamin D to meet the needs of most adults, including pregnant women, (IOM, 2005).

Iodine is required for normal brain development and growth, iodine deficiency worldwide is a growing concern. During pregnancy, iodine requirements increase, making mother and developing fetus vulnerable, the Institute of Medicine(2005), recommends an iodine intake from dietary and supplement sources of 150 mg/day before conception and 220 mg per day for pregnant women (Swanson *et al*., 2012). Hydration and water needs are

essential to healthy pregnancy, as a woman accumulates 6 to 9 L of water during gestation. The total water adequate intake for pregnancy (including drinking water, beverages and food) is 3 L/day. This includes approximately 2.3 L (approximately 10 cups) as total beverages (IOM, 2005).

A systematic review by van den Broek*et al*., (2010),did not reveal a role for antenatal vitamin A supplementationfor the prevention of maternal or perinatal mortality,preterm birth or LBW. However, supplementationwas associated with a reduced risk of maternal nightblindnessand a reduction in maternal anaemia, particularlyin populations with a high prevalence of vitamin A and HIV.Vitamin A deficiency (VAD) is recognised as a seriouspublic health problem in Nigeria (Williams *et al.*, 2011). Vitamin A requirements increase in pregnancy byapproximately 100 lg retinol equivalents (RE) per day. WHO therefore recommend that pregnant womenachieve an intake of 800 lg RE per day (FAO/WHO,2004).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Materials

3.1.1 Chemicals

All chemicals and reagents used were of analytical grade, purchased from reputable chemical company in Zaria and Kaduna.

3.1.2 Anthropometric measurement materials

Well calibrated non stretchable tape, UNICEF SECA scale, MUAC tape, infant weighing scale were gotten from the Primary Health Care facility of Yakassai, in Maigana ward, Soba Local Government Area of Kaduna State.

3.2 Methods

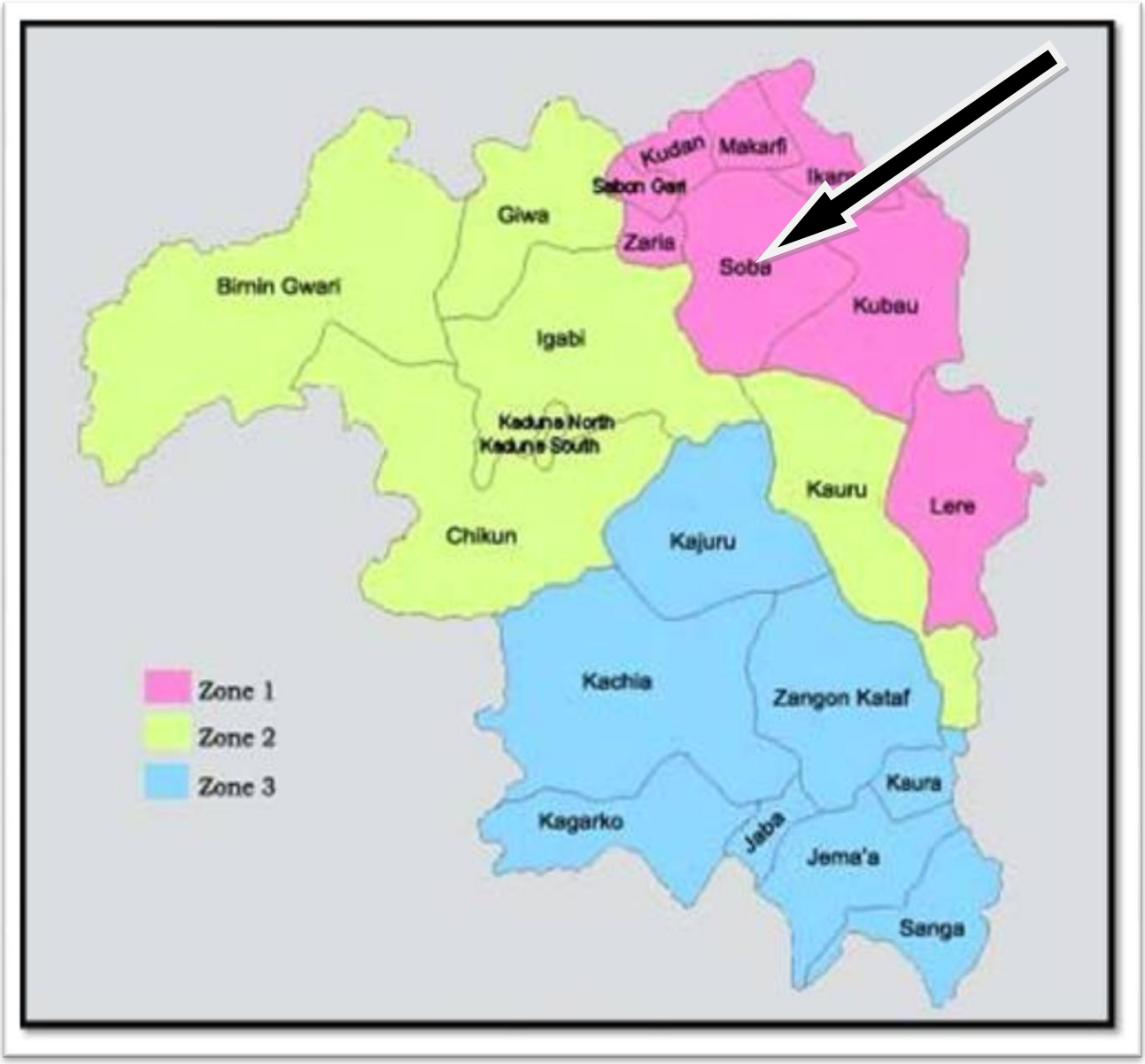
3.2.1 Study area

The study was conducted at Maigana ward, Soba Local Government Area of Kaduna State. The Local Government covers approximately 2955sq km and lies between latitude $90^0$and 110^0 North and longitude 70.3^0North-East. Soba L.G.A is bounded by Makarfi Local Government to the North, Sabon Gari and Zaria Local Governments to the North-West, Igabi LGA to the South-West, Kauru LGA to the South and Ikara LGA to the North-East respectively. The populations are predominantly Hausas and Fulanis, who are the indigenous people. According to the State and Local Government projection 2015, Soba LGA has a total population of 386,117people. Maigana consist of twenty threewards and has eight primary health facilities which are situated at Yakasai,

Tudunsaibu, Maitari, Gora, Buda, Ungwar, Rimi, Tofa,Kwadaro, and Maigana (ZEMDA, 2006)

Plate1 : Map of Kaduna State showing the Soba Local Government Area

Source: http://www.ncocusa.com/constituencies kaduna.html.



3.2.2 Study design

The study design was a longitudinal. The randomly selected pregnant women in their third trimester in Maigana ward of Soba LGA of Kaduna state were followed up regularly at home and during antenatal care days at their various health facilities until delivery. During the study the following were determined: socio-economic information, nutritional status, dietary intake, micronutrient status, antenatal care attendance score and also baby's birth weight at delivery.

3.2.3 Study population

The population comprised primarily pregnant women (in third trimester) residing in Maigana ward, Soba Local Government Area, Kaduna State. Exclusion criteria includedvisiting pregnant women, women who were sick requiring hospitalization and women that had birth outcome of multiple gestation and still birth.

3.2.4 Sample size

The sample size was determined using the formula:

$n = t^2 \times p\ (1-p) / d^2$ and n was adjusted for sampling defect (1.5) and non-response (5%)

Where:

n = required sample size

t =Standard normal distribution at 95% Confidence limit (standard value of 1.96)

p = prevalence rate for low birth weight (36.1) in Kaduna State (NDSH, 2013)

d = absolute desired precision 5% (standard value of 0.05).

$n = t^2 x p\ (1-P)/d^2$

$n=1.96^2 x 0.361\ (1-0.361)/0.05^2$

n=354 n was adjusted for sampling defect (1.5) and non-response (5%)

n= 354x1.5

531

3.2.5 Sampling procedure

The selection of the Local Government was done by classifying the 23 Local Governments in Kaduna state into three sectoral groups of Urban, Peri Urban and Rural. Soba was randomly selected using random number generator from the Peri Urban group. Maigana ward was selected by balloting, out of the entire 11 wards of the Local Government. Maigana ward has 23 communities. The Communities were cluster into eight (8) with each consisting of three communities excluding one. Pregnant women (third trimester), were randomly selected after household listing exercise from each of the grouped communities.

3.2.6 Ethical considerations

Prior to commencement, ethical approval was obtained from Soba Local Government Council Secretarial through the Director of Primary Health Care Services, and Ahmadu Bello University Ethical Committee.After the first familiarization visit to the District Head, the field work commence by household listing in the communities of the ward.

3.2.7 Field data collection

Data were collected from subjects attending antenatal care at the (HF) Health Facility, and those that did not attend, in Maigana ward Soba Local Government Area Kaduna. During the study the following were determined: socio-economic/ socio-demographic information, nutritional status, dietary intake, micronutrient status, antenatal care

attendance score and also baby's birth weight at delivery. A period of 16 weeks (November 2016 to March 2017) was used in conducting the research.

A pre-tested questionnaire (appendix I) consisting of four sections was administered;

Socio-economic data

Anthropometric measurements

Food frequency questionnaire

ANC attendance and compliance Score

3.2.8 Anthropometric measurements

Height was measured to the nearest 0.1 centimeters (cm) in bare feet with subject standing upright against a flat surfacehead and buttocks to the wall using a non stretchable tape. All heights were recorded in the questionnaire sheet (UNICEF, 2009).

Weight was measured to the nearest 0.1 kilogramme (kg) with participants lightly dressed using a UNICEF SECA scale (UNICEF, 2009).

TheMid Upper Arm Circumference (MUAC) was measured.The measurement was taken by using flexible but not stretchable measuring tape MUAC. Measured at the mid-point of the upper arm between the shoulder and elbow (inferior to the tip of the Olecranon) the measurement was taken to estimate and was recorded to the nearest 0.1cm(UNICEF 2009).

3.2.9 Dietarypattern

These was assessed with the use of food frequency questionnaire (appendix i), where respondents reported their usual frequency of consumption of each food from a list of foods for a specific period. Information was collected on frequency but little detailswere collected on other characteristics of the foods as eaten, such as the methods of cooking.

3.2.10 The Antenatal care (ANC) score and compliance

The ANC score was calculated using the formula

$$\text{ANC Score} = \frac{\text{Total Antenatal care attendance}}{\text{Expected Antenatal attendance}} \times 100$$

Where

Total ANC attendance of a subject during the gestation period

The expected ANC attendance is the total score a subject is supposed to have for the whole gestational period

3.2.11 Collection of blood sample

Blood was collected using Venopuncture with the aid of a sterile syringe by a skilled laboratory technician. About 4ml of blood was collected from peripheral vein; the blood was placed in a sample bottle containing no anticoagulant and allowed for about 30-60 minutes for spontaneous blood clotting. Serum wasseparated from the cells by centrifuging at 3000g for about 10 minutes at room temperature; this wasused for the biochemical analyses of Zinc, Vitamin A and Iron.

3.2.12 Determination of micronutrient status

3.2.12.1 *Determination of vitamin A*

Vitamin A (retinol) was determined using Shimadzu UV-VIS 2550 Spectrophotometer

Principle

Serum retinol was separated from other substances, which absorb radiant energy at equal or similar wavelengths to retinol, using hexane. Retinol was then detected using Spectrophotometric techniques.

Procedure

The sample was extracted with 50 ml of petroleum ether in triplicate. The ether extract was concentrated and evaporated to dryness. The residue was dissolved in 0.2 ml chloroform-acetic anhydride (1: 1). Two milliliters of trichloroacetic acid-chloroform (1: 1) was added and the absorbance read at 620 nm at 15 sec interval using Shimadzu UV-VIS 2550 Spectrophotometer.

3.2.12.2 Determination of serum iron and zinc by atomic absorption spectrophotometer (AAS)

Principle

The Sample aspirated into a flame; a beam was directed through the flame into a monochromatic detector that measures the amount of light by atomized element in the flame. A source lamp composed of the same element was used because each element has its own characteristic wavelength. Amount of energy at the characteristic wavelength absorbed in the flame was proportional to the concentration of the element in the sample over a limited concentrated

Preparation of samples

To measure the serum level for trace elements, serum samples were thawed and directly diluted. For Iron, serum samples were diluted 50 times in 0.1N nitric acid.

Procedure and analyses

2mlof serum Sample was added into a conical flask to which 10ml of concentrated nitric acid was added using a pipette. 5ml ofperchloric acid were added and the mixture heated on an electro thermal heater for about 20 minutes until a clear digest was obtained (Aslam*et al.*, 2005). The digest was allowed to cool at room temperature and then diluted to 50ml with distilled water and afterward filtered with 12cm whatman filter paper into a plastic vial for mineral analysis.

The calibration curve was prepared by running different concentrations of the elemental standard solutions. The AAS was then set to zero by running the respective reagent blanks, Zinc and Iron concentrations were determined at their respective wavelength. Average of the replicate values was taken for each mineral determined.

3.2.13 Statistical analysis

Socio-economic and anthropometric data were expressed as descriptive statistics (frequency and percentage). Biochemical data were expressed as mean ± SD; SPSS Version 20 was used to analysedata on Dietary pattern. P-values less than 0.05 were considered significant.

CHAPTER FOUR

4.0 RESULTS

4.1 Socio-economic Characteristics of Pregnant women from Maigana Ward Soba LGA

The socio-economic characteristics of pregnant women from Maigana ward are presented in Table 4.1. The age range with the highest percentage was age 21-25 (27.2%), and the least was age 36 and above (3.9%). Others were; 11-15 (9.7%), 16-20 (22.3%), 26-30 (22.3%), and 31-35 (13.6%). All the women were married; none was single, divorced, or widowed. Only 15.5%, 8.7%, and 7.8% had primary, secondary and post secondary education respectively. Also, 67.9% had no form of education. About 35.9% of the women are traders, 31.1% are housewives, and 18.4% are artisans. Only 6.8% and 7% were civil servants and farmers respectively. About 54% of the pregnant women earn less than #10,000 monthly, 27.2%earn #10,000 - 19,000 monthly, while only 1% of the women earn #60,000 and above monthly.

4.2 Nutritional Status of Pregnant Women from Maigana Ward Soba LGA

The nutritional status of pregnant women from MaiganaWard based on MUAC cut-off is shown in Table 4.2. The result reveals that 9.7%, 31.1% and 59.2% of the women were underweight, normal, and overweight respectively. Hence, more than half of the women were over weight

4.3 Anthropometric Measurementsof Pregnant Women from Maigana Ward Soba LGA

Maternal anthropometric measurements as shown in Table 4.3. reveals that maternal age ranges of 11-15, 16 -20, 21-25, 26-30, 31-35 and 36 above had mean± SD of 1.56±0.06, 1.54±0.06,1.57±0.06, 1.56±0.05, 1.58±0.07, 1.50±0.05 for height and 49.60±5.72, 54.96±6.81, 64.96±6.27, 67.21±6.70, 69.29±5.80,69.50±5.45for weight respectively

Table 4.1: Socio-economic Characteristics of Pregnant Women in Maigana Ward of Soba LGA, of Kaduna State

Characteristics	Frequency (n = 103)	Percentage
Age		
11-15	10	9.7
16-20	23	22.3
21-25	28	27.2
26-30	24	23.3
31-35	14	13.6
36 and above	4	3.9
Marital Status		
Married	103	100.0
Highest Western Education Attainment		
Primary	16	15.5
Secondary	9	8.7
Post- Secondary	8	7.8
No education	70	67.9
Occupation		
Civil Servant	7	6.8
Artisan/Skilled worker	19	18.4
Trader/Business	37	35.9
Farming	8	7.8
Housewife	32	31.1
Monthly Income	55	53.4
Less than 10,000	28	27.2
10000-19999	9	8.7
20000-40000	3	2.9
41000- 59,999	1	1.0
60,000 & above		
Don't Know	7	6.8

Table 4.2: Nutritional Status of Pregnant women in Maigana Ward, Soba LGA, Kaduna State

Nutritional Status*	Frequency (n = 103)	Percentage (%)	Mean ± SD
Underweight (MUAC<23.3cm)	**10**	**9.7**	**22.75 ± 0.30**
Normal (MUAC 23.3 – 25.0cm)	**32**	**31.1**	**24.20 ± 0.64**
Overweight (MUAC > 25cm)	**61**	**59.2**	**27.10 ± 1.32**

Values are mean ± SD

*MUAC cut-off for Nutritional status of pregnant women as defined by Gritlyand Bahafizala, (2014)

Table 4.3: Anthropometric Measurementsof Pregnant Women from Maigana Ward Soba LGA

Age (Years)	Frequency	Maternal height (m) Mean ± SD	Maternal weight (kg) Mean ± SD
11-15	10	1.56±0.06	49.60±5.72
16-20	23	1.54±0.06	54.96±6.81
21-25	28	1.57±0.06	64.96±6.27
26-30	24	1.56±0.05	67.21±6.70
31-35	14	1.58±0.07	69.29±5.80
36 and above	4	1.50±0.05	69.50±5.45

4.4:The Dietary Pattern of Pregnant Women in Maigana Ward Soba LGA of Kaduna State.

The average dietary intake of pregnant women in Maigana Ward, presented in T able 4.4 reveals that cereals, vegetable soup/ sauces were consumed more at percentage and rate of 22.1 and 21.0% twice daily,21.1 and 19.0% once daily,. Meat fish/poultry, fruit and other plant were consumed less by the pregnant women at the percentage and rate of 0.0 and 1.0% twice daily, 3.0 and 4.9% once daily. Tuber and roots were consumed at the percentage and rate of 12.4,twice daily, 21.0% once daily. Pastas and bread were consumed at the percentage and rate of 1.0% twice daily, 7.8% once daily, Average Dairy product consumption was 2.0% twice daily, 4.9% once daily, while Legumes were consumed in the percentage and rate of 87.8%twice daily, 17.5% once daily respectively.

Table 4.4: Dietary Pattern of Pregnant Women in Maigana Ward Soba LGA of Kaduna State

Frequency (n = 103) Food Groups	Never or less than once a month	1-3 times per month	once a week	2-4timesa week	5-6 times per week	once a day	2-3 times/day
Cereals	3.8	10.6	10.6	14.4	17.3	21.1	22.1
Tuber and roots	1.0	3.8	21.9	32.4	7.6	21.0	12.4
Diary product	25.5	25.5	20.6	12.7	8.8	4.9	2.0
Meat,fishand poultry	23.5	29.4	22.5	11.8	9.8	3.0	0.0
Legumes	1.0	19.4	22.3	19.4	12.6	17.5	7.8
Bread/pastas	21.4	23.3	8.4	18.4	9.7	7.8	1.0
Vegetable, soup/ sauces	4.8	11.4	18.1	13.3	12.4	19.0	21.0
Fruits and other plants	26.5	25.5	19.6	12.7	9.8	4.9	1.0

4.5 Antenatal Care Attendance and Compliance Score of Pregnant Women from Maigana Ward Soba LGA

The antenatal care attendance among pregnant women from Maigana Ward in Soba LGA is shown in Table 4.5. The result reveals that about 5% never attended antenatal care, while 9%, 24%, 39%, 17%, and 7% of the women had attended antenatal care once, twice, thrice, four times, and five times respectively.

The antenatal care compliance scores were 76.7% scored below the compliance score, 16.5% had minimal compliance score and 7% had the desired Compliance.

4.6: Parity of Pregnant Women in Maigana Ward Soba LGA of Kaduna State

The parity of pregnant women from Maigana Ward in Soba LGA is displayed in Table 4.6. The result shows that 18% of the women have not been pregnant before, while 82% hadnumbers of pregnancy ranging from 1 to 9. Hence, about 13%, 18%, 13%, 13%, 11%, 10%, 5% and 2% of the women have one, two, three, four, five, six, seven and nine pregnancy records respectively

Table 4.5: Antenatal Care Attendance and Compliance Status of Pregnant Women in Maigana Ward, Soba LGA, of Kaduna State

Characteristics of attendance and compliance	Frequency (n=103)	Percentage (%)
Number of Attendance		
0	5	4.9
1	9	8.7
2	25	24.3
3	40	38.8
4	17	16.5
5	7	6.8
Compliance scores		
Below compliance (less than 4 visits)	79	76.7
Minimal compliance (4 visits)	17	16.5
Desired compliance	7	6.8

Table 4.6: Parity of Pregnant Women in Maigana Ward, Soba LGA of Kaduna State.

Parity (number of Pregnancy)	Frequency (n = 103)	Percentage%
0	18	17.5
1	13	12.6
2	18	17.5
3	13	12.6
4	13	12.6
5	11	10.7
6	10	9.7
7	5	4.9
9	2	1.9

4.7: Micronutrient Status of Pregnant Women in Maigana Ward, Soba LGA of Kaduna State.

The micronutrient status of pregnant women in the study area at third trimester as shown in Table 4.7, indicate that 28%, 3% of the pregnant women had Iron and Zinc level within normal range 5-35µmol/L and7.7- 11.8 µmol/L respectively, while none of the women had Vitamin A level of 0.79-1.71umol/l. The mean levels of Iron, Zinc and Vitamin A were 4.02± 1.471, 2.52 ±0.31 and 0.45± 0.14µmol/L respectively.

4.8 The Incidence and Contributing factors of Low Birth Weight in Maigana ward Soba LGA.

The birth weights of neonates in Maigana Ward of Soba LGA are summarized in Figure 4.1. The result indicates that 83.5% of the neonates had birth weight more than or equal to 2.5kg, while nearly17% had birth weight less than 2.5kg.

Table 4.7: Micronutrient Status of Pregnant Women in the study Area at third Trimester

Micronutrients*	Mean ±SD	% Distribution of Pregnant Women by Micronutrient Statusn = 103		
		Below Normal	Normal	Above Normal
		%	%	%
Iron (Fe) µmol/L	4.02± 1.471	73.1	26.9	0.0
Zinc (Zn)µmol/L	2.52 ±0.31	96.2	2.9	0.0
Vitamin Aµmol/L	0.45± 0.14	100.0	0	0.0

*Cut off value of 5 – 35, 7.7 – 11.8 and 0.79 – 1.71 µmol/L for Iron, Zinc and vitamin A respectively was used according to Abbassi-Ghanavati et al., (2009).

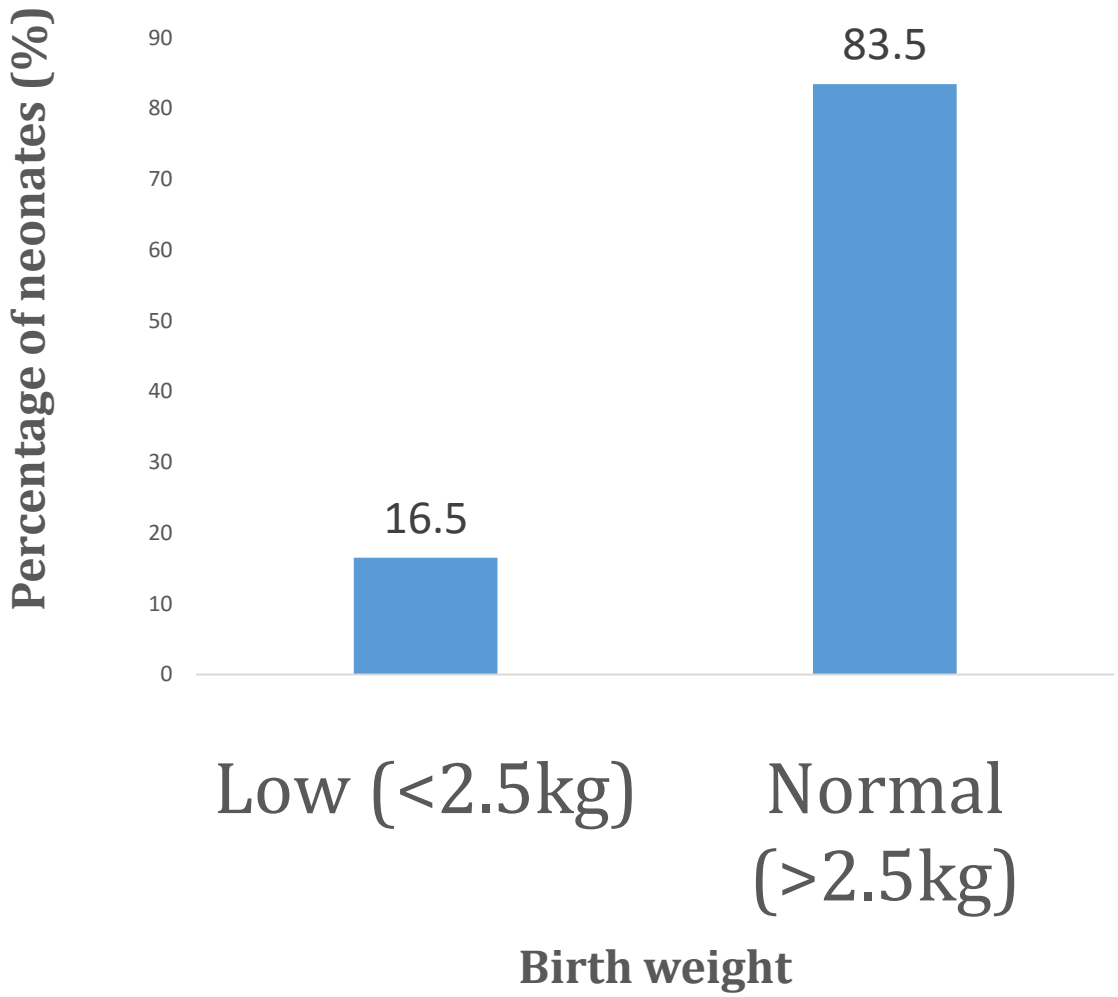


Figure 4. 2: Incidence of Low Birth weight among Neonates in Maigana wards, Soba LGA of Kaduna State

4.8.1 Effect of Socio-Economic Factors on Birth Weight of Neonates in MaiganaWard of Soba LGA of Kaduna State.

The effects of socio-economic factors on birth weight of neonates in Maiganaare shown in Table 4.8: reveal that for the age 11-15 had 9(90%) were underweight and 1(10%) were normal weight neonates, 16-20 had 8(10.5%) underweight and 15 (89.5%) normal weight neonates. 20-30, 30-35 and 36 above years had 0(0%) underweight while 52(100%), 5(100%) and 3(100%) for normal weight neonates respectively.

Highest educational attainmentreveals that 21.4% of the pregnant women with no formal education, had 93.8% underweight neonates, 6.2%of the women with primary school,had 888.9% underweight neonates.11.1%of the women with secondary school, and hadpost secondary school, for normal weight of neonate respectively.

The effect of occupation on the birth weight of neonates indicates that house wife had the highest number of under weighed neonate 11(34.4%) and 21(65.6%) for neonate with normal weight, civil servant had 0(0.00%) of underweight neonate, 7(100%) had normal weight,Artisan/skilled workers had 2(10%) of underweight neonate, 17(90%) had normal weight. Farmers, trader/business men had 2(25%) and 2(5.4%) of underweight neonate,while 6(75%)and 35(94.6%) had normal weight of neonates respectively.

The effect of monthly income on birth weight of neonate revealed that 12(21.8%)of the women that earn less than #10000 a month had underweight neonates, and 13(78.2%) of normal weight neonate. #10000-#19000 had 1(3.6%) underweight and 27(96.4%) normal weight neonates.20000-60000 and above had 0 (0.00%) of underweight and 13(100%) normal weight neonates. Women that don’t know the amount they earn in a month had 4(52.5%) and 3(73.2%) for underweight and normal weight neonates.

Table 4.8: Effect of socio Economic factors on Birth Weight of Neonates in Maigana Ward, Soba LGA of Kaduna State

	Underweight (< 2.5kg)	Normal (> or = 2.5kg)	Chi-square	P-value
Age (Years)			58.609	0.000*
11-15	9 (90.0%)	1 (10.0%)		
16-20	8 (10.5%)	15 (89.5%)		
21-25	0 (0.0%)	28 (100.0%)		
26-30	0 (0.0%)	24 (100.0%)		
31-35	0 (0.0%)	14 (100.0%)		
36 and above	0 (0.0%)	4 (100.0%)		
Education			4.224	0.238
Primary	1 (6.2%)	15 (93.8%)		
Secondary	1 (11.1%)	8 (88.9%)		
Post- Secondary	0 (0.0%)	8 (100.0%)		
No education	15 (21.4%)	55 (78.6%)		
Occupation			13.019	0.011*
Civil Servant	0 (0.0%)	7 (100.0%)		
Artisan/Skilled worker	2 (10.5%)	17 (89.5%)		
Trader/Business	2 (5.4%)	35 (94.6%)		
Farming	2 (25.0 %)	6 (75.0%)		
Housewife	11 (34.4 %)	21 (65.6%)		
Monthly Income			15.484	0.008*
Less than 10,000	12 (21.8%)	43 (78.2%)		
10000-19999	1 (3.6%)	27 (96.4%)		
20000-40000	0 (0.0%)	9 (100.0%)		
41000- 59,999	0 (0.0%)	3 (100.0%)		
60,000 & above	0 (0.0%)	1 (100.0%)		
Don't Know	4 (57.15)	3 (42.9%)		

4.8.2 Effect of Micronutrients and Antenatal Care Compliance Score on Birth Weight of Neonates among Pregnant Women in Maigana Ward Soba LGA.

The effect of micronutrients on birth weight of neonates among pregnant women in Maigana ward, Soba LGA is shown in Table 4.9. Pregnant women with normal level of iron 27(100.0%) had normal weight of neonates. Eighty five(83.3%) of those with low of serum iron level had normal weight of neonates while 7(22.7%) had underweight neonate. Six (100.0%) pregnant women that were within the normal range of serum zinc level had normal weight of neonates, 83(83.3%) of those with low of serum zinc level had normal weight of neonates while 17(17.7%) had underweight neonate, 86(83.5%) of those pregnant women with low of serum Vitamin A level had normal weight of neonates while 17(16.5%) had underweight neonate.

The effect and Antenatal Care Compliance Score on Birth Weight of Neonates among Pregnant Women in Maigana ward Soba LGA, as shown in Table 4.8 reveals that pregnant women which were below compliance had 16 (20.0%) underweight and 83(86%) normal weight neonates. Those with minimal compliance had 1(5.8%) underweight and 16(94%) normal weight neonates. While the woman with desired compliance had 7(100%) normal weight neonate.

4.8.3 Effect of Maternal Nutritional Status on Birth Weight of Neonates in Maigana Ward, Soba LGA of Kaduna State.

The effect of maternal nutritional status on birth weight of neonates in Maigana ward, Soba LGA of Kaduna State is shown in Table 4.10. The results reveal that pregnant women with MUAC below the normal range had 8(80%) underweight neonates and

2(20%) normal weight neonates, women that had MUAC within normal range had 8(25%) underweight neonates and 24(75%) normal weight neonates, while the pregnant women with MUAC above normal range had 17(1.6%) underweight neonates and 86(83.5%) normal weight neonates**.**

Table 4.9: Effect of Micronutrient and Antenatal Compliance Status on Birth Weight of Neonates in Maigana Ward, Soba LGA of Kaduna State

	Underweight (< 2.5kg)	Normal (> or = 2.5kg)	Chi-square	P-value
Iron (Fe)			7.344	0.007*
Normal	0 (0.0%)	27 (100.0%)		
Low	17 (22.7%)	58 (77.3%)		
High	-	-		
Total	17 (16.7%)	85 (83.3%)		
Zinc (Zn)			0.611	0.434
Normal	0 (0.0)	6 (100.0%)		
Low	17(17.0%	83 (83.0%)		
High	-	-		
Total				
Vitamin A			-	-
Normal	-	-		
Low	17(16.5%)	86 (83.5%)		
High	-	-		
Total	17(16.5%)	86 (83.5%)		
ANC score			5.581	0.024*
Below compliance (Less than 100%)	16(20.0%)	63(80.0%)		
Minimal Compliance (100%)	1 (5.8%)	16 (94.0%)		
Desired Compliance (above 100%)	0(0.0%)	7 (100.0%)		

Table 4.10: Effect of Maternal Nutritional Status on Birth Weight of Neonates in Maigana Ward, Soba LGA of Kaduna State.

MUAC	Underweight (< 2.5kg)	Normal (> or = 2.5kg)	Chi-square	P-value
Underweight (<23.3)	8 (80%)	2 (20%)	40.713	0.000**
Normal (23.3-25)	8 (25.0%)	24 (75%)		
Overweight (>25)	1 (1.6%)	60 (98.4%)		
Total	17 (16.5%)	86 (83.5%)		

CHAPTER FIVE

5.0 DISCUSSION

Adverse pregnancy outcomes are influenced by a myriad of biological, social and environmental factors (Sandra, 2015).About 90% of the women with in the age group range 11-15 had Low Birth Weight neonates, this could be indicative that young mothers are at risk of LBW. Studies have found that socioeconomic status and income inequality are correlated with birth outcomes. A variety of other social factors have been linked to poor birth outcomes, including maternal education, marital status, pregnancy prevention and teenage pregnancy (Lynch*et al*., 2001, Cohen, 2014). Short stature is also associated with poor socioeconomic conditions and inadequate nutrition during childhood and adolescence. In women, short stature is a risk factor for poor birth outcomes and obstetriccomplications. For example, short stature is associated with small pelvic size, which increases the risk of difficulty during delivery and also risk of bearing low birth weight babies. Women with height below 145 cm are considered to be at higher risk (NDHS, 2013).

Occupation indicates that 34.4% house wives, followed by 25% of farmers, 10.0% artisans and 5.4% traders recorded LBW. This could be because the women lack financial capacity to purchase what they need to eat, and only depend on what is available for them to eat. The monthly income, could be related to the effect of economic status on the ability to afford food and medication to enhance the pregnancy outcome. And also most of them had no formal education to get a white collar job to earn a better income and consume a better food.

It also reveals that 21.4% of women with no education had LBW compared with 0% for women with post-secondary school education.Kader and Perera, (2014) reported that maternal education, are significant predictors of LBW. Agreeing with previous studies, birth weight of the baby is greatly influenced by mother's level of education and having some kind of maternal education (oppose to no education) have a protective effect against LBW. (Som*et al*., 2004).It is likely that women with no or low level of education and/or knowledge may practice poor health habits (e.g., smoking, drug or substance uses, etc.). Additionally they may be very poor and lacks access to adequate healthcare services (for instance, antenatal care, iron supplements, etc.) which consequently may poorlyinfluenced fetal growth. Low socio-economic status is one of the strongest predictors of LBW in low-income countries (Kader and Perera, 2014). In these study the following socioeconomic factors (maternal age, occupation, and monthly income), contributed significantly to birth outcome in the study area.Therefore,continuous nutrition education will go a long way in ensuring adequate nutrient intake among pregnant women. (Sholeye*et al.*, 2014)

Good maternal nutrition is important for the health and reproductive performance of women and the health, survival, and development of their children (Mora and Nestel, 2000).Poor nutritional status in pregnancy is common in developing countries for a variety of reasons, including poverty, food insecurity, sub-optimal healthcare and frequent infections(WHO, 1994).Poor nutritional status could results toLow birthweight,due to restricted foetal growth whichaffects the person throughout life and is associatedwith poor growth in childhood and a higherincidence of adult diseases, such as

type 2diabetes, hypertension and cardiovascular disease.An additional risk for girls is having smaller babieswhen they become mothers (WHO,2015).

The nutritional status of the study area revealed that 9.7% of the pregnant women were considered underweight (MUAC<23.3cm), 31.1% are normal (MUAC 23.3 – 25.0cm) and 59.2% are Overweight (MUAC >25cm).The percentage of underweight women is considered low because Maigana community are predominantly farmers, so they have sufficient food, some of the undernourished could be as a result of infection or poor health care, (Lindsay*et al.,* 2012). And also due to poor knowledge of diversification of food, they consume On the average cereals, vegetable soup/sauces more, at the rates of 22% and 21% 2-3times a day; while Meat, fish and poultry, fruits and other plants are consumed less at the rates of 3% and 5% once a day.

Antenatal care (ANC) is a key strategy to decreasing maternal mortality in low-resource settings. ANC clinics provide resources to improve nutrition and health knowledge and promote preventive health practices. (Perumal*etal.,* 2013).This study found a strong association between lack of antenatal care and low birth weight and the results are in agreement with previous studies.(Coria-Soto*et al.*, 1996, Khatun and Rahman, 2008), Antenatal care provide routine monitoring of height and weight gain, identification of medical maternal or fetal problems, counseling against tobacco or substance use, provide psychosocial support, nutritional advice, and early intervention which may reduction adverse pregnancy outcomes including LBW (WHO, 1994).Lack of access to ANC could be influenced by many factors including lower socio-economic status and poor knowledge. Delaying early marriage, provision of free maternal health services and frequent antenatal care were considered key preventive measures. Most of the women

earn less, as such have little or no money for ANC and so preferred home delivery where not much is needed. These result to 7 and 27% for desired or minimal compliance respectively.

From this study73%, 96.2% and 100% of the pregnant women had serum level of Iron, Zinc and Vitamin A below normal range. The serum micronutrient level for the women were considered low, 100% of the women that had their serumiron level below normal had LBW babies. Iron plays an important role in foetal development and a low iron status in pregnancy increases the risk of preterm delivery and LBW (Scholl and Johnson, 2000). The iron deficiency could be due to maternal iron requirements are higher than average absorbable iron intakes. If a woman's diet does not contain enough iron to meet these needs, the body can meet fetal requirements only by drawing upon maternal iron stores(Okwu andUkoha, 2008).

In addition, thepregnant women, frequently consume cereals more,it could because the intestinal absorption of any consumed dietary iron is likely to be reduced as a result of the highintake of phytates from grains, such as millet and sorghum (VanderJagt*et al.,* 2007).It's alsorecognised,that anaemia among pregnant women may have multiplecauses, which includes iron, folate and B12 deficiencies, parasiticinfections (malaria and hookworms), HIV/AIDS andhaemoglobinopathies (van den Broek, 1996).

Deficienciesof copper, zinc and vitamin A may also be contributingfactors because these micronutrients are involved in erythropoesisand iron metabolism (Bloem*et al.,* 1990).Vitamin A deficiency is recognized as a serious public health problem in Nigeria, and pregnant women appear to be particularly susceptible (Williams *et al.,* 2011). From the result of these study 100% of the women had serum Vitamin A level below the

recommended range which is similar to that of Ojofeitimi*et al.*, (2008) reported that 100% of Nigerian Women in their study, both pregnant and non pregnant failed to meet the recommended dietary intake of Vitamin A

This study establishes that socioeconomic status (maternal age, occupation, and monthly income), nutritional status and antenatal compliance score of the pregnant women are determinant of their birth outcome.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Socioeconomic characteristic of the Pregnant Women in Maigana Ward of Soba LGA, of Kaduna State reveals that about 10% of the pregnant women are between age 11-15years old, while about 73% are between age 16-30years old, 68% of them had no formal education and about half of them (53%) are classified poor because they earn less than ₦350 per day. The nutritional status of the study area revealed that 9.7% of the pregnant women are underweight (MUAC<23.3cm), 31.1% are normal (MUAC 23.3 – 25.0cm) and 59.2% are Overweight (MUAC >25cm).On the average cereals, vegetable soup/sauces more, at the rates of 22% and 21% 2-3times a day; while Meat, fish and poultry, fruits and other plants are consumed less at the rates of 3% and 5% once a day.The antenatal care attendance and compliance status indicates 76.7% were below compliance, 16.5% had minimal compliance and 6.8% has desired compliance.The mean micronutrient serum concentration (µmol.) of the pregnant women are respectively 4.02, 2.52 and 0.45 for iron(Fe),zinc(Zn) and vitamin A, leaving 73.1%, 96.2% and all (100%) of the pregnant women deficient of the micronutrients. As a result of the findings theMaternal nutritional status, socio-economic characteristics, antenatal care compliance score of the pregnant women in Maigana ward, Soba LGA are major determinant of their birth outcome.

6.2 Recommendations

In view of the findings, it is recommended that

i. Promotion of dietary diversity and antenatal care attendance among pregnant women in the LGA by the local health authority, Non GovernmentalOrganisations (NGO) will go a long way to improve maternal healthand birth outcome.

ii. Adolescelentgirl's supplementation with Micronutrients (Vitamin A, Iron and Zinc). Early supplementation will reduce the risk of maternal micronutrient deficiency during pregnancy, which is a risk factor for adverse pregnancy out come.

iii. Strengthening of the Universal Basic Education (UBE) programme to encourage and help girl child education and hence maternal education in the communities

REFERENCES

Adam T, Lim SS, Mehta S, Bhutta ZA, Fogstad H, Mathai M, Zupan J, Darmstadt GL: (2005); Achieving the millennium development goals for health - Cost effectiveness analysis of strategies for. maternal and neonatal health in developing countries. *British Medical Journal.,331:1107 1110.10.1136/bmj.331.7525.1107.*

Adekanle D.(2008). Late Antenatal Care Booking And Its Predictors Among Pregnant Women In South Western Nigeria. *Online journal of health and allied sciences.;7(1).*

Adetunji, J.A. (1995) 'Infant mortality and mothers' education in Nigeria', *Soc. Sci. Med*.

Akesode, F.A., O.F Njokanma and A.O Sule-Odu (1994) 'Perinatal mortality at the Ogun state b University Teaching Hospital, Sagamu, Nigeria', *Journal of Tropical Paediatrics40(2):78-81*.

Alexander, G.R and C.C Korenbrot (1995) 'The role of prenatal care in preventing low birth weight', *The Future of Children* 5(1):103-120. www.justor.org/stable/1602510

Ambetsa, M.W.(2012). The influence of prenatal care on pregnancy outcome in a rural area in Kitui district [cited 2013 May 14]. Availabl from: http://irlibrary.ku.ac.ke/ir/handle/123456789/4194

Amosu A. (2011); Retrospective study of some factors influencing delivery of low birth weight babies in Ibadan, Oyo state, Nigeria. Scientific Research [cited 2013 May 12];6(2):236–40.Availablefrom: http://www.academicjournals.org/SRE/PDF/pdf2011/18Jan/Amosu et al.pdf

Andrews, K.M.; Brouillette, D.B; andBrouillette, R.T. (2008). "Mortality, Infant". Encyclopedia of Infant and Early Childhood Development. pp. 343–359. *doi*:*10.1016/B978-012370877-9.00084-0.*

Aslam, M., F. Anwar, R. Nadeem, U. Rashid, T.G. Kazi and M. Nadeem (2005): Mineral composition of *moringaoleifera* leaves and pods from different regions of Punjab, Pakistan. *Asian Journal of Plant Sciences,* 4: 417-421.

Awusi VO. (2009): Factors affecting utilization of ANC Emevor Village, Delta state.Benin journal of postgraduate medicine;11Supplem.

Barker, D.J.P.(1992), *Fetal and infant origins of disease*, BMJ Books, London.

Blanc AK, andWardlaw T. (2005): Monitoring low birth weight: An evaluation of international estimates and updated estimation procedure. World Health Organisation;83:178-85. Back to cited text no. 26

Bloem, M.W., Wedel, M., van Agtmaal, E.J., Speek, A.J., Soawakontha, S. andSchreurs, W.H.P. (1990) Vitamin A intervention: short term effects of a single oral massive dose on iron metabolism. Am. J. Clin. Nutr. 51, 76–79.

Blooms, S T. L and Wupis I .D (1999). Does antenatal care make a difference to safe delivery? A study in utter Pradesh, India; *health Policy and planning* 14; 38-48.

Blount, D. (2005). Growing a Baby: Diet and Nutrition in Pregnancy.*The Birthkit*, Issue 46.

Butz, A.M., and A.W. Funkhouser, L. Caleb and B.J. Rosenstein (1993) 'Infant health careutilization predicted by pattern of prenatal care', *Paediatrics,* 92(1):50-4

Carey, T.S.K and Hamer, C. (1991). Prepaid versus traditional Medicaid *Plans*: lack of effect pregnancy and prenatal care; *Health serve es*.26:165-81

Ceesay, S.M, A.M. Prentice and T.J Cole (1997) 'Effects of birth weight and perinatal mortality of maternal dietary supplements in rural Gambia: 5-year randomized controlled trial', *British Medical Journal* 315(7111):786-90.

Civil Society Legistilative Advocacy Centre (CSLAC) (2011): Policy brief on MDG'S 4 and 5: on reduction of fewer than five and maternal mortality rate. *Civil society legislative advocacy centre*, 1:4-5.

Claire C. Murphy ,BeritS.i, Terri L. Myhr, and Janice D. Mont (2001); Abuse: A risk factor for low birth weight? A systematic review and meta-analysis *CMAJ May 29,vol. 164 no. 11*

Cleveland LM, Minter ML, and Cobb KA, (2008). Lead hazards for pregnant women and children: part 1: immigrants and the poor shoulder most of the burden of lead exposure in this country. Part 1 of a two-part article details how exposure happens, whom it affects, and the harm it can do. Am J Nurs. Oct;108(10):40-9

Cohen, W. R. (2014). Does maternal age affect pregnancy outcome?.*BJOG: An International Journal of Obstetrics &Gynaecology*, *121*(3), 252-254.

Coria-Soto, I. L., Bobadilla, J. L., and Notzon, F. (1996).The effectiveness of antenatal care in preventing intrauterine growth retardation and low birth weight due to preterm delivery.

Deierlein AL, Siega-Riz AM, andEvenson KR.(2012). Physical activity during pregnancy and risk of hyperglycemia. J WomensHealth.21(7):769-775.

Ebimoyi E, Adetoro OO, and Wickremasinghe AR.(1991); Birth weight and sociobiological factors in Ilorin, Nigeria. J BiosocSci ;23:417-23. Back to cited text no. 16

FAO/WHO.(2004) Vitamin and Mineral Supplements in Human Nutrition.Report of a Joint FAO/WHO Expert Consultation.FAO/WHO Non-series Publication. Rome: Food and Agriculture Organisation.

Gautam CS, Saha L, Sekhri K, and Saha PK(2008); Iron deficiency in pregnancy and the rationality of iron supplements prescribed during pregnancy. Medscape J Med.;10(12):283-288. http://www.ncbi. nlm.nih.gov/pmc/articles/PMC264404/.Accessed October 3, 2012.

Gochfeld M, and Burger J (2005). "Good fish/bad fish: a composite benefit-risk by dose curve". Neurotoxicology.**26** (4): 511–20. *doi*:*10.1016/j.neuro.2004.12.010*.

Gresham, E.,Bisquera, A., Byles, J. E. and Hure, A. J. (2014).Effects of dietary interventions on pregnancy outcomes: a systematic review and meta-analysis. *Maternal Child Nutrition PubMed* PMID: 25048387.

Gritly M. O.,and N A. Bahafizalla(2013). Assessment of Nutritional Status using Anthropometric Measurements in Relation to Pregnancy Outcome among Southern Sudanese Pregnant Mothers in Juba City.*International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2013): 6.14 | Impact Factor (2014): 5.611*

Hollis BW, Johnson D, Hulsey TC, Ebeling M,and Wagner CL., (2011). Vitamin D supplementation during pregnancy: Doubleblind, randomized clinical trial of safety and effectiveness. J Bone Miner Res.;26(10):2341-2357.

Institute of Medicine (IOM) (2005).Dietary reference intakes for water, potassium, sodium,chloride,andsulfate.http://www.nap.edu/openbook.php?record_id¼10925 &page¼ 151. Accessed October 21,2012.

Johnson JA, and Tough S, (2012).Delayed child-bearing.*J ObstetGynaecolCan* ;34:80–93. Cross refPub MedGoogle Scholar

Kader, M.,and Perera, N. K. P. (2014). Socio-economic and nutritional determinants of low birth weight in India.*North American journal of medical sciences*, *6*(7), 302.

Kathleen, Abu-Saad.,and Drora,.Fraser. (2010). Maternal nutrition and birth outcomes.*Epidemiologic reviews*, *32*(1), 5-25.

Kawada T (2004). "The effect of noise on the health of children". J Nippon Med Sch. **71** (1): 5–10. *doi*:*10.1272/jnms.71.5*.

Kazaura, M.R., Kidanto, and H.L. Massawe, SN. (2006).Levels, trends and risk for early neonatal mortality at Muhimbili National Hospital Tanzania 1999-2005. *East African Journal of Public Health. 2006;3:10–3.*

Keith R.(2005). The Lancet‟s neonatal survival series. [cited 2013 May 4];365(9474):1845. Available from: http://www.thelancet.com/journals/a/article/PIIS0140 6736(05)66608-1/fulltext

Khatun, S., andRahman, M. (2008). Socio-economic determinants of low birth weight in Bangladesh: a multivariate approach. *Bangladesh Medical Research Council Bulletin*, *34*(3), 81-86.

Knopik VS.(2009): Maternal smoking during pregnancy and child outcomes: real or spurious effect? Dev Neuropsychol.;34(1):1-36.

Kramer, M.S., (1987) 'Determinants of Low Birth Weight: Methodological assessment and meta-analysis', *Bulletinof the World Health Organization*, vol. 65, no. 5,

Kruger HS. (2005).Maternal anthropometry and pregnancy outcomes: a proposal for the monitoring of pregnancy weight gain in outpatient clinics in South Africa. Curationis [Internet].;28(4):40–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/16450558

Lewtas J.(2007): Air pollution combustion emissions: characterization of causative agents and mechanisms associated with cancer, reproductive, and cardiovascular effects. Mutat Res.Nov-Dec;636(1-3):95-133.

Lindsay, K. L., Gibney, E. R., and McAuliffe, F. M. (2012). Maternal nutrition among women from Sub-Saharan Africa, with a focus on Nigeria, and potential implications for pregnancy outcomes among immigrant populations in developed countries. *Journal of human nutrition and dietetics*, *25*(6), 534-546

Lynch, J., Smith, G. D., Hillemeier, M., Shaw, M., Raghunathan, T and. Kaplan, G. (2001). Income inequality, the psychosocial environment, and health: comparisons of wealthy nations. *The Lancet*, *358*(9277), 194-200.

Magadi, M. A., I. Diamond, N. Madise and P. Smith (2004) 'Pathways of the determinants of unfavourable birth outcomes in Kenya', *Journal of Biosocial Science* 36:153-76

Martin-Gronet MS. and Ozanne SE. (2006). Maternal nutrition during pregnancy and health of the off spring. Pub Med. 34 (pt5) : 779-84

Matsui T, Matsuno T, andAshimine K, (Sep 2003). "Association between the rates of low birth-weight and/or preterm infants and aircraft noise exposure".Nippon EiseigakuZasshi.**58** (3): 385–94. *doi*:*10.1265/jjh.58.385*.

McMillen IC, MacLaughlin SM, Muhlhausler BS, Gentili S, Duffield JL, andMorrison JL. (2008);Developmental origins of adult health and disease: The role of periconceptional and foetal nutrition. Basic ClinPharmacolToxicol.;102(2):82-89.

Mora, J.O. and Nestel, P.S., (2000).Improving prenatal nutrition in developing countries: strategies, prospects, and challenges.*The American journal of clinical nutrition*, *71*(5), pp.1353S-1363S.

Moss, W., Darmstadt, G. L., Marsh, D. R., Black, R. E., and Santosham, M. (2002). Research priorities for the reduction of perinatal and neonatal morbidity and mortality in developing country communities.*Journal of Perinatology*, *22*(6), 484.

Mridula D, Mishra CP, andChakraverty A,(2003). Dietary intake of expectant mother.Indain J Nutr Diet. 40:24-30

.

Nigeria Demographic and Health Survey (2013).Preliminary report.National Population Commission. Federal Republic of Nigeria, Abuja, Nigeria; Summary of status and trends; World Health Statistics 2014

Nigeria Demographic and Health Survey (2008).Preliminary report.National Population Commission. Federal Republic of Nigeria, Abuja, Nigeria; Summary of status and trends; World Health Statistics 2009

Ogunjuyigbe, P.O.,Ojofeitimi E.O., Sanusi, R..A., Orji, E.O., Akinlo, A., Liasu, S.A., andOwolabi O.O. (2008). Food aversion during pregnancy: a major cause of poor pregnancy outcome in Nigeria, *Journal of Chinese Clinical Medicine*,3(7)389–397.

Ojofeitimi, E.O., Elegbe, E. andBabafemi, J. (1982) Diet restrictionby pregnant women in Nigeria. Int. J. Gynaecol. Obstet.20, 99–104.

Okwu, G.N. andUkoha, A.I. (2008) Studies on the predispoising factors of iron deficiency anaemia among pregnant women in a Nigerian community. Pak. J. Nutr. 7, 151–156. Pan, Y.L., Dixon, Z., Himburg, S. & Huffman, F. (1999) Asian.

Ozumba A. and J. Okafor (2006) 'Low birth weight babies in eastern Nigeria' *Journal of Public Health*. http://devdata.worldbank.org/wdi2006/contents/Section2.htm

Perumal, N., Cole, D. C., Ouédraogo, H. Z., Sindi, K., Loechl, C., Low, J. and Oyunga, M. (2013). Health and nutrition knowledge, attitudes and practices of pregnant women attending and not-attending ANC clinics in Western Kenya: a cross-sectional analysis. *BMC pregnancy and childbirth*, *13*(1), 146.

Pojda, J and L. Kelly (2000) 'Low Birth Weight' ACC/SCN Nutrition Policy Paper. A report based on the International Low Birth Symposium and Workshop held on 14-17 June 1999 at The International Centre for Diarrhoeal Disease Research in Dhaka, Bangladesh.

Pope DP, Mishra V. and Thompson L. (2010); Risk of low birth weight and stillbirth associated with indoor air pollution from solid fuel use in developing countries. Epidemiol .Apr; 32(1):70-81

Procter, S. B. and Campbell, C. G. (2014). Position of the Academy of Nutrition and Dietetics: nutrition and lifestyle for a healthy pregnancy outcome. *Journal of the Academy of Nutrition and Dietetics*, *114*(7), 1099-1103.

Rajan, L. and Oakley, A.(1990). Low birth weight babies: the mother's point of view. *Midwifery*, *6*(2), 73-85.

Salmasi G, Grady R, and Jones J, (2010). Environmental tobacco smoke exposure and perinatal outcomes: a systematic review and meta-analyses. *ActaObstetGynecol Scand.;89 (4):423-41*.

Sandra, B.P. (2014). Nutrition and lifestyle for a healthy pregnancy outcome.*Practice Paper of the Academy of Nutrition and Dietetics: Academy of Nutrition and Dietetics*, retrieved from http://www. eatright.org/members/practicepapers

Scholl, T.O. and Johnson, W.G. (2000) Folic acid: influence on the outcome of pregnancy. Am. J. Clin. Nutr.71, 1304S–1307S.

Shapira N. (2008) Prenatal nutrition: A critical window of opportunity for mother and child. WomensHealth.4(6):639-656.

Sholeye, O. O., Badejo, C. A., andJeminusi, O. A. (2014). Dietary habits of pregnant women in Ogun-East Senatorial Zone, Ogun State, Nigeria: A comparative study. *International Journal of Nutrition and Metabolism*, *6*(4), 42-49.

Som, S., Pal, M., Adak, D. K., Gharami, A. K., Bharati, S.,and Bharati, P. (2004). Effect of socio-economic and biological variables on birth weight.

Stevens-Simon C., and Orleans M..(1999). "Low-birthweight prevention programs: the enigma of failure". Birth.**26** (3): 184–91. *doi*:*10.1046/j.1523-536x.1999.00184.x*.

Swanson C, Zimmermann M,and Skeaff S, (2012). Summary of an NIH workshop to identify research needs to improve the monitoring of iodine status in the United States and to inform the DRI. J Nutr.;142(6):1175S-1185S.

Theobald C.E. Mosha and Napendaeli Philemon N.(2010), Factors influencing pregnancy outcomes in Morogoro Municipality, Tanzania. Tanzania Journal of Health Research.;12(4):243–51.

Thorne-Lyman, A, and Fawzi W.W., (2012). Vitamin Dduring pregnancy and maternal, neonatal and infant health outcomes: A systematic review and meta-analysis. *PaediatrPerinatEpidemiol. ;26 (suppl 1):75-90.*

Townsend CL and Maynard RL (2002)."Effects on health of prolonged exposure to low concentrations of carbon monoxide".Occup Environ Med. **59** (10): 708–11. doi:10.1136/oem.59.10.708. PMC 1740215.PMID 12356933.

Tuntiseranee P., J. Olsen., V. Chongsuvivatwong and S. Limutara (1999) 'Socioeconomic and work related determinants of pregnancy outcome in southern Thailand' *Journal of Epidemiol Community Health 53:624-29*

UNFPA (2005). Reproductive Health and Gender indicators: Baseline Survey of UNFPA assisted states in Nigeria, 2004. Back to cited text no. 31

United Nations Children's Fund.(1990). *Malnutrition Conceptual framework* (image). Retrieved from https://www.google.com.ng/search?q=unicef+conceptual+framework+1990&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwi4vJyV2r3RAhXWIFAKHbB_AWUQsAQILg

UNICEF(2014). Global Databases: Based on Multiple Indicator Cluster Surveys (MICS), Demographic and Health Surveys (DHS) and other nationally representative surveys, 2009─2013

UNICEF, WHO (2004); Low birth weight: country, regional and global estimates. *New York: UNICEF*.

Van den Broek, N. (1996) The cytology of anaemia in pregnancy in West Africa. Trop. Doc. 26, 5–7.

van den Broek, N., Dou, L., Othman, M., Neilson, J.P., Gates, S. and Gulmezoglu, A.M. (2010) Vitamin A supplementation during pregnancy for maternal and newborn outcomes.

VanderJagt, D.J., Brock, H.S., Melah, G.S., El-Nafaty, A.U., Crossey, M.J. andGlew, R.H. (2007) Nutritional factors associated with anaemia among pregnant women in Northern Nigeria. J. Health Popul. Nutr. 25, 75–81.

Van Eijk AM, Bles HM, Odhiambo F, Ayisi JG, Blokland IE, Rosen DH, Adazu K, Slutsker L, Lindblade K.A.(2006). Use of antenatal services and delivery care among women in rural western Kenya: a community based survey. Reproductive Health., 3:Google Scholar

Vaughan DA, Cleary BJ and Murphy DJ (.2014): Delivery outcomes for nulliparous women at the extremes of maternal age a cohort study. BJOG 2014;121:260–7.

Villar, J., Bergsjo, P., and World Health Organization. (2002). WHO antenatal care randomized trial: manual for the implementation of the new model.

Voorhoeve, A.M., H. W'oigo and A.S. Muller (1984) 'The outcome of pregnancy' in J.K. Van Ginneken and .S Muller (eds) Maternal and child health in rural Kenya- an Epidemiological Study, Groom Helm, Sydney, Australia

WHO (2004).Evaluation of annual health Policies of some developing countries. Geneva:

WHO (2006): Making a difference in countries: Strategic approach to improving maternal and newborn survival and health., Geneva, WHO Google Scholar

WHO/UNICEF (2009): Country, Regional and Global Health Facts; Monitoring the situation of Children and Women, World Health Statistics.

WHO (2015).The Inter-agency Group for Child Mortality Estimation (UN IGME).Levels and Trends in Child Mortality. Report 2015.New York, USA.

Wilcox, A. J. and Skaeve, R. (1992).Birth weight and prenatal mortality; The Effect of gestational age.

Williams, I.O., Essien, E.U. and Eka, O.U. (2011) Socioeconomic factors and vitamin A status of pregnant women in Calabar Urban, Southeastern Nigeria. Matern. Child Health J. 15, 943–948.

World Health Organisation (2000) World Health Report 2000- Health Systems: Improving Performance. Geneva, Switzerland

World Health Organization [WHO](1994).Technical Working Group on Antenatal Care.Geneva.

World Health Organization, and UNICEF. (2009). WHO child growth standards and the identification of severe acute malnutrition in infants and children: joint statement by the World Health Organization and the United Nations Children's Fund.

World Health Organization,(WHO) (1992) *International statistical classification of diseases and related health problems*,tenth revision, World Health Organization, Geneva.

Zazzau Emirate Development Association (2006.) https/zemda.org.ng/wp/local-goverments/soba

APPENDICES

APPENDIX I: QUESTIONAIRE

AHMADU BELLO UNIVERSITY, ZARIANUTRITION SECTION, DEPARTMENT OF BIOCHEMISTRY

Dietary Intake, Antenatal Care Attendance and Maternal Nutrition among Pregnant Women in Maigana Ward, Soba Local Government Area, of Kaduna State.

QUESTIONAIRE ID

Q NO …….. . COMMUNITY……..

HOUSING UNIT NO…… HOUSEHOLD NO……..

DATE…….. INTERVIEWER SIGNATURE……

ANTHROPOMETRY MEASUREMENT

- Weight _____ (Kg)
- Height _____ (m)
- Mid Upper Arm Circumference_____ (cm)

Instruction: Please kindly provide answers to the following questions

SECTION A: SOCIO- ECONOMIC AND DEMOGRAPHIC INFORMATION

(1) Name: ……

(2) Date of birth ……/……/…… Age…….

(3) Marital status: (a) single [ ] (b.) Married [ ] (c.) Divorced [ ] (d.) Widowed [ ] (e.) Separated [ ]

(4) NUMBER OF CHILDREN AND PREGNACY RELATED ISSUES

TOTAL NO OF CHILDREN	TOTAL NO <5 YEARS	TOTAL NO CHILDREN'S DEATH	EVER MISCARRIGE YES OR NO	IF YES HOW MANY TIMES

(5) Highest Education attainment (a) Primary [ ] (b) JSS [ ] (c) SSS [ ] (d) Post Secondary (e) Nonel [ ]

(6) Husband's highest Education attainment (a) Primary [ ] (b) JSS [ ] (c) SSS [ ] (d) Post Secondary (e) None [ ]

(7) Main Occupation: (a) Civil Servant [ ] (b) Housewife [ ] (C) Artisan/ Skilled worker [ ] (d) Trader / Business [ ] (e.) farming [ ]

(8) Husband's Main Occupation: (a) Civil Servant [ ] b) Nothing [ ] (C) Artisan/ Skilled worker [ ] (d) Trader/ Business [ ] (e.) farming [ ]

(9) Estimated Household monthly income (a) < 10,000 [ ] (b) 10,000- 19,999 [ ] (c) 20,000-40,000 [ ] (d) 41,000 -59,999 [ ] (e) >60,000 [ ] (f) Don't know

(10) Ownership of the Following items Yes or No

A) Car…….

B) Motor cycle……

C) Television set…….

D) GSM/Mobile Phone……

SECTION B: ANTENATAL CARE AND COMPLANCE

(1) Have you ever attended Antenatal care (a) Yes [ ] (b) No [ ]

(2)IF YES, Name the health facility……..

(3) If YES How many times have you attended antenatal care for these pregnancy……

(4) IF No, WHY (a) Traditional noms [ ] (b) lack of Money (c) No husbands approval[ ]

(5) List things you were given at the ANC

(a)……..……..

(b)……

(6) Tell me what you've learned from ANC

(a) ……

(b) ….. . …….....

(c) ……..

(7) Do you know your approximate date of delivery (a)Yes [ ](b.)No [ ]

(8) Where will you deliver your baby: (a) Home [ ] (b) hospital [ ] (c) others [ ] specify……..

COMPLIANCE

(1) Do you take any supplement: (a) yes [ ] (b) No [ ] IF (Yes) Show me……..

(2) Dosage of the supplement (no of tablet)…….

(3) Frequency (a)Daily [ ] (b) Weekly [ ] (C) Monthly [ ](d) Others [ ] specify…….

SECTION C: DIETARY INTAKE (GENERAL)

(1) How many times do you eat per day: (a) once [ ] (b) twice [ ] (c) trice [ ] (d) more than three times [ ] (e) less than once [ ]

(2) Is there any food that is prohibited for you to eat during this pregnancy? (a) Yes [ ] (b) No [ ]

IF YES list the food(s)……

(3)WHY is it prohibited (a) harmful the fetus (b) Harmful to the mother[ ] (c) a taboo [ ] (d) Don't Know why[ ]

(4) Is there any food you crave for always (a) Yes [ ] (b) No [ ]

IF YES List the food

(a)……

(b) …….

(c) …….....

(5) Is there any special food you eat a lot or like more (a) Yes [ ] (b) No [ ]

If Yes Name the Food

(a)…….....

(b)……

(c)……

APPENDIX II

FOOD FREQUENCY QUESTIONAIRE

Food Categories	**Never or Less tha Once Month**	**1-3 times Per Month**	**Once a week**	**2-4 times Per Week**	**5-6 times per week**	**Once a day**	**2-3 times per day**
CEREALS							
Rice: Boiled/White/Jolof (*dagẹ-dagẹ/dafaduka*							
Túwon rice							
Rice Cake *(masa/waina)*							
Maize Boiled(with/without cob)Roasted							
TúwonMasara							
(Couscous*Burabusko/Tsaki)*							
Pap(*kunu*)							
Maize Snack(*Punkasau/Màkala*)							
Sorghum Tuwo							
(Couscous*Burabusko/Tsaki)* /porridge							
(*gawri*)**:** Gruel (*gari)* /Pap(kunu)							
Snack (*Punkasau)*							
Millet: Ground Millet mix (*Fura*) Pap *(Kunu)*							
Porridge *(nyiiri)*							
Root and Tuber							
Cocoyam: boiled/Roasted/Porridge **(Gwaza)**							

Yam: Boiled / Porridge/Fried							
Potato: Boiled/Fried							
Irish Potato: Fried							
Cassava: fried Cassava Cake (*rogo)*							
Dairy products and fats							
Fresh milk(*madara*)							
Sour milk (*nono*)							
Yoghurt(*kindirmo*)							
Local butter(*maishanu*)							
Cheese(*wara*)							
Meat, Fish and Poultry							
Beef: Boiled, fried, *Suya, Kilishi*							
Lamb: Fried, Roasted							
Chicken: Boiled, Fried							
Fish: boiled, fried							
Eggs: boiled, fried							
Legumes							
Beans: boiled/Porridge							
Fried bean cakes (*kosai)*							
Alele/ Dan-wake							

Groundnut: Roasted G/nut Pap (*kunungyada)/kulikuli* G/nut soup (*miyangyada/donga)*							
Bambara nuts(*biriji***):**roasted Fried/ Soup							
Bread **Pasta:** Semolina Indomie/suppergetti/macroni/taliyz							
Vegetables Soups and Sauces							
Sesame leaves(*MiyanKarkashi)*							
African sorrel(*Yakuwa/MiyanTaushe)*							
Baobab leaves (*MiyanKuka)*							
*Okra (*MiyanKubewa)							
Moringa leaves (*MiyanZogale/danbu)*							
Corchorus *(Rama*)							
Pumpkin (*kabewa)*							
Bitter leaves (*shuwaka)*							
Fruits and other Plants							
African Fan palm (*Giginya)*							
Figs (*Baure)*							
Tiger nuts *(aya)*							
Mango (*mangoro)*							
Sugarcane (*Raake)*							
Banana(*ayaba*)							
Cabbage(*kabeji*)							
Carrot(*karas*)							

Coconut(*kwakwa*)							
Dates(*dabino)*							
Guava(*gwaiba*)							
Lettuce(*latas*)							
Papaya(*gwanda*)							
Pineapple(*abarba*)							
Watermelon(*kankana*)							
Baobab(*kuka*)							
Pumpkin (*kabewa***)**							

- Are there any other foods you ate more than once a week? YES [ ] NO [ ]
  If yes, please List Below:

Food	**Number of Times Eaten Per Week**
_____	_____
_____	_____
_____	_____

APPENDIX III: **Food Frequency Table**

	Never or less than once a month	**1-3 times per month**	**once a week**	**2-4timesa week**	**5-6 times per week**	**once a day**	**2-3 times/day**
Cereals							
Rice	0 (0)	21(20.4)	21(20.4)	34(33.0)	10(9.7)	17(16.5)	0(0)
Tuwon Rice	41(39.8)	33(32.0%)	8(7.8)	9(8.7%)	7(6.8)	5(4.9)	0(0)
Rice Cake	31(30.1)	35(34.0)	12(11.7)	9(8.7)	12(11.7)	4(3.9)	0(0)
Maize	17(16.5)	20(19.4)	10(9.7)	26(25.2)	8(7.8)	15(14.6)	7(6.8)
TuwonMasara	1(1.0)	1(1.0)	2(1.9)	9(8.7)	7(6.8)	46(44.7)	37(35.9)
Couscous	19(18.4)	21(20.4)	26(25.2)	14(13.6)	11(10.7)	9(8.7)	3(2.9)
Pap	17(16.5)	10(9.7)	12(11.7)	31(30.1)	20(19.4)	12*11.7)	1(1.0)
Maize Snack	22(21.4)	19(18.4)	12(11.7)	29(28.2)	11(10.7)	9(8.7)	1(1.0)
Sorghum	45(43.7)	24(23.3)	7(6.8)	6(5.8)	11(10.7)	9(8.7)	1(1.0)
Couscous Por	25(24.3)	22(21.4)	23(22.3)	14(13.6)	11(10.7)	6(5.8)	2(1.9)
Gawri	23(22.3)	18(17.5)	19(18.4)	21(20.4)	8(7.8)	10(9.7)	4(3.9)
Snack Punkasau	31(30.1)	28(27.2)	14(13.6)	15(14.6)	9(8.7)	4(3.9)	1(1.0)
Millet	18(17.5)	25(24.3)	24(23.3)	18(17.5)	11(10.7)	6(5.8)	1(1.0)
PORRIDGE	27(26.2)	26(25.2)	15(14.6)	19(18.4)	12(11.7)	3(2.9)	1(1.0)
Tubers and Roots							
Cocoyam	36(35.0)	36(35.0)	12(11.7)	6(5.8)	10(9.7)	1(1.0)	2(1.9)
Yam	13(12.6)	39(37.9)	25(24.3)	15(14.6)	8(14.6)	8(7.8)	3(2.9)
Potato	12(11.7)	28(27.2)	35(34.0)	16(15.5)	9(8.7)	3(2.9)	0(0)
Irish Potato	27(26.2)	33(32.0)	17(16.5)	14(13.6)	10(9.7)	1(1.0)	1(1.0)
Cassava	23(22.3)	33(32.0)	25(24.3)	12(11.7)	4(3.9)	6(5.8)	0(0)

Dairy Products							
Fresh milk	36(35.0)	21(20.4)	17(16.5)	13(12.6)	8(7.8)	7(6.8)	1(1.0)
Sour milk	24(23.3)	33(32.0)	22(21.4)	13(12.6)	5(4.9)	4(3.9)	2(1.9)
Yoghurt	30(29.1)	27(26.2)	22(21.4)	8(7.8)	9(8.7)	3(2.9)	2(1.9)
Local butter	36(35.0)	22(21.4)	15(14.6)	11(10.7)	10(9.7)	5(4.9)	2(1.9)
Cheese	6(5.8)	25(24.3)	29(28.2)	20(19.4)	14(13.6)	8(7.8)	1(1.0)
Meat, Fish and Poultry							
Beef	18(17.5)	37(35.9)	22(21.4)	12(11 .7)	12(11.7)	1(1.0)	1(1.0)
Lamb	43(41.7)	26(25.2)	14(13.6)	11(10.7)	7(6.8)	2(1.9)	0(0)
Chicken	36(35.0)	21(20.4)	20(19.4)	12(11.7)	9(8.7)	5(4.9)	0(0)
Fish	12(11.7)	33(32.0)	31(30.1)	13(12.6)	10(9.7)	3(2.9)	1(1.0)
Eggs	13(12.6)	32(31.1)	29(28.2)	12(11.7)	12(11.7)	5(4.9)	0(0)
Legumes							
Beans	16(15.5)	28(27.2)	13(12.6)	19(18.4)	13(12.6)	13912.6)	1(1.0)
Fried Bean Cakes	23(22.3)	10(9.7)	8(7.8)	29(28.2)	17(16.5)	14(13.6)	2(1.9)
Allele	21(20.4)	16(15.5)	28(27.2)	30(29.1)	6(5.8)	2(1.9)	0(0)
Groundnut	32(31.1)	24(23.3)	14(13.6)	9(8.7)	12(11.7)	8(7.8)	2(1.9)
Groundnut Soup	21(20.4)	22(21.4)	24(23.3)	16(15.5)	12(11.7)	7(6.8)	1(1.0)
Bambara nuts	24(23.3)	18(17.5)	23(22.3)	18(17.5)	15(14.6)	5(4.9)	0(0)
Bread							
Bread Pasta	22(21.4)	24(23.3)	19(18.4)	19(18.4)	10(9.7)	8(7.8)	1(1.0)
Vegetables Soups and Sauces							
Sesame leaves	19(18.4)	17(16.5)	20(19.4)	12(11.7)	22(21.4)	11(10.7)	2(1.9)
African Sorrel	12(11.7)	31(30.1)	29(28.2)	11(10.7)	7(6.8)	11(10.7)	2(1.9)
Baobab Leaves	7(6.8)	19(18.4)	11(10.7)	9(8.7)	11(10.7)	26(25.2)	20(19.4)

Okra	11(10.7)	11(10.7)	10(9.7)	18(17.5)	14(13.6)	29(28.2)	10(9.7)
Moringa	28(27.2)	17(16.5)	26(25.2)	18(17.5	9(8.7)	4(3.9)	1(1.0)
Corchorus	38(36.9)	22(21.4)	11(10.7)	11(10.7)	13(12.6)	5(4.9)	3(2.9
Pumpkin	24(23.3)	24(23.3)	24(23.3)	14(13.6)	11(10.7)	6(5.8)	0(0)
Bitter leaves	34(33.0)	15(14.6)	21(20.4)	17(16.5)	13(12.6)	3(2.9)	0(0)
Fruits and Other Plant							
African fan palm	56(54.4)	28(27.2)	6(5.8)	7(6.8)	3(2.9)	2(1.9)	1(1.0)
Figs	44(42.7)	21(20.4)	14(13.6)	9(8.7)	10(9.7)	3(2.9)	2(1.9)
Tiger nuts	32(31.1)	21(20.4)	26(25.2)	9(8.7)	6(5.8)	8(7.8)	(1(1.0)
Mango	17(16.5)	25(24.3)	22(21.4)	16(15.5)	15(14.6)	6(5.8)	2(1.9)
Sugarcane	16(15.5)	16(15.5)	23(22.3)	18(17.5)	13(12.6)	17(16.5)	0(0)
Banana	33(32.0)	28(27.2)	13(12.6)	15(14.60)	5(4.9)	8(7.8)	1(1.0)
Cabbage	31(30.1)	32(31.1)	16(15.5)	18(17.5)	5(4.9)	1(1.0)	0(0)
Carrot	26(25.2)	22(21.4)	28(27.2)	10(9.7)	14(13.6)	2(1.9)	1(1.0)
Coconut	7(6.8)	28(27.2)	37(35.9)	16(15.5)	9(8.7)	5(4.9)	1(1.0)
Dates	8(7.8)	32(31.1)	31(30.1)	18(17.5)	12(11.7)	2(1.9)	0(0)
Guava	31(30.1)	36(35.0)	9(8.7)	12(11.7)	13(12.6)	2(1.9)	0(0)
Papaya	20(19.4)	33(32.0)	29(28.2)	10(9.7)	6(5.8)	4(3.9)	1(1.0)
Pineapple	17(16.5)	47(45.6)	23(22.3)	6(5.8)	9(8.7)	1(1.0)	0(0)
Watermelon	14(13.6)	25(24.3)	22(21.4)	5(4.9)	10(9.7)	2(1.9)	0(0)
Baobab	54(52.4)	15(14.6)	9(8.7)	13(12.6)	3(2.9)	9(8.7)	0(0)
Kabewa	36(35.0)	23(22.3)	9(8.7)	16(15.5)	6(5.8)	12(11.7)	1(1.0)

SOBA LOCAL GOVERNMENT COUNCIL

SECRETARIAT:
Jos Road, P.o. Box 8, Maigana,
Kaduna State

Ref_____ Date 21/11/2018

The Head,
Department Biochemistry,
Ahmadu Bello University,
Zaria.

NOTICE OF APPROVAL

Dietry intake, ante – natal care attendance and birth outcome among pregnant women at Maigana ward soba local government area, Kaduna state

LAKKA HAJARA,

Principal investigator,

Department of Bio – chemistry,

A .B. U. Zaria.

This is to inform that research describe in the submitted protocol, the consent forms, advertisement and other participant information materials have been reviewed and given full approval by the Primary Health Care Department, Soba Local Government Area.

However, researcher is kindly requested to submit a copy of his/her findings to the local government, please.

Mohammed Madaki
Director Primary Health Care
For: Chairman