

**THE DETERMINANTS OF ANAEMIA IN PREGNANCY
IN, LUSAKA URBAN DISTRICT, ZAMBIA**

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By

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BSc. NURSING, ZRM, ZRN

**A dissertation to be submitted in partial fulfilment of the
requirement for the degree of the masters of public health**

University of Zambia

2007

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DECLARATION

I hereby declare that the work presented in this study for the Master of Public Health has not been presented whether wholly or in part for any other study programme and is not being submitted for any other Masters programme. This work is entirely the result of my own independent investigation. The various persons and resources to which I am indebted are acknowledged.

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ABSTRACT

Anaemia is a major public health problem all over the world. Pregnant women in the developing world are mostly affected. Anaemia in pregnancy has serious consequences both to the mother and her baby. It leads to maternal death, reduced physical capacity, lowered resistance to infection, post partum haemorrhage, neurological dysfunction, reduced transfer of iron to the foetus, foetal death, abortion, prematurity, low birth weight and neonatal death.

The purpose of this study was to determine the factors associated with anaemia in pregnancy in pregnant women attending antenatal clinics in Lusaka Urban District.

A case-control study was conducted; the cases were the antenatal women who were found with the haemoglobin of less than 11 grams/dl of blood; the control group comprised of antenatal women who were found with the haemoglobin of more than 11 grams/dl of blood.

The study was conducted in five health centres in Lusaka Urban District. These centres were selected using purposive sampling method from the 26 health centres which provide the antenatal care services. The study population included pregnant women in the second and third trimester of gestation, attending antenatal clinic in the five selected health centres in Lusaka Urban District. Each woman was taken as a sampling unit, assigned as either a case or control, depending on the haemoglobin level. The sample was selected by using a systematic sampling method. The cases and the controls were sampled separately. The cases were selected at an interval of 1 in 2 from the sampling list of cases. The controls were selected at the interval of 1 in 5 from the sampling list of controls. The study had two independent samples of 150 subjects each.

Data was collected using a structured questionnaire administered to 300 antenatal women. Blood slides for malaria infection and stool for worm infestation was collected from 60 (30 cases and 30 controls) respondents for laboratory examination. The laboratory examination was done at Chawama health centre laboratory. In addition, the review of records for Hb estimation and HIV status was done. A checklist was used to record the laboratory results.

Data was analyzed using SPSS computer Software package. Chi-Squared (χ^2) test and Odds Ratio (OR) were used. Multivariate logistic regression analysis was used to control for confounding factors. Statistical significance was achieved if $P < 0.05$.

The results revealed a significant association between employment status and anaemia in pregnancy, with more cases (91.3%) than controls (66.7%) among the respondents who were unemployed. The respondents who were unemployed were 23 times more likely to have had anaemia in pregnancy than those who were employed.

Furthermore, a significant association was observed between the frequency of eating green vegetables (spinach, pumpkin leaves, sweet potato leaves green beans and 'bondwe') and anaemia in pregnancy, with more cases (82.7%) than controls (29.3%) among the respondents who ate green vegetables for 1-7 times in 7 days (low intake). Those who had green vegetables for 1-7 times in 7 days were 16 times more likely to have had anaemia in pregnancy than those who had green vegetables for 8-14 times in 7 days.

Another significant association was observed between diet during pregnancy and occurrence of anaemia in pregnancy, with more controls (75.3%) than cases (26.0%) among the respondents who had had balanced diet during pregnancy. The results further revealed that the respondents who had balanced diet during

pregnancy were eighty percent less likely to have had anaemia in pregnancy compared to those who had poor diet during pregnancy.

Additionally, a significant association was observed between compliance with iron/folate supplementation and anaemia in pregnancy, with more controls (83.3%) than cases (43.2%) among the respondents who complied. The respondents who complied with iron/folate supplementation were eighty-nine percent less likely to have had anaemia in pregnancy compared to those who did not comply.

Consequently, we conclude that unemployment status of respondents, low intake of green vegetables, poor diet during pregnancy and non-compliance with iron/folate supplementation are the determinants are the major factors influencing the occurrence of anaemia in pregnancy among pregnant women in Lusaka Urban District.

There is need for policy makers, reproductive health care providers and other stakeholders to work together to reduce the burden of anaemia in pregnancy in the community by addressing the specific determinants.

Key Words: Anaemia, Pregnancy, Iron Deficiency, Malnutrition, HIV Infection, Hookworm Infestation, Interpregnancy Interval, Cultural Beliefs, Compliance to Preventive Measures, and Case-Control study.

DEDICATION

This research work is dedicated to Lord God Almighty, who has made my dream of obtaining Masters of Public Health degree come to pass.

To my beloved husband Apostle Collins C. Chipaya, who gave me moral support and encouragement and without whose love, patience, and prayers my studies and this work would not have been possible.

To my beloved children Gabriel, Luwi and Michael who were denied adequate motherly love and support at the time they needed it most and without whose understanding and patience, my studies would not have been successful.

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ABBREVIATIONS

ANCs: Antenatal Clinics
AIDS: Acquired Immuno Deficiency Syndrome
CBoH: Central Board of Health
CSO: Central Statistical Office
dl: Decilitre
DOTS: Direct Observation Therapy Short course
FAO: Food and Agriculture Organization
Gms: Grams
Hb: Haemoglobin
Hct: Haematocrit
HIV: Human Immunodeficiency Virus
IEC: Information, Education and Communication
IPT: Intermittent Presumptive Treatment
ITNs: Insecticide Treated Mosquito Nets
LBW: Low Birth Weight
LDHMT: Lusaka District Health Management Team
LMP: Last Menstrual Period
Mls: Millilitres
MOH: Ministry of Health
NFNC: National Food and Nutrition Commission
NGOs: Non-Governmental Organisations
NMCC: National Malaria Control Centre
OR: Odds Ratio
PHC: Primary Health Care
PMTCT: Prevention of Mother-to-Child Transmission
PPH: Post Partum Haemorrhage
RBM: Roll Back Malaria
UN: United Nations
UNICEF: United Nations Children's Fund

UNU: United Nations University
UTH: University Teaching Hospital
USAID: United States Agency for International Development
VCT: Voluntary Counselling and Testing
WHO: World Health Organization.
ZDHS: Zambia Demographic Health Survey

DEFINITION OF TERMS

Anaemia: A reduction in the quantity of oxygen carrying pigment (haemoglobin) in blood; a state where blood haemoglobin is less than 11 grams /dls of blood.

Case-Control Study: An analytic epidemiologic research design in which the study population consists of groups who either have or do not have the disease.

Determinant: Any factor, event, characteristic, or other definable entity, that brings about change in a health condition.

Deficiency: A state of not having, or not having enough of something that is essential.

Iron: A micronutrient needed for the transfer of oxygen to various parts of the body.

Nutrient: A substance found in food needed to keep the person alive and to help grow. Together with water, nutrients are essential for life.

Macronutrients: Nutrient consisting of carbohydrates, proteins and fats. They form bulk of the diet and supply all energy needed by the body.

Micronutrients: All vitamins and minerals, required in tiny amounts, which are essential for life and needed for a wide range of body functions and processes.

Purposive Sampling Method: A non-probability sampling design where the sample units are selected subjectively by the researcher who attempts to obtain a sample that appears to be representative of the population.

Systematic Sampling Method: The selection of the units at fixed intervals from a list.

CHAPTER 1

1.0 INTRODUCTION

1.1 BACKGROUND INFORMATION

Pregnancy in developing countries come with a lot of risks from lack of infrastructure, lack of transport facilities, to unavailability of adequate facilities for antenatal factors like worm infestations and malaria, coupled with malnutrition. One of the major medical complications encountered during pregnancy is anaemia. Anaemia is a major public health problem worldwide (WHO, 1992). Women of reproductive age are most affected and the estimated prevalence is 11 percent in the developed world and 47 percent in the developing world. In pregnant women the prevalence is over 50 percent in developing countries (WHO, 1992). On the basis of data collected in 1998 and on the assumption that 59 percent of pregnant women and 47 percent of all women are anaemic, >745 million of the >1514 million women of childbearing age (15-49 years) are anaemic (Mora and Nestel 2000). The prevalence rates for developing countries range from 35 to 56 percent for Africa, 37 to 75 percent for Asia and 37 to 52 percent for Latin America (WHO, 1992). In Zambia, the prevalence of anaemia in pregnancy is estimated to be 46.9 percent (Luo, 1999). This is almost half of all pregnant women in the country.

Anaemia in pregnancy is a condition where blood haemoglobin is less than 11 grams/dl of blood (Gillespie and Johnston, 1998; WHO, 1992). Anaemia is actually a statistical construct; it is defined with respect to an individual, as a state in which the haemoglobin concentration has fallen below the threshold lying at two standard deviations below the median for a healthy population of the same age, sex and stage of pregnancy (WHO/UNICEF/UNU, 1997). This is reflected in table 1 below.

TABLE1: Hb AND Hct LEVELS WHICH ANAEMIA IS JUDGED TO PRESENT

Group/Age/Physiological Status	Critical Level	
	Hb (g/dl)	Hct (%)
Children:		
6 months to 5 years	11.0	33
6 to 11 years	11.5	34
12 to 13 years	12.0	36
Men	13.0	39
Women:		
Non-pregnant	12.0	36
Pregnant	11.0	33
-Severe Anaemia	7.0	-
-Very Severe Anaemia (Life threatening)	4.0	-

Source: WHO/UNICEF/UNU (1997)

Anaemia in pregnancy has a multifactorial aetiology and the contributions of its determinants vary in many ways. It can be caused by dietary factors, malaria, intestinal parasites, HIV or certain genetic haemoglobinopathies (Gillespie and Johnston, 1998). Geography, ecology, age, sex and physiology are some of the factors that govern the degree to which any one of these determinants affects the anaemia outcome. Moreover, the determinants interact.

Quite often anaemia in pregnancy is due to iron deficiency resulting from inadequate dietary intake and consumption of foods with low iron bio-availability (Massawe, et al. 2002; Bothwell, 2000). However, iron deficiency anaemia is also associated with poor absorption and increased nutrient loss. It is recommended that pregnant women take about 23 mg of iron/day (Gillespie and Johnston, 1998). These recommendations are

based on the assumption of absorption of about 12 percent from a mixed diet. Nonetheless, in many African countries in which millet, sorghum, or maize is the staple, a large amount of dietary iron may be derived from the staple food (FAO/WHO, 1998). These foods may contain tannin, or phytates which may inhibit absorption of iron (Macphail, et al., 1981; Gillooly, et al., 1984; Siegenberg, et al., 1991; MacPhail and Bothwell, 1992). Therefore, although individuals may thus consume at least a quantity of iron meeting recommended iron intakes, the actual percentage of iron absorbed may be as low as 1- 2 percent. In Zambia, iron deficiency anaemia is still a major problem affecting many pregnant women (CSO, et al. 2003).

The nutritional deficiency status of women in developing countries is compounded by frequent parasitic infections such as hookworm and malaria. In Africa, 30 million women living in malaria-endemic areas become pregnant each year (WHO, 2003). For these women, malaria is a threat both to themselves and to their babies. Malaria infection increases the prevalence of anaemia and worsens its severity through haemolysis of the parasitized red blood cells which reduces iron in the haemoglobin mass and in more sequestered stores. Malaria is also associated with some impairment in the release of iron from the reticulo-endothelial stores and secondary folate deficiency (Chimumbwa, 2000). Sinel et al. (1984) found that in rural Kenya the commonest type of anaemia encountered during pregnancy was associated with haemolysis due to malaria. Moreover, malaria and pregnancy both increase folate needs, and folate deficiency compounds anaemia. Malaria is thought to be primary cause of severe anaemia in at least 50 percent of subjects in malaria-endemic areas (Gillespie and Johnston, 1998). Malaria is estimated to indirectly cause 75,000 to 200,000 infant deaths per year, for example through malaria related maternal anaemia in pregnancy (Steketee, et al., 2001; WHO, 2003).

Hookworms cause morbidity in the host by producing haemorrhage. The adult hookworms then ingest the blood, rupture the erythrocytes and degrade the haemoglobin. In study by Michele, et al. (2000) the attributable fraction of anaemia and severe anaemia associated with hookworm infection in pregnant women in Nepal was 19 percent of all anaemia and 54 percent of moderate to severe anaemia. Hotez, et al. (2005) estimated the prevalence of hookworm infection to be 30 to 48.8 percent of the Zambian population. The actual prevalence in pregnant women is not known.

Other factors contributing to anaemia in pregnancy are other infections such as tuberculosis, HIV, and urinary tract infections. HIV and other related infections are ranked high as a major determinant of anaemia in reproductive age women in Africa (Fleming, 1989; Antelman, et al. 2000). Furthermore, there are frequent births and women do not recover their iron stores before the next pregnancy. CSO, et al. (2003) recorded 16 percent of births occurring less than 24 months and 43 percent births occurring between 24– 35 months after the earlier birth.

It is clear to those in clinical practice and research that anaemia in pregnancy is a major public health problem and under-reported especially in developing countries. The consequences of anaemia in pregnancy are numerous and they include: maternal deaths, reduced transfer of iron to the fetus, fetal death, abortion, low birth weight, neonatal mortality, prematurity, reduced physical capacity, lowering resistance to sepsis, post partum haemorrhage and neurological dysfunction (O'Dowd, et al. 1979; Van den Broek, 1998). Failure of lactation and anaemia in subsequent pregnancy may be long-term problems.

In Zambia no detailed studies have been undertaken on the determinants of anaemia in pregnancy in the recent past. With the advent of HIV/AIDS pandemic it is presumed that there could be some changes in the epidemiology of anaemia in pregnancy. The researcher decided to undertake a research on this topic in view of the public importance of the problem which needs continuous review of the situation in order to contribute meaningfully to the effective control of the disease. The study will bring to the attention of health providers, the determinants of anaemia in pregnancy in Lusaka Urban District, so that appropriate interventions may be put in place.

1.2 STATEMENT OF A PROBLEM

Anaemia in pregnancy remains a serious public health problem in most of the world. It is known to worsen other complications of pregnancy, delivery and puerperium. It has adverse effects for both the mother and her child. In the developing countries anaemia is also an important contributory factor to high low birth weight (LBW) and still-birth rates (Ogbeide et al. 1994).

Each year more than 500,000 women die from pregnancy related causes, the vast majority (99 percent) in developing countries (WHO, 1991). ZDHS 2001-2002 (CSO, et al. 2003) estimated maternal mortality ratio of 729 per 100,000 live births, which was higher than the estimates of 649 deaths per 100,000 live births in the 1996 ZDHS. Anaemia in pregnancy contributes greatly to maternal mortality. A detailed compilation of anaemia prevalence by WHO in 1992 included estimates of maternal mortality from anaemia for nine selected countries. These estimates of maternal mortality from anaemia varied greatly among countries in the regions, in Asia the values varied (per 100,000 live births) from 27 in India and 54 in Bangladesh to 194 in Pakistan and in Africa from 34 in Nigeria and 35 in Senegal to 82 in Kenya (WHO, 1992). In

combination with obstetric haemorrhage, anaemia is estimated to be responsible for 17 to 46 percent cases of maternal deaths (Harrison, 1988).

The factors associated with anaemia in pregnancy are many, they include nutritional deficiencies of iron and folate, haemoglobinopathies, and secondary effects of infection and parasitic infestations especially hookworm (see figure 1). Most of these factors can be abated through various interventions.

Iron deficiency anaemia affects many Zambian pregnant women because most of the households consume diets of low bio-availability due to poverty. This is compounded by poor absorption of iron caused by the constituencies in the foods such as phytates in maize (the staple food). As a result many women start pregnancy with no iron stores and less than optimal haemoglobin concentration. The increased demand of iron during pregnancy causes further depletion of iron and worsens situation. CSO, et al. (2003) acknowledged iron deficiency anaemia being a threat to maternal health. However, the actual fraction of anaemia attributed to iron deficiency is not known.

In Zambia, as a measure of preventing iron deficiency anaemia, all antenatal mothers attending antenatal clinics are supposed to be supplemented with iron and folic acid tablets during their pregnancy (CSO, et al. 2003). The international recommendations are that iron and folic acid tablets are taken daily for at least three months during pregnancy. CSO, et al. (2003) revealed that, although six in ten women reported having been supplied with iron tablets during their pregnancy, only 20 percent took them for 90 or more days. In Lusaka province only 14.8 percent of the women took the tablets for the required period. This is reflecting low compliance to the program. In Lusaka Urban District there is

limited information on the compliance with the iron supplementation intervention.

Zambia has areas of meso and hyper-endemicity of malaria where *plasmodium falciparum* accounts for over 98 percent of the infections (NMCC, 1999). There is no direct data of the proportion of anaemia in pregnancy attributed to placental malaria, but Luo, et al. (1999) found that 8.6 percent of pregnant women had peripheral Parasitaemia. The peripheral Parasitaemia does not reflect the actual disease burden of malaria in pregnancy because most of the cases of malaria in pregnancy are asymptomatic. A pregnant woman may not even know that she is infected (McDermott, et al., 1988). Even if she suspects an infection and is tested for malaria, she may test negative for peripheral parasitaemia but still have a serious placental infection which can increase her and child's chance of death (Yamada, et al., 1989; Katherine, et al.2002).

Central Board of Health through the "Roll Back Malaria" program recommends the prophylactic treatment of malaria during the second and third trimester of pregnancy to reduce the impact of malaria. The Intermittent Presumptive Treatment (IPT) of Sulfadoxine-Pyrimethamine is recommended. One adult treatment dose (3 tablets stat) is given after 20 weeks following the last menstrual period (LMP). Two more doses are given at least four weeks apart, during the second and third trimester (CBoH, 2002). In addition to the chemoprophylaxis; other measures of malaria prevention are promoted. One of the measures is the use of Insecticide Treated Mosquito Nets (ITNs) where all the pregnant mothers are encouraged to utilize. The ITNs are provided at highly subsidized prices through ANCs and the voucher system. The ZDHS (CSO, et al. 2003) results indicate that less than one in five pregnant women (18 percent) sleep under a mosquito net and only 8 percent sleep under an

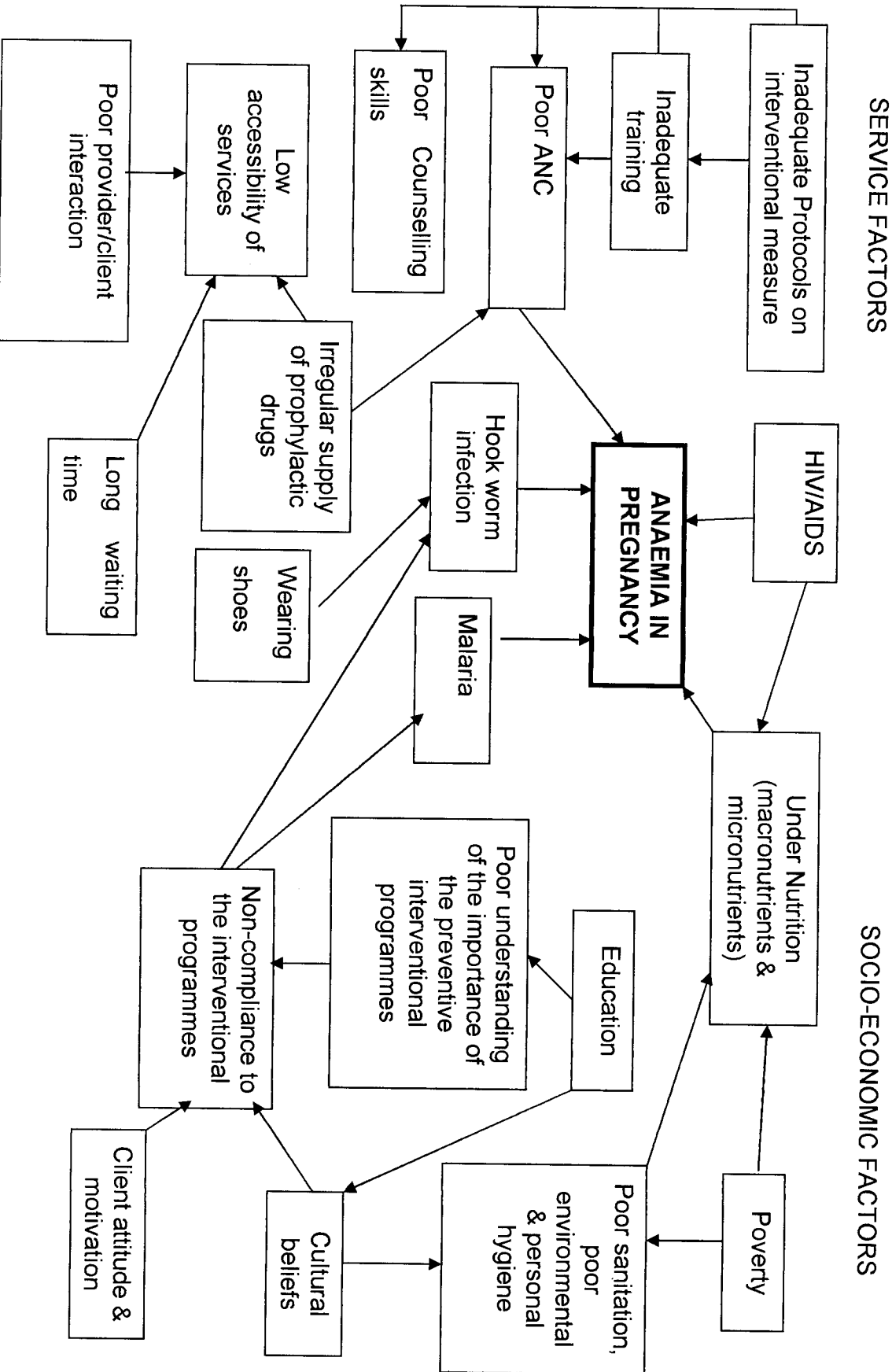
ITN. This makes the pregnant women to be exposed to malarial infection, which may result in anaemia in pregnancy.

Another common cause of anaemia in pregnancy is hookworm infestation. In a study by Michele et al. (2000) hookworm infection was responsible for 54 percent of cases of moderate to severe anaemia in pregnancy. Mature hookworms cause intestinal bleeding, leading to faecal blood loss proportional to the intestinal worm burden (Michele, et al. 2000; Steketee, 2003). Consequently, hookworm infections exacerbate iron deficiency. Parasitic diseases are closely related to clay consumption, lack of sanitation, and to warm and humid climates (De Maeyer, et al.1989; Sharma, et al. 2001; Steketee, 2003). WHO (2000) recommends the inclusion of antihelmintic treatment in the management of anaemia in pregnancy in the hookworm endemic areas.

Recognizing that anaemia in pregnancy is a serious public health problem, which has adverse effects on the mother and her baby, it is therefore imperative to regularly review the factors which may hinder its prevention through research, so that appropriate interventions may be put in place.

Figure 1 below is showing the broad picture of the factors associated with anaemia in pregnancy.

1.2.1 **Fig 1: ANALYSIS OF THE PROBLEM**



CHAPTER 2

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

Anaemia in pregnancy has been a major public health problem affecting women worldwide. The women in developing countries are mostly affected. It leads to maternal deaths, fetal death, neonatal death, low birth weight, premature labour, postpartum haemorrhage, lowered resistance to infections, reduced physical capacity and neurological dysfunction (O'Dowd, et al. 1979; Van den Broek, 1998).

Fleming (1989) in his study on anaemia in pregnancy in tropical Africa stated that anaemia is often multifactorial with different causes interacting in a vicious cycle of depressed immunity, infection and malnutrition. This was affirmed by Steketee (2003) when he noted that in the developing world young women, pregnant women and their infants and children frequently experience a cycle where under nutrition (macronutrient and micronutrient) and repeated infection including parasitic infections lead to adverse consequences that can continue from one generation to the next. The literature review focused on the prevalence and the determinants of anaemia in pregnancy.

2.2 THE PREVALENCE OF ANAEMIA IN PREGNANCY

The published rates for prevalence of anaemia in pregnancy in developing countries range from 35 to 56 percent for Africa, 37 to 75 percent for Asia and 37 to 52 percent for Latin America (WHO, 1992). This is in sharp contrast to industrialized countries where anaemia in pregnancy occurs in less than 20 percent of women (Van den Broek, 1998). In Zambia the prevalence was 46.9 percent (Luo, et al., 1999).

2.3 FACTORS ASSOCIATED WITH ANAEMIA IN PREGNANCY

2.3.1 IRON DEFICIENCY

Nutritional deficiencies of micronutrients are major contributing factors of anaemia in pregnancy. Iron deficiency is the most common nutritional deficiency worldwide and is estimated to affect 1.3 to 2.2 billion people. It is generally accepted that about half of the anaemia worldwide is due to iron deficiency, and there is emerging evidence that low iron stores, even in the absence of anaemia, can have negative functional consequences (WHO, 1992). Van den Broek (1998) in the review of anaemia in pregnancy in developing countries revealed that the nutritional imbalance result from low nutrient intake, poor absorption and increased nutrient loss or demand. According to Van den Broek (1998) iron absorption is often inhibited by high phytates content of many of the grain based diets in tropics. He further observed that dietary shortcomings are often related to cooking and dietary habits as well as to cost.

Iron deficiency anaemia is a common feature in most of the African countries where most of the populations live below the poverty datum line. Haidar, et al. (1999) in their study on iron deficiency anaemia in pregnant and lactating mothers in rural Ethiopia observed that the low iron intake areas were seen to be affected significantly by anaemia than the high iron intake groups. This was supported by the results in the study done by Massawe, et al. (2002) in Tanzania where it was revealed that iron deficiency was the pre-dominant factor in anaemia in pregnancy. They attributed this to inadequate dietary intake and consumption of foods with low iron bio-availability. In Zambia, a study done by O'Dowd, et al. (1979) also revealed that iron deficiency anaemia was common.

In these studies, it is exposed that the problem of nutritional anaemia is predominantly affecting the countries in the developing world where the poverty levels are increasing. This could be due to the fact that many of the populations can not afford to eat animal source iron as a result; they resort to consume diets of low bio-availability. Therefore, most women enter pregnancy with no iron stores and less than optimal haemoglobin concentration. Thus anaemia in pregnancy is compounded and perpetuated by poverty.

In 1989 the World Health Organization recommended universal supplementation of all pregnant women with 60mg ferrous iron twice daily in populations where gestational anaemia is common and once daily in populations where overall iron nutrition is better. This recommendation was subsequently modified to a single daily dose of 60mg ferrous iron for 6 months in pregnancy. Many countries implemented the supplementation programs. However, there are some technical and practical barriers which affect the effectiveness of the iron supplementation interventions. The studies by Bothwell (2000), and Mora (2002) revealed the problems related to costs and logistics which affect the supply for iron tablets, poor access to prenatal care, insufficient counseling on the need for and benefits of iron supplementation and unwillingness by pregnant women to take iron supplements. The non compliance was the result of both an aversion to the side effects of taking iron supplements and the failure of many primary health care systems to adequately motivate both health care providers to issue the iron tablets and pregnant women to take them. This was highlighted in a study by Schultink, et al. (1993) in Indonesia where only 36 percent of the women who had been receiving 60mg ferrous iron daily had positive results on stool tests for iron and this indicated low compliance. This was also reflected in the study by Ekström, et al. (1996) in Tanzania where only 42 percent of pregnant women adhered to iron supplementation. In

Zambia, CSO, et al. (2003) revealed that, during the antenatal period six in ten women were reported having received iron tablets, but only 20 percent took them for 90 or more days. This shows that the problem of non compliance exists among women suffering from anaemia in pregnancy.

2.3.2 MALARIA INFECTION

Malaria is another determinant of anaemia in pregnancy. Bernard and Nahlen (2000) noted that malarial infection during pregnancy is a major public health problem in tropical and subtropical regions throughout the world. In endemic areas, pregnant women are the main group of adults at risk for malaria. Steketee (2003) in the study of pregnancy, nutrition and parasitic diseases revealed that malaria and intestinal helminthes coexist widely with micronutrient deficiencies and contribute importantly to anaemia. He further stated that malaria causes 300 – 500 million infections each year and is estimated to lead approximately one million deaths each year, mostly the children. The majority of the infections and most severe morbidity and mortality are caused by *plasmodium falciparum*. The largest part of *plasmodium falciparum* infections are in sub-Saharan Africa, but Asia, South East Asia and the Americas are also sites of transmission for this parasite. He further affirmed that malaria clearly contributes to anaemia throughout life and specifically during pregnancy. Guyatt and Snow (2001) conducted a study on the epidemiology and burden of *plasmodium falciparum* related anaemia among pregnant women in sub-Saharan Africa, the results suggested that the median prevalence of severe anemia in all-parity pregnant women is approximately 8.2 percent and assuming that 26 percent of these cases are due to malaria, it was suggested that as many as 400,000 pregnant may have developed severe anaemia as a result of infection with malaria.

Fleming, et al. (1986) carried out a study in the Guinea Savanna of Nigeria, the results revealed that 45 percent of the women were anaemic at first attendance before 24 weeks of gestation and malaria parasitaemia was seen in 27 percent of whom 60 percent were anaemic.

Another study done by Granja, et al. (1998) on malaria related maternal mortality in Urban Mozambique revealed that the overall 15.5 percent of deaths were directly attributable to malaria and 19.7 percent of the women who died were found to be parasitaemic prior to death. Autopsies on 161 of the women who died showed histological evidence of malarial infection in the spleen of 44 (27.3 percent). Many (37.8 percent) of the malaria-related deaths occurred in adolescent primigravidae and most of them were associated with severe anaemia.

These results are similar to those in the study done by Marchant, et al. (2002) on anaemia during pregnancy in Southern Tanzania where high malarial parasitaemia and iron deficiency were independent determinants of anaemia.

Given the known adverse consequences of malarial infection during pregnancy, WHO (1994) recommended that all pregnant women residing in endemic malaria areas should be given anti malarial prophylaxis according to the country policy. However, Steketee, et al. (1996) observed that despite the availability of an effective control strategy, implementation of programmes to prevent malaria has been rare. In addition, the emergence of chloroquine resistance and problems of compliance have limited the effectiveness. This was supported by Lim, et al. (2003) who documented high degree (88 percent) of chloroquine resistance in Western Cambodia. In the light of the problems encountered in the earlier preventive strategies, the World Health Organisation's 'Roll Back Malaria' initiative has brought a pre-emptive approach using intermittent presumptive treatment (IPT) with Sulfadoxine-Pyrimethamine

at regularly scheduled antenatal clinic visits and providing insecticide-treated bed nets for each pregnant woman (WHO, 2000; Nahlen 2000). In Zambia, Central Board of Health through the "Roll Back Malaria" program, the recommended preventive interventions have been adopted.

2.3.3 HIV INFECTION

The emergence of HIV infection has worsened the situation in the malaria endemic areas. The literature reviewed shows the association between HIV and malaria infection. In the study done by Steketee, et al. (1996) in Malawi, the findings suggested that HIV infection reduces a pregnant woman's capacity to control *plasmodium falciparum* parasitaemia, placental and newborn infection. The investigators found an increased percentage of HIV positive pregnant women to have malaria: 57 percent as compared to 44 percent in HIV negative pregnant women. Parasite densities were also found to be higher: 1558/mm³ as opposed to 670/mm³ in HIV negative pregnant women. The prevalence of placental parasitaemia was also found to be greater: 38 percent as compared to 23 percent in HIV negative pregnant women, and peak parasite prevalence was found to occur earlier in gestation: 16 to 19 weeks as opposed to 20 to 23 weeks in HIV negative pregnant women. Van den Broek, et al. (1998), also conducted a study in pregnant Malawian women and the results indicated that asymptomatic HIV infection is related with increased prevalence of anaemia in pregnancy. It was inferred that HIV infection is associated with increased prevalence and severity of anaemia in pregnancy. This is an added challenge to the control of malaria and worsens the consequences of malaria such as anaemia in pregnancy.

Verhoeff, et al. (1999) conducted another study in Malawi, where it was revealed that HIV infection is associated with a significant increase in malaria prevalence in pregnant women of all parities with the effect

apparent from early gestation. Similar results were found in a study done by Van Eijk, et al. (2001) in Western Kenya where *plasmodium falciparum* parasitaemia was more common among HIV-Seropositive women in all gravidities compared with HIV-Seronegative women. Asymptomatic HIV infection was noted as an important factor in anaemia in pregnancy.

Steketee (2003) further revealed that with the development and rapid expansion of the HIV epidemic, particularly in sub-Saharan Africa investigators have observed the worsening of malaria and its consequences. In malaria endemic settings, women with HIV are at greater risk of malaria, placental malaria infection, and higher density parasitaemias with infection. He also noted that HIV infection and malaria contribute independently to maternal anaemia.

2.3.4 HOOKWORM INFESTATION

Hookworm infestation has been named as part of the cycle causing anaemia in pregnancy. A World Health Organisation report in 1994 stated that 44 million of the developing world's 124 million pregnant women harbored hookworm infection. Furthermore, Stoltzfus, et al. (1997) noted that hookworms are an important cause of anaemia in women who are often overlooked in helminthes control programs. The study conducted by Sharma, et al. (2001) revealed high prevalence of intestinal helminth infections in pregnant women in Delhi. The intestinal infections were directly proportional to severity of anaemia and were seen in 26.7 percent cases in Hb 10-11gm group, 43.5 percent in 8 to 9.9gm group, 72.7 percent in 6 to 7.9 gm group, and 90.9 percent in less than 6 gm group. Steketee (2003) supported these inferences in his study when he stated that intestinal infections are common worldwide but thrive in poor communities in the tropics where poor water supply and poor sanitation are common. The burden of infection is estimated to exceed

1000 million infected persons each for roundworm (*Ascaris Lumbricoides*), hookworm (*Ancylostoma Duodenal* and *Necator Americanus*), and whipworm (*Trichuris Trichiura*). He further noted that hookworm infection causes laceration and enzymatic damage to the mucosa of the small intestines leading to approximately 0.05 ml/d of blood loss per adult *Necator Americanus* and approximately 0.25 ml/d per adult *Ancylostoma Duodenale*. The hypochromic microcytic anaemia follows chronic infection within 3 - 5 months of exposure. The gastro-intestinal blood loss, malabsorption and appetite inhibition may further aggravate the iron, zinc and protein-energy deficiencies and the anaemia in pregnancy. WHO report in 1996 recommended the use of antihelminthic treatment in pregnant women to prevent anaemia in pregnancy.

2.3.5 INTERPREGNANCY INTERVAL

Short inter-pregnancy interval has an adverse effect on maternal health. It is a contributory factor to anaemia in pregnancy. Women who have an inter-pregnancy interval of less than 18 months may not have sufficient time to replace the nutrients used during the previous pregnancy. Iron is a micronutrient that is mobilized from maternal stores during pregnancy for the normal development of the fetus, and the stores tend to remain low for several months after delivery (King, 2003). Thus, the risk of the negative effect of maternal depletion is increased with a shorter period of potential repletion during interpregnancy interval. This occurs at the outset of pregnancy with the result that there is no time for the restitution of iron used and lost during the previous pregnancy and delivery. The demands of the current pregnancy worsen the situation of anaemia.

Mahfouz, et al. (1994) carried out a study on anaemia among pregnant women in the Asir Region, Saudi Arabia, and the results showed the prevalence of 35.2 percent of anaemia among women who had interpregnancy spacing of less than one year. These results were affirmed

by a study done by Lazovic and Pocekova (1996) which revealed that anaemia was greater in a far larger number of women with shorter intervals between deliveries. In the first trimester anaemia was detected in 13.3 percent of pregnant patients while only 7.1 percent in those with longer interval between deliveries. In the second trimester 33.3 percent of pregnant women with shorter time intervals suffered from anaemia and 14.3 percent of those with longer interval. In the third trimester 50 percent of pregnant patients with shorter interval were anaemic in comparison to 21.4 percent of women with longer interval between deliveries. In this study it is seen that the differences in the prevalence of anaemia between the women with short interpregnancy interval and those with longer interval was statistically significant in the second and third trimester which reflects the effect of pregnancy on maternal health.

Furthermore, Conde-Agudelo and Belizán (2000) in their study on maternal morbidity and mortality associated with interpregnancy interval discovered that women with short interpregnancy intervals had highest rates of third trimester bleeding, premature rupture of membranes, puerperal endometritis, anaemia and maternal deaths than did the women with interpregnancy intervals of 18-23 months.

2.3.6 CULTURAL BELIEFS

Other determinants associated with anaemia in pregnancy were the traditional beliefs and cultural practices. This was reflected in a study conducted by Elegbe, et al. (1984) in Nigeria, where they reported that the Nigerian women used traditional black ring pre-soaked in native medicine worn on the middle finger. The women believed that rubbing the black ring on their faces instantly alleviated the disease. No other medicine was taken along with the use of the ring; to do otherwise would show lack of confidence in the black ring. In this study, the women who complained of constant dizziness during pregnancy and used traditional black rings on

their middle fingers as a prophylactic treatment against dizziness during pregnancy were screened for anaemia. Fifty-nine percent (59%) of them were anaemic (haemoglobin less 10gm/100mls of blood). All the women in the experimental group thought that insufficient blood caused dizziness. Wearing of the black ring as prophylaxis against anaemia was mostly practiced by women who were illiterate. These results were similar to findings by MacLeod, and Rhode, (1998) in Tanzania where it was revealed that mothers and their families followed strong cultural beliefs which were detrimental to the mother's health. This was in line with the earlier inferences made by Froozan, et al. (1978) study on maternal and new born iron status; they noted that nutritional anaemia can further be complicated in communities where traditional beliefs and food taboos form an important aspect of one's culture. Marchant, et al. (2002) added that pregnancy-related food taboos restricted the consumption of fish and meat. Thus, cultural beliefs exposed many women to anaemia in pregnancy by restricting their diets.

2.4 CONCLUSION

The reviewed literature shows that the determinants of anaemia in pregnancy are many and they interact to form a complex web of factors associated with anaemia in pregnancy. These include under nutrition (macronutrient and micronutrient); malarial infection, helminthic infection (especially hookworms), and HIV infection; illiteracy; traditional and cultural beliefs. This picture was reflected in the study done by Fleming (1989) on the aetiology of severe anaemia in pregnancy in Ndola, Zambia. He agreed with other researchers that the aetiology of anaemia in pregnancy is usually multiple. In this study, 37 pregnant women who had severe anaemia (haemoglobin of less than 7.0g/dl), 31 (84 Percent) of them were found with *plasmodium falciparum* malaria, 23 (62 percent) were folate deficient, 13 (35 percent) were iron deficient, one had sickle-cell anaemia and one had HIV/AIDS. Folate deficiency was most often

secondary to malarial haemolysis; iron deficiency was nutritional, but hookworm was contributory in about one-third of the patients.

2.5 GAPS IN THE LITERATURE

Anaemia in pregnancy is a major threat to maternal health. It has adverse consequences to both the mother and her child. It contributes to, intrauterine fetal growth retardation and intrauterine fetal death, prematurity, neonatal death, low birth weight, maternal death, lowered resistance to infection, impaired cognition, and reduced physical capacity. This calls for the need to review the determinants of anaemia in pregnancy so that appropriate measures to prevent the disease are put in place. Unfortunately not much research has been done in this area in Lusaka Urban District. This is reflected in the limitation of recent data on the prevalence of anaemia in pregnancy and on the effectiveness of the intervention measures on prevention of anaemia in pregnancy.

Furthermore, most of the studies reviewed anaemia associated with individual factors which gives a limited picture of what really causes the perpetuation of the prevalence of the disease; this study looked at the broad view of the determinants of anaemia in pregnancy.

Most of the studies were cross-sectional studies which are descriptive in nature, while this study used a case-control study design which is analytical in nature and tried to elucidate on the strength of association between the causal factors and anaemia in pregnancy.

2.6 JUSTIFICATION FOR THE STUDY

CSO, et al. (2003) recorded the maternal mortality ratio of 729 deaths per 100,000 live births which was higher than the estimates from the 1996 ZDHS. Anaemia in pregnancy being one of the major contributory factors to maternal death, still and poses a threat to many lives. Though the

definite figures of the prevalence of anaemia in pregnancy are not reflected in the ZDHS, it acknowledged that iron-deficiency anaemia is a *major threat to maternal health* (CSO, et al.2003). This study examined the determinants of anaemia in pregnancy in Lusaka Urban District. Reports of anaemia in pregnancy in Lusaka Urban District is inconsistent; most of the health centres record the women with Hb of less than 10 grams/dl of blood irregularly due to short supply of Hb estimation kits. However, available records indicate that anaemia in pregnancy exists at the district level, for example, Kanyama health centre recorded 56 percent of anaemia in pregnancy cases in the first quarter of 2003. The problem of under-reporting may cause planners to pay little attention to anaemia. Yet the problem is adversely affecting the health of women and their children. Anaemia deserves more attention than is currently receiving.

Beyond fulfilling the dissertation requirement for the Masters of Public in Health results of the study on the determinants of anaemia in pregnancy will help in the development of appropriate preventive strategies to control the disease. This will help avert maternal deaths attributed to anaemia in pregnancy and other adverse effects caused by the disease on the mother and her child. Furthermore, prevention of anaemia in pregnancy would preserve millions worth of productivity which could be lost during the time due to anaemia among women.

2.7 RESEARCH QUESTION

Despite all the intervention programmes against anaemia in pregnancy in Zambia, why does anaemia in pregnancy persist in communities?
What are the determinants of anaemia in pregnancy?

2.8 HYPOTHESIS

There is no association between anaemia in pregnancy and non-compliance with preventive intervention against anaemia in pregnancy.

CHAPTER 3

3.0 OBJECTIVES

3.1 GENERAL OBJECTIVE

To determine factors associated with of anaemia in pregnancy in Lusaka urban district so as to make recommendations to relevant authorities for the development of appropriate strategies.

3.2 SPECIFIC OBJECTIVES

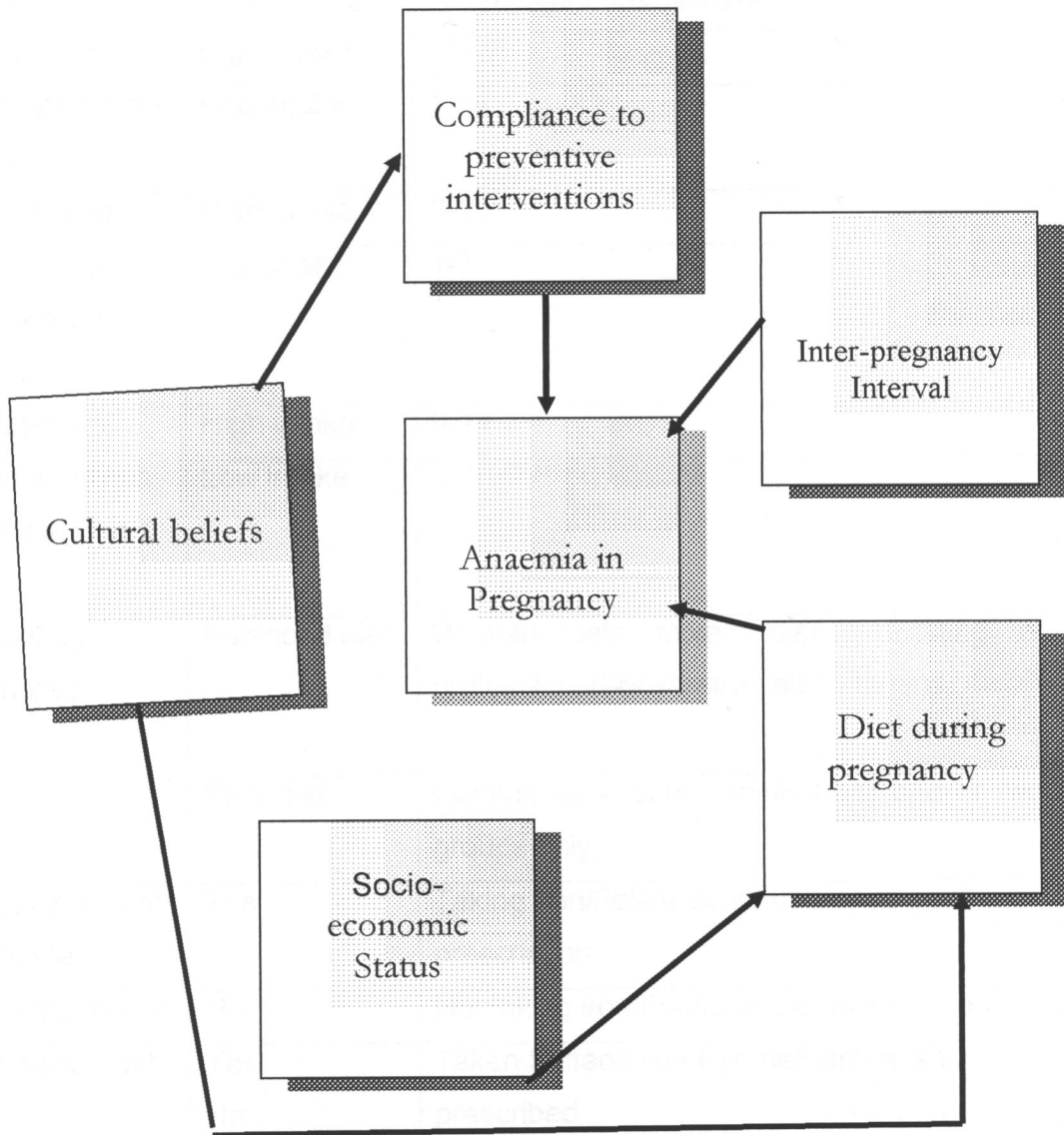
1. To determine association between socio-economic factors and anaemia in pregnancy.
2. To establish whether foods commonly eaten by pregnant women is associated with anaemia in pregnancy.
3. To ascertain whether non-adherence to the preventive interventions against anaemia in pregnancy contributes to anaemia in pregnancy.
4. To establish whether short interpregnancy interval contributes to anaemia in pregnancy.
5. To determine whether cultural beliefs and practices is associated with anaemia in pregnancy.
6. To make recommendations to policy makers, reproductive health care providers and NGOs on the appropriate interventions for prevention of anaemia in pregnancy

CHAPTER 4

4.0 RESEARCH METHODOLOGY

4.1 CONCEPTUAL FRAMEWORK

FIGURE 2: Interrelationship Links of Dependent and Independent Variables



These are the variables which will be used for analysis.

Table 2 (a): Conceptual Framework on Variables

VARIABLE	INDICATORS	SCALE OF MEASUREMENT
Anaemia in pregnancy	Absent	Hb of 11 and more gms /dl of blood
	Present	Hb < 11 grams/dl of blood
Interpregnancy interval	Safe interval	36 months and more
	Short interval	<36 months
Socio-economic status	High	Respondent employed
	Low	Respondent unemployed
Frequency of eating grains in 7 days	High intake	15-28
	Low intake	1-14
Frequency of eating green vegetables in 7 days	High intake	8-14
	Low intake	1-7
Frequency of eating fruits rich in vitamin C in 7 days	High intake	8-14
	Low intake	1-7
Diet during pregnancy	Balanced diet	Woman eats mixed diet consisting of proteins, carbohydrates, and vitamins.
	Poor diet	Woman eats foods mainly from one or two groups only.
Compliance with iron/folate supplementation	Yes	Taking iron/Folate continuously as per prescription
	No	Not taking iron/Folate as per prescription
Compliance with IPT	Yes	Taken Sulfadoxine Pyrimethamine as prescribed
	No	Not taken Sulfadoxine Pyrimethamine

Table 2 (b): Conceptual Framework on Variables

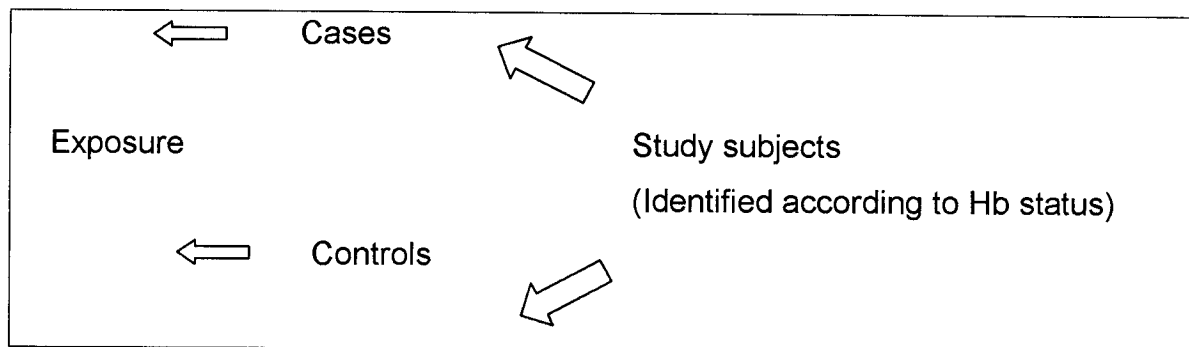
VARIABLE	INDICATORS	SCALE OF MEASUREMENT
Use of ITN	Yes	Uses ITN always
	No	Not using ITN
Always wears shoes when doing daily activities	Yes	Wears Shoes
	No	Does not wear shoes
HIV infection	Yes	HIV positive
	No	HIV Negative
Cultural beliefs and practices	Yes	Has food restrictions in the culture
	No	No food restrictions

These are the sub groups of the main variables in figure 2

4.2 RESEARCH DESIGN

The purpose of this study was to determine the factors associated with anaemia in pregnancy in Lusaka District Health Centres. To achieve this case-control research design was used. Case-control study is often called a retrospective study and is a common approach to test causal hypothesis (Park, 2002). The case-control study is an analytic epidemiologic research design in which the study population consists of groups who either have or do not have the disease.

Figure 3: Definition of Comparison Groups in Case-Control Studies



Source: Becerra et al. 1991

The cases were antenatal women attending antenatal clinic between the period of October-November, 2005 who were found with haemoglobin of less than 11 grams /dl of blood.

The control group were antenatal women attending antenatal clinic during the same period and were found with Hb of more than 11 grams/dl of blood.

For each woman attending antenatal clinic a sample of blood were collected for estimation of Hb. The women were assigned as cases or controls on the basis of their Hb level.

Both groups were matched by the level of haemoglobin, compliance to preventive measures, mentioned belief system and practice, diet during pregnancy and demographic characteristics.

4.3 RESEARCH SETTING

The study was conducted in Lusaka Urban District. Lusaka is a cosmopolitan city, as it is the centre of commercial, industrial, political, and Governmental activities of the country. It is the capital city, situated in Lusaka province in the Central part of Zambia. It is located about 1280 meters above the sea level on the Southern part of Central African Plateau. It lies at 28 degrees 10' east of the Greenwich Meridian and 15 degrees 30' south of the Equator (LDHMT, 2004). The district has the surface area of 360 square kilometers. Lusaka district share borders with the following districts: Chongwe to the east, Mumbwa to the west, Chibombo to the north, and Kafue to the south. Its boundaries extend from Zani Muone Motel in the north, Chilanga in the south, Garden House Motel in the west, and International Airport turn off in the east (LDHMT, 2004).

The population of Lusaka district is 1,558,616. The population of women in the child-bearing age (15-45 years) in Lusaka is 342,895. The expected pregnancies are 84,165. The density for Lusaka province is 65.4 persons per square kilometers. Lusaka is the most urbanized and the most densely populated in the country and within the region. The national growth rate is 2.9 percent while that of Lusaka is 4.0 percent, making it the second highest after Northern Province, which is at 4.3 percent. The fertility rate for Lusaka Province

is 6.0 children per woman. The average national life expectancy is 48 years, with the woman having on average, a longer life span of about 4 years than men (LDHMT, 2004).

Lusaka Urban District is responsible for the provision of Primary Health Care (PHC), thus LUHMB offers preventive, promotive and curative services. The district is subdivided into four operational areas known as sub-districts, in order to facilitate the administration and provision of the district health care package. The district is running 30 health facilities. There are 26 health centres offering antenatal care. The study was conducted in five of these centres which were selected purposively. The setting was selected because the health centres are the first level of health care and therefore, see many antenatal cases.

4.4 STUDY POPULATION

The study population included 300 pregnant women in the second and third trimester of gestation, between the ages of 15- 49 years, attending antenatal clinic in the five selected health centres (out of 26) in Lusaka Urban District, during the period of October-November, 2005. Each pregnant woman was taken as a sampling unit.

4.5 INCLUSION CRITERIA

4.5.1 Cases:

Pregnant women in the second and third trimester of gestation, attending antenatal clinic in Lusaka Urban District who had the haemoglobin of less than 11g /dl of blood were included as cases in the study.

4.5.2 Controls:

Pregnant women in the second and third trimester of gestation, attending antenatal clinic in Lusaka District who had the haemoglobin of 11g/ dl of blood and more were included in the study as controls.

4.6 EXCLUSION CRITERIA

Pregnant women in the first trimester of gestation, attending antenatal clinic in Lusaka Urban District were excluded from the study.

4.6.1 Cases:

The following women in the second and third trimester of gestation, who had the haemoglobin of less than 11g/dl of blood, were excluded from the study as cases:

- Those who presented with dizziness and weakness.
- Those living outside Lusaka.

4.6.2 Controls:

The women in the second and third trimester of gestation who had the haemoglobin of 11g/dl of blood and more living outside Lusaka were excluded from the study as controls.

4.7 SAMPLING AND SAMPLE SIZE DETERMINATION

4.7.1 SAMPLE SELECTION

The Lusaka Urban District has 26 Health centres which provide antenatal care to the communities in their catchment areas. These communities vary in size and economic status. This makes the health centres to be heterogeneous. For this reason, I used a purposive sampling method was used in the selection of the health centres included in the study. Purposive sampling is a nonprobability sampling design where the sample units are selected subjectively by the researcher, who attempts to obtain a sample that appears to her/him to be representative of the population (Nachmias and Nachmias, 1981). The chance that a particular sample unit will be selected for the sample depends upon the subjective judgment of the researcher. A sample is built up which enables the researcher to satisfy the needs in a project (Robson, 1993). The health centres which were included in the study were those whose catchment areas are densely populated with low economic status, and have poor environmental conditions. These communities are also likely to have high prevalence of anaemia in pregnancy. The health centres selected were: Chawama Health Centre, Matero

Main Health Centre, Mandevu Health Centre, Ng'ombe Health Centre, and Bauleni Health Centre.

To get the required sample of 300 subjects, study units were selected from selected health centres using the systematic sampling method. Systematic sampling method is a probability sampling design which involves the selection of study units at fixed intervals from a list (Becerra et al. 1991). Using systematic sampling procedure, the antenatal women attending antenatal clinic during the period of October-November, 2005 were chosen at regular intervals from the sampling frame. The cases and the controls were sampled separately. Since the cases were fewer than the controls they were selected at an interval of 1 in 2 from the sampling list of cases. The controls were selected at the interval of 1 in 5 from the sampling list of controls. The women were included in the study as either cases or controls on the basis of their Hb level.

SELECTION OF CASES

The cases are the antenatal women found to have haemoglobin of less than 11 grams/dl of blood.

These women were identified by:

a). (i) Diagnostic Criteria:

- **Signs and symptoms:** Pallor of the mucosae, and heart palpitations.
- **Laboratory Investigation:** A blood sample for haemoglobin estimation which showed the Hb level of less than 11 grams/dl of blood.

(ii) Eligibility Criteria: All the cases of anaemia diagnosed between the periods of October-November, 2005 were eligible to be included as cases in the study.

b). Sources of Cases: The cases were drawn from the five selected health centres in Lusaka Urban District.

SELECTION OF CONTROLS

The controls are the antenatal women with the Hb of more than 11 grams/dl of blood (without anaemia).

Sources of Controls: The controls were drawn from the five selected health centres in Lusaka Urban District. These women were those attending the antenatal clinic during the same period as cases. They underwent screening for anaemia and were found with no disease.

4.7.2 SAMPLE SIZE DETERMINATION

To determine the factors associated with anaemia in pregnancy in order to increase the compliance to preventive intervention programmes against anaemia from 42 percent (Ekström, et al., 1996) to 62 percent using the two independent groups as cases and controls. The sample size was determined by the use of the formula:

$$n = \frac{P_1 Q_1 + P_2 Q_2}{(P_1 - P_2)^2} \cdot f(\alpha, \beta)$$

Where:

P₁=the likely percentage in the control group

P₂= the percentage in the experimental group, which I wished to have a good chance of detecting as difference from P₁

Q = (100-P)

Using a two-tailed test at 5 percent significant level for the power of 90 percent

Table 3: Values for f (α,β)

Significance Level, α				
	One- tailed test		Two-tailed test	
Power, 1 -β	0.05	0.01	0.05	0.01
0.5	2.71	5.41	3.84	6.63
0.8	6.18	10.04	7.85	11.68
0.9	8.56	13.02	10.51	14.88

Source: Dobson, 1984

$$n = \frac{42(100-42) + 62(100-62)}{(42-62)^2} * 10.51$$

$$n = \frac{42*58 + 62*38}{(-20)^2} * 10.51$$

$$n = \frac{2436 + 2356}{400} * 10.51$$

$$n = \frac{4792}{400} * 10.51$$

$$n = 125.9$$

$$n = 126$$

Expecting the response rate of 90 percent the required number in each of the groups (cases and controls) was:

$$126/0.9 = 140$$

Thus, we had two independent samples of 150 subjects each.

4.8 DATA COLLECTION

Data for independent variables that were hypothesized to be related to anaemia in pregnancy was collected by administering an interview schedule using a structured questionnaire. The questionnaire had closed and open-ended questions. This instrument was chosen because it had the advantage of being administered even to respondents who could not read and write.

Data collection was done with the help of two research assistants. Training of the research assistants was at Chilenje Health Centre after permission to conduct the study was granted by the concerned institutions. The training period was one week and was conducted a week before data for the main study was collected.

In addition, peripheral blood slides from 60 respondents were prepared and stained with Giemsa and read for malarial parasites by an experienced

technician. Stool samples were collected for microscopic examination for presence of ova and were examined by the same technician. The presence of ova was an indication of helminthic infection. The laboratory examinations were done at Chamawa Health Centre laboratory. I wanted to collect and examine the blood slides and stool from all respondents but was advised to do it from one health centre by the DHMT due to major interventional studies been undertaken on PMTCT targeting the pregnant women in the District. A checklist was used to record the results of each respondent.

The records review for Hb and HIV results was done. Hb estimation is done routinely on every antenatal woman attending the clinic on the first visit. HIV test is also done routinely on antenatal women after VCT.

4.9 DATA ANALYSIS

All questionnaires were checked for completeness and accuracy at the time of collecting questionnaires from the research assistants. The questionnaires were then given identification numbers serially from 001 to 300. Content analysis was used to analyse the open-ended responses. This is the process of organising and integrating the narrative information according to emerging themes and concepts (Polit and Hungler, 1995). This was done by transcribing all the open-ended responses and categorizing them. Codes were assigned to all responses for both qualitative and quantitative data. The data was then entered and analyzed using SPSS for Windows 11.5 version. The analysis consisted of cross-tabulation tables and graphs. Discrete and continuous variables were compared using Chi-Squared (χ^2) test. Odds Ratio was done to determine the strength of association between the dependent and independent variables. Statistical significance was achieved if $P < 0.05$. Then a multivariate logistic regression analysis was done to control for confounding factors.

4.10 ETHICAL CONSIDERATION

Ethical approval for the study was granted by Research Ethics Committee of the School of Medicine at University of Zambia. Permission was obtained in writing

from the Director of DHMT, with copies to the Health Centres in-charges of the research sites. This was in recognition of the respective authorities and to gain cooperation. Written consent was obtained from each respondent after explaining to them fully the purpose of the study. Participation was voluntary, confidentiality and privacy were maintained. The questionnaires were assigned numbers instead of individual names.

4.11 PRETEST OF THE QUESTIONNAIRE

Pre-test of the questionnaire refers to a small-scale trial of the research component. The pre-test was conducted at Chilenje Health Centre. This was done to assess reliability, validity, appropriateness and sequence of questions. The outcome of the pre-test helped to refine the research instrument before the main study. It also helped to evaluate the success of the training of research team.

CHAPTER 5

5.0 PRESENTATION OF FINDINGS

5.1 INTRODUCTION

The findings are from data obtained from 300 pregnant women attending antenatal clinic in Lusaka Urban District. Data was collected over the period of two months from five (5) different health centres. The data analysis was done using SPSS Software package, and it was done in two stages. The first stage was the bivariate analysis to assess the affect of social demographic characteristics, obstetric characteristics, socio-economic factors, foods commonly eaten by pregnant women, compliance to preventive interventions against anaemia in pregnancy, HIV infection and cultural beliefs/practices. The Chi-squared test was used to identify significant factors associated with anaemia in pregnancy. Then Multivariate analysis was performed using the logistic regression to control for confounders that were significant during the bivariate analysis to assess which factors were independently associated with anaemia in pregnancy. The findings of the study have been presented in table form and bar graphs. This was found to be appropriate because tables and graphs summarised the results in a meaningful way, which facilitated understanding of the study findings.

5. 2 SOCIAL DEMOGRAPHIC CHARACTERISTICS

Table 4 shows the analysis of the association between the distribution of demographic characteristics and the occurrence of anaemia in pregnancy. A significant association was observed between educational level and anaemia in pregnancy ($p=0.001$), with more cases (72.0%) than controls (52.7%) among the respondents who had no/primary education.

Table 4: Demographic Characteristics and Anaemia in Pregnancy

Demographic Characteristics	Anaemia in Pregnancy					
	Cases		Controls		x ²	P Value
Age (in years)	n	(%)	n	(%)		
14-19	21	(14.0)	36	(24.0)		
20-24	53	(35.3)	50	(33.3)		
25-29	43	(28.7)	32	(21.3)		
30 and above	33	(22.0)	32	(21.3)		
Total	150	(100.0)	150	(100.0)	5.66	0.129
Educational Level						
No/primary education	108	(72.0)	79	(52.7)		
Secondary and above	42	(28.0)	71	(47.3)		
Total	150	(100.0)	150	(100.0)	11.94	0.001
Marital Status						
Married	143	(95.3)	135	(90.0)		
Others*	7	(4.7)	15	(10.0)		
Total	150	(100.0)	150	(100.0)	3.13	0.076

* Single, Widowed, Divorced and Separated.

5.3 OBSTETRIC CHARACTERISTICS

Table 5 shows the obstetric characteristics of the respondents in relation with the occurrence of anaemia in pregnancy. There is a significant association observed between parity and anaemia in pregnancy ($p=0.032$), with more cases (50.7%) than controls (39.3%) among those who had 1-2 children. The results further show a significant association ($p=0.003$) with more cases (79.5%) than

controls (61.2%) among the respondents who had the interpregnancy interval of less than 36 months. The Primigravidae were not included in the analysis.

Table 5: Obstetric Characteristics and Anaemia in Pregnancy

Obstetric Characteristics						
	Anaemia in Pregnancy					
Gravida	Cases		Controls		x ²	P Value
	n	(%)	n	(%)		
1-2	68	(45.3)	83	(55.3)		
3-4	56	(37.3)	50	(33.3)		
5 and more	26	(17.3)	17	(11.3)		
Total	150	(100.0)	150	(100.0)	3.71	0.156
Parity	Cases		Controls		x ²	P Value
	n	(%)	n	(%)		
0	33	(22.0)	53	(35.3)		
1-2	76	(50.7)	59	(39.3)		
3 and more	41	(27.3)	38	(25.3)		
Total	150	(100.0)	150	(100.0)	6.90	0.032
Interpregnancy Interval						
Less than 36 months	93	(79.5)	63	(61.2)		
36 months and more	24	(20.5)	40	(38.8)		
Total	117	(100.0)	103	(100.0)	8.91	0.003
Antenatal booking in weeks of gestation						
0-12	22	(14.7)	19	(12.7)		
13-24	97	(64.7)	114	(76.0)		
25-36	31	(20.7)	17	(11.3)		
Total	150	(100.0)	150	(100.0)	5.67	0.05

5.4 SOCIO-ECONOMIC FACTORS

Table 6 shows the analysis of association between socio-economic status of the respondents and anaemia in pregnancy. The occupation of the respondents and that of their husbands were used to assess the economic status of the respondents. A significant association was observed between occupation of respondents and anaemia in pregnancy ($p < 0.001$), with more cases (91.3%) than controls (66.7%) among the respondents who were unemployed.

Table 6: Socio-economic Status and Anaemia in Pregnancy

Table 6: Socio-economic Status and Anaemia in Pregnancy						
	Cases		Controls		x ²	P Value
Occupation	n	(%)	n	(%)		
Unemployed	137	(91.3)	100	(66.7)		
Employed	13	(8.7)	50	(33.3)		
Total	150	(100.0)	150	(100.0)	27.51	<0.001
Husband's						
Occupation						
Unemployed	54	(37.8)	50	(36.2)		
Employed	89	(62.2)	88	(63.8)		
Total	143	(100.0)	138	(100.0)	0.071	0.79

5.5 FOODS COMMONLY EATEN BY PREGNANT WOMEN

Tables 7a and 7b show the analysis of association between foods commonly eaten by pregnant women and anaemia in pregnancy. A significant association was observed between the frequency of eating foods from grains and anaemia in pregnancy ($p = 0.041$) with more controls (85.3%) than cases (76.0%) in the respondents who ate grains for 15-28 times in 7 days. A significant association was also observed between the frequency of eating green vegetables (spinach, pumpkin leaves, sweet potato leaves and 'bondwe') and anaemia in pregnancy

($p < 0.001$) with more cases (82.7%) than controls in the respondents who ate the vegetables for 1-7 times in 7 days. Another significant association was observed between the frequency of eating fruits rich in vitamin C and anaemia in pregnancy ($p = 0.006$) with more cases (71.3%) than controls (56.0%) among respondents who ate fruits for 1-7 times in 7 days. One more significant association was observed between the frequency of eating proteins (beef, chicken, fish or eggs) and anaemia in pregnancy ($p < 0.001$), with more cases (88.7%) than controls (58.7%) in the respondents who ate proteins for 1-7 times in 7 days. Additionally, there was a significant association observed between balanced diet and anaemia in pregnancy ($p < 0.001$) with more cases (74.0%) than controls (24.7%) in the respondents who had poor diet.

Table 7a: Foods commonly eaten by Pregnant Women and Anaemia in pregnancy

Foods commonly Eaten by Pregnant Women		Anaemia in Pregnancy				
Frequency of eating foods from Grains* in 7 days	Cases		Controls		x²	P Value
	n	(%)	n	(%)		
1-14	36	(24.0)	22	(14.7)		
15-28	114	(76.0)	128	(85.3)		
Total	150	100.0)	150	(100.0)	4.19	0.041
Frequency of eating green vegetables** in 7 days						
1-7	124	(82.7)	44	(29.3)		
8-14	26	(17.3)	106	(70.7)		
Total	150	(100.0)	150	(100.0)	86.59	<0.001
Frequency of eating fruits*** rich in Vitamin C in 7 days						
1-7	107	(71.3)	84	(56.0)		
8-14	43	(28.7)	66	(44.0)		
Total	150	(100.0)	150	(100.0)	7.62	0.006

*Bread, rice, millet, sorghum, or maize.

** Spinach, pumpkin leaves, sweet potato leaves or 'bondwe'.

*** Bananas, apples, avocados, oranges, lemons or tomatoes.

Table 7b: Foods commonly eaten by Pregnant Women and Anaemia in pregnancy

Foods commonly Eaten by Pregnant Women		Anaemia in Pregnancy					
Frequency of eating proteins **** in 7 days.	Cases		Controls		x ²	P Value	
	n	(%)	n	(%)			
1-7	133	(88.7)	88	(58.7)			
8-14	17	(11.3)	62	(41.3)			
Total	150	(100.0)	150	(100.0)	34.80	<0.001	
Diet during Pregnancy							
Balanced Diet*****	39	(26.0)	113	(75.3)			
Poor Diet	111	(74.0)	37	(24.7)			
Total	150	(100)	150	(100)	73.03	<0.001	

****Beef, chicken, fish or eggs.

***** Diet consisting of carbohydrates, proteins, and vitamins

5.6 COMPLIANCE WITH PREVENTIVE INTERVENTIONS AGAINST ANAEMIA IN PREGNANCY

The following tables show the results on compliance with preventive interventions which are done to prevent anaemia in pregnancy as part of antenatal services. These include: iron/folate supplementation; information, education and communication (IEC) on prevention against anaemia in pregnancy; prevention against malaria; and prevention against worm infection.

5.6.1 Compliance with Supplementation of Iron and Folate

Table 8 shows the analysis of association between compliance with supplementation of Iron and Folate and occurrence of anaemia in Pregnancy. A significant association was observed between being given Iron/Folate tablets and instructions on how to take the drugs for supplementation and anaemia in pregnancy ($p=0.019$) with more controls (88.7%) than cases (78.7%) among the

respondents who were given drugs and instructions. Another association was observed between compliance with the supplementation of Iron/Folate and anaemia in pregnancy ($p < 0.001$), with more controls (83.3%) than cases (43.2%) among the respondents who complied with the supplementation of Iron/Folate tablets. The respondents who did not receive the drugs were excluded in the analysis. Furthermore, a significant association was observed between the availability of drugs for supplementation and anaemia in pregnancy ($p = 0.005$), with more controls (86.4%) than cases (71.2%) among the respondents who said that the drugs were available at the health centre.

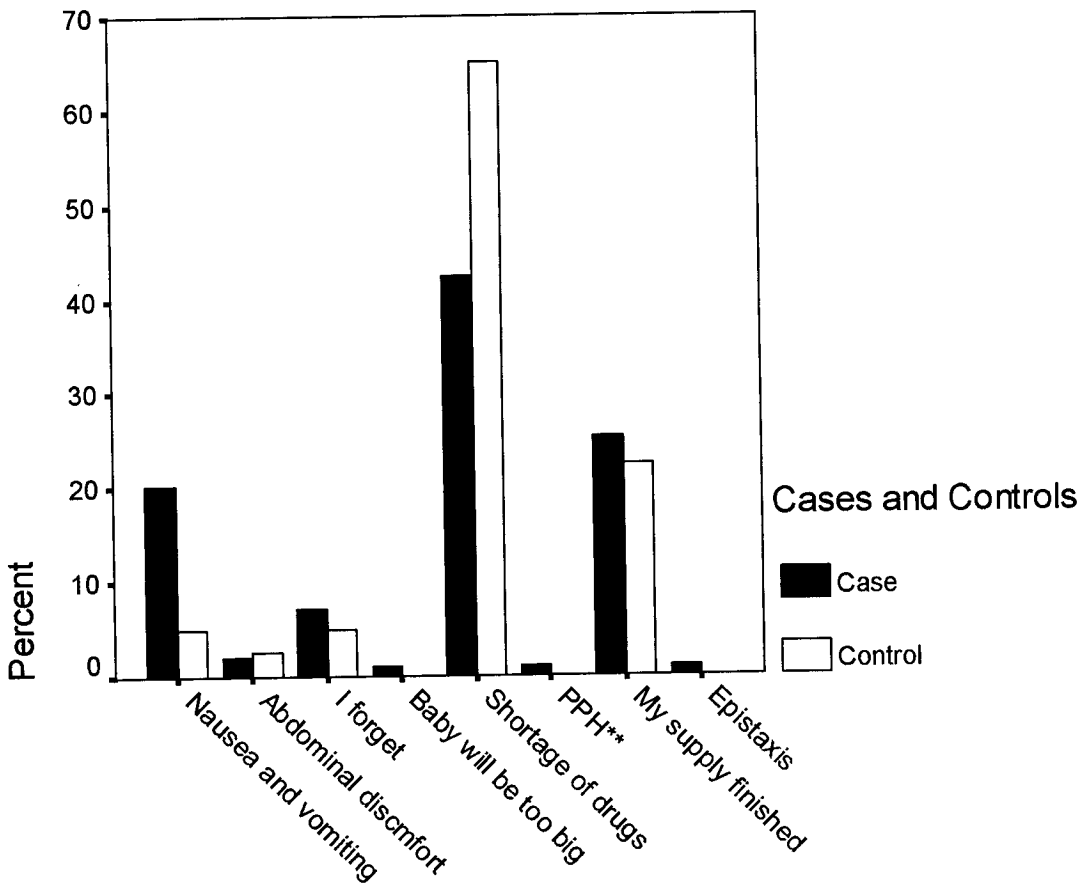
Table 8: Compliance with Supplementation of Iron/ Folate tablets and Anaemia in Pregnancy

Compliance with Iron and Folate Supplementation			Anaemia in Pregnancy			
Given Iron/Folate tables and Instructions.	Cases		Controls		x²	P Value
	n	(%)	n	(%)		
Yes	118	(78.7)	133	(88.7)		
No	32	(21.3)	17	(11.3)		
Total	150	(100.0)	150	(100.0)	5.49	0.019
Compliance with Supplementation of Iron/Folate						
Yes	51	(43.2)	110	(83.3)		
No	67	(56.8)	22	(16.7)		
Total	118	(100.0)	132	(100.0)	41.73	<0.001
Are Iron/Folate tablets always available at the Health Centre						
Yes	84	(71.2)	114	(86.4)		
No	34	(28.8)	18	(13.6)		
Total	118	(100.0)	132	(100.0)	7.92	0.005

Figure 4 shows the reasons for non-compliance with the supplementation of Iron/Folate tables, with more controls (65.0%) than cases (42.4%) among the respondents who gave the shortage of drugs as a reason for non-compliance. However, the figure also shows other reasons for non-compliance where there were more cases than controls. This reflects the attitude of respondents and

the myths associated with iron/folate supplementation. These include nausea and vomiting, forgetting to take the drugs, baby will be too big; the drugs cause PPH and epistaxis. Others did not comply because their supply finished before the review date.

Figure 4: Reasons for non-compliance with supplementation of Iron/Folate



** Post Partum Haemorrhage

5.6.2 Information on how to prevent Anaemia in Pregnancy

Table 9 shows analysis of association between receiving information on how to prevent anaemia in pregnancy and anaemia in pregnancy. There was no association observed. Furthermore, only one (0.3%) respondent got information on prevention of anaemia in pregnancy from the media (TV and

radio) and she was a control. This shows that sources of information are not effective tools of preventing anaemia in pregnancy.

Table 9: Information on Prevention of Anaemia in Pregnancy and Anaemia in Pregnancy

Information on Prevention of Anaemia in Pregnancy		Anaemia in Pregnancy				
Received Information	Cases		Controls		x²	P Value
	n	(%)	n	(%)		
Yes	66	(44.0)	73	(48.7)		
No	84	(56.0)	77	(51.3)		
Total	150	(100.0)	150	(100.0)	0.66	0.418
Type of Information given						
Adequate	9	(13.6)	11	(15.1)		
Inadequate	57	(86.4)	62	(84.9)		
Total	66	(100.0)	73	(100.0)	0.06	0.810

5.6.3 Prevention against Malaria in Pregnancy

Tables 10a and 10b show the comparison of association between compliance with prevention against malaria in pregnancy and anaemia in pregnancy. There are two main measures of prevention against malaria in pregnancy. These include: intermittent presumptive treatment (IPT) and the use of insecticide treated mosquito nets (ITNs). A significant association between the type of mosquito nets used and anaemia in pregnancy ($p=0.031$) with more controls (79.2%) than cases (60.3%) among the respondents who used ITNs.

Then a sub- sample of 60 respondents had blood slides taken for laboratory examination for malarial parasites, all of them were negative.

Table 10a: Compliance with prevention against Malaria in Pregnancy and Anaemia in Pregnancy

Compliance with prevention against malaria		Anaemia in Pregnancy				
Malaria during the present Pregnancy	Cases		Controls		x²	P Value
	n	(%)	n	(%)		
Yes	55	(56.7)	42	(43.3)		
No	95	(46.8)	108	(53.2)		
Total	150	(100.0)	150	(100.0)	2.58	0.109
Was blood slide taken						
Yes	26	(50.0)	19	(51.4)		
No	26	(50.0)	18	(48.6)		
Total	52	(100.0)	37	(100.0)	0.01	0.929
B/S results for malaria parasite						
Positive	17	(65.4)	9	(47.4)		
Negative	9	(34.6)	10	(52.6)		
Total	26	(100.0)	19	(100.0)	0.82	0.367
Compliance with IPT*						
Yes	144	(96.0)	147	(98.0)		
No	6	(4.0)	3	(2.0)		
Total	150	(100.0)	150	(100.0)	1.03	0.310

* Intermittent Presumptive Treatment

Table 10b: Compliance with prevention against Malaria in Pregnancy and Anaemia in Pregnancy

Compliance with prevention against malaria		Anaemia in Pregnancy				
Number of doses of SP taken as IPT during this pregnancy.	Cases		Controls		x²	P Value
	n	(%)	n	(%)		
One	63	(42.0)	53	(35.3)		
Two	56	(37.3)	62	(41.3)		
Three	25	(16.7)	32	(21.3)		
Never taken SP	6	(4.0)	3	(2.0)		
Total	150	(100.0)	150	(100.0)	3.03	0.388
IPT given by DOTS**						
Yes	113	(78.5)	123	(83.7)		
No	31	(21.5)	24	(16.3)		
Total	144	(100.0)	147	(100.0)	1.28	0.257
Used mosquito net						
Yes	58	(38.7)	53	(35.3)		
No	92	(61.3)	97	(64.7)		
Total	150	(100.0)	150	(100.0)	0.36	0.550
Type of mosquito net used						
ITN***	35	(60.3)	42	(79.2)		
Untreated mosquito net	23	(39.7)	11	(20.8)		
Total	58	(100.0)	53	(100.0)	4.66	0.031

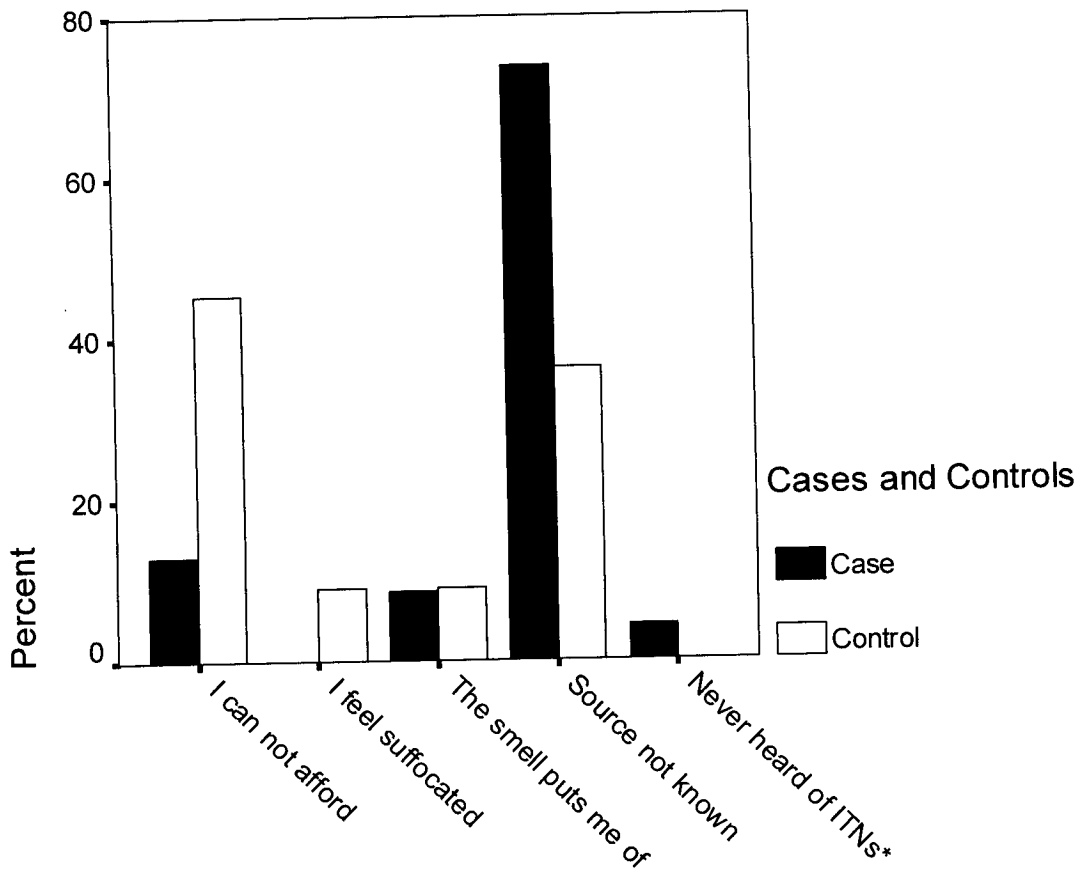
** Directly Observed Treatment Short Course

*** Insecticide Treated mosquito Net

Figure 5 is a bar graph showing the reasons for not using ITNs for prevention against Malaria, with more cases (73.9%) than controls (36.4%) among the

respondents who did not know where to buy the ITNs. A significance test between the respondents who knew where to buy the ITNs and those who did not know was valid ($p=0.044$).

Figure 5: Reasons for not using ITNs



* Insecticide Treated mosquito Nets

5.6.4 Compliance with prevention against worm infestation

Table 11 shows analysis of association between compliance with prevention against worm infestation and anaemia in pregnancy. A significant association was observed between wearing shoes for prevention of hookworm infection and anaemia in pregnancy ($p=0.040$) with more cases (70.0%) than controls (58.7%) among the respondents who did not always wear shoes when doing daily activities like sweeping the surroundings and gardening.

Table 11: Compliance with prevention against Worm Infestation and Anaemia in Pregnancy

Compliance with Prevention against Worm Infestation			Anaemia in Pregnancy		x²	P Value
	Cases		Controls			
	n	(%)	n	(%)		
Eating Soil						
Yes	70	(46.7)	75	(50.0)		
No	80	(53.3)	75	(50.0)		
Total	150	(100.0)	150	(100.0)	0.33	0.563
Dewormed during present Pregnancy						
Yes	140	(93.3)	139	(92.7)		
No	10	(6.7)	11	(7.3)		
Total	150	(100.0)	150	(100.0)	0.05	0.821
Pass/Vomit any Worm after deworming						
Yes	47	(33.6)	44	(31.7)		
No	93	(66.4)	95	(68.3)		
Total	140	(100.0)	139	(100.0)	0.12	0.733
Always wear shoes when doing daily activities						
Yes	45	(30.0)	62	(41.3)		
No	105	(70.0)	88	(58.7)		
Total	150	(100.0)	150	(100.0)	4.20	0.040

5.7: HIV INFECTION AND ANAEMIA IN PREGNANCY

Table 12 shows analysis of association between HIV infection and anaemia in pregnancy. A significant association was observed between HIV infection and anaemia in pregnancy, with more cases (28.8%) than controls (15.0%) in the respondents who were HIV positive. The respondents who were not tested were excluded.

Table12: HIV Infection and Anaemia in Pregnancy

HIV Infection	Anaemia in pregnancy				x ²	P Value
	Cases n	(%)	Controls n	(%)		
Positive	40	(28.8)	20	(15.0)		
Negative	99	(71.2)	113	(85.3)		
Total	139	(100.0)	133	(100.0)	7.46	0.006

5.8 CULTURAL BELIEFS/ PRACTICES

Table 13 shows the analysis of association between cultural beliefs and practices. No association was observed.

Table 13: Cultural Beliefs and Practices and Anaemia in Pregnancy

Cultural beliefs & practices	Anaemia in Pregnancy				x ²	P Value
	Cases n	(%)	Controls n	(%)		
Any food restrictions?						
Yes*	27	(18.0)	18	(12.0)		
No	123	((82.0)	132	(88.0)		
Total	150	(100.0)	150	(100.0)	2.12	0.146

*Restricted from eating pork, eggs, game meat, bubble fish, bananas, beans and cabbage during pregnancy.

5.9 MULTIVARIATE ANALYSIS

Table 14 shows the multivariate analysis using logistic regression to control for confounding factors that were significant during the bivariate analysis. The results show that the respondents who were unemployed were 22.70 (p=0.006) times more likely to have anaemia in pregnancy than those who were employed.

In relation to the frequency of eating green vegetables in 7 days; the respondents who had green vegetables for 1-7 times in 7 days were 16.20 ($p=0.001$) times more likely to have anaemia in pregnancy than those who had green vegetables for 8-14 times in 7 days.

In relation to diet during pregnancy; the respondents who had balanced diet during pregnancy were 80 percent ($p=0.044$) less likely to have anaemia in pregnancy compared to those who had poor diet.

Additionally, in relation to supplementation of Iron/Folate tablets; the respondents who complied with supplementation of Iron/Folate tables were 89 percent (0.040) less likely to have anaemia in pregnancy compared to those who did not comply.

Table 14: Multivariate Analysis

FACTOR	OR	(95%CI)
Occupation		
Unemployed	22.70	(2.47,209.09)
Employed	Referent	
Frequency of eating green vegetables		
1-7	16.20	(2.92,90.05)
8-14	Referent	
Diet during Pregnancy		
Balanced diet	0.20	(0.04, 1.02)
Poor diet	Referent	
Compliance with Iron/Folate supplementation.		
Yes	0.11	(0.01,0.95)
No	Referent	

CHAPTER 6

6.0 DISCUSSION OF FINDINGS

6.1 INTRODUCTION

A case control study was conducted on the determinants of anaemia in pregnancy in Lusaka Urban District. The results were based on the analysis of the responses from 300 pregnant women drawn from 5 Health Centres in the district and these included: Chawama Health Centre, Matero Main Health Centre, Mandevu Health Centre, Ng'ombe Health Centre and Bauleni Health Centre. These health centres were selected using purposive sampling method. These health centres were selected because their catchment areas are densely populated with low economic status and have poor environmental conditions. These communities are also likely to have high prevalence of anaemia in pregnancy.

The study population comprised of pregnant women in the second and third trimester of gestation, between the ages of 15-49 years attending antenatal care services in Lusaka Urban District. The women were selected using systematic sampling method. Each woman was included in the study after giving an informed written consent as either a case or control on the basis of her Hb level.

Anaemia in pregnancy has serious consequences both to the mother and her baby. It leads to maternal death, reduced physical capacity, lowered resistance to infection, post partum haemorrhage, neurological dysfunction, reduced transfer of iron to the foetus, foetal death, abortion, prematurity, low birth weight and neonatal death. The current study revealed varied determinants which are at higher risk of influencing anaemia in pregnancy among pregnant women in Lusaka Urban District. These include occupation of the woman, the frequency of eating green vegetables, balanced diet during pregnancy and compliance with iron/folate supplementation.

6.2 STUDY LIMITATIONS

I could not do laboratory examination on all respondents as planned. Instead, only a small sub-sample of 60 respondents was done. The District Health Management Team (DHMT) felt the study would interfere with the major interventional study on Prevention of Mother-to-Child Transmission (PMTCT) of HIV infection since both studies were targeting the same study population.

The estimates in the multivariate logistic regression analysis on the occupation and frequency of eating green vegetables in 7 days were less precise because of the wide confidence interval.

I failed to confirm the self reported compliance by examining stool for concentration of iron because of limited resources.

There was a high failure rate in the submission of stool specimen for microscopic examination for helminthic infestation. A sub-sample of 60 (30 cases and 30 controls) respondents was given specimen containers to bring stool to the laboratory for examination (because they had no specimen at the time of interview). Only 8 (13.3%) respondents brought back the specimens to the laboratory for examination and all of them had no ova. This sample was too small to yield significant results.

6.3 ASSOCIATION BETWEEN DEMOGRAPHIC CHARACTERISTICS AND ANAEMIA IN PREGNANCY

6.3.1 Age and Anaemia in Pregnancy

There was no statistical association between age and anaemia in pregnancy (see table 4). This finding is consistent with the study done by Amoa and others, (1998) which shows no association between age and anaemia in pregnancy. The results of the current study imply that age is not a risk factor of anaemia in pregnancy. However, we observed that as age advances there is a tendency of having more cases than control. The adolescent age group was not

affected; this could be due to the fact that they are just being exposed to the reproduction process. This could indicate that it is the exposure to repeated pregnancies that may influence the occurrence of anaemia in pregnancy than the age itself.

6.3.2 Educational Level and Anaemia in Pregnancy

Education is a key determinant of life style and status an individual enjoys in a society. A woman who attains a high level of education has opportunities of being employed and of having a high socio-economic status. The present study reveals a statistically significant association between educational level and anaemia in pregnancy, with more cases (72.0%) than controls (52.7%) among the respondents who had up to primary level education. This could mean that women who are exposed to no or low education are at risk of anaemia in pregnancy. These findings are in conformity with the studies by Desalegn (1993) and Gautam and colleagues, (2002) which show educational status to be associated with anaemia in pregnancy. However, multivariate logistic regression analysis in the current study shows that educational level is not independently associated with anaemia in pregnancy (see table 14). It may have been confounded by the cultural belief on the type of foods eaten during pregnancy and the economic status of the women which may restrict her on the choices of food.

6.3.3 Marital Status and Anaemia in Pregnancy

There is no association between marital status and anaemia in pregnancy, with more cases (95.3%) than controls (90.0%) among the respondents who are married. This implies that marital status is not a risk factor of anaemia in pregnancy.

6.4 ASSOCIATION BETWEEN OBSTETRIC CHARACTERISTICS AND ANAEMIA IN PREGNANCY

6.4.1 Parity and Anaemia in Pregnancy

The current study reveals a significant association between parity and anaemia in pregnancy (see table 5), with more cases (50.7%) than controls (39.3%) among the respondents who had 1-2 children. This means that exposure to child bearing processes would put the women at risk of anaemia in pregnancy. Most women do not recover fully from effects of pregnancy and child birth before starting the next pregnancy. This could be due to lack of access to family planning information and services or poverty which hinders them from accessing food with high iron bio-availability. Nevertheless, at the multivariate analysis level the factor was not significantly associated with anaemia in pregnancy which shows that it was not independently associated with anaemia. It may have been confounded by the interpregnancy interval. The results in the studies done by Ahmad and others, (1997) and Singh (1998) found parity to be associated with anaemia in pregnancy. This could be because they did not do multivariate analysis which eliminates the confounding factors.

6.4.2. Interpregnancy Interval and Anaemia in Pregnancy

Anaemia in pregnancy compromises the health of mothers in the traditional cultures where women tend to have several children close together after marriage, with inadequate interval to replenish nutritional stores (Kilbride, 1999). The minimum safe interpregnancy interval is 36 months (CSO, 2003). This study showed a significant association between interpregnancy interval and anaemia in pregnancy, with more cases (79.5%) than controls (61.2%) of those who had the interpregnancy interval of less than 36 months. The findings are consistent with study results by Lazovic and Pocekovac (1996). The probable explanation could be because there is still an unmet need of 27% for family planning in Zambia, with the unmet need for spacing (17.0%) greater than the unmet need for limiting children (11.0%) among married women (CSO,2003). This implies that exposure to short interpregnancy interval puts women at risk of anaemia in

pregnancy, though multivariate logistic regression analysis shows that it is not independently associated with anaemia in pregnancy.

6.4.3 Antenatal Booking and Anaemia in Pregnancy

The current study still reveals the trends of late booking for antenatal services among the respondents (see table 5). Late booking gives less opportunity for health providers to carry out investigations and management of complications of pregnancy. The majority (70.3%) booked for antenatal services during the second trimester (13-24 weeks), with more controls (76.0%) than cases (64.7%). No significant association was observed between antenatal booking and anaemia in pregnancy. This means that antenatal booking is not related to the occurrence of anaemia in pregnancy. The results conflict with those found by Ahmad and colleagues (1997) whose study reveal an association between gestational age at the first visit (booking) and anaemia in pregnancy.

6.5 ASSOCIATION BETWEEN SOCIO-ECONOMIC STATUS AND ANAEMIA IN PREGNANCY

The current study used the employment status of the woman and her husband as indicators of assessing the socio-economic status of the respondents. Other socio-economic indicators (owning a house, refrigerator, television, radio, bicycle, motorcycle or car/truck) were not included because they are not directly related with anaemia in pregnancy.

6.5.1 Respondent's Occupation and Anaemia in Pregnancy

A woman with an appropriate level of education is able to get employed and sustain her income and livelihood and that of her family. Employed pregnant women have more choices on the variety and quality of food they eat than those who are not employed. Unlike the employed woman, a woman with no employment will not have money to buy food for herself and that of her children. Her poverty status restricts her choice of food; she may only access the foods of low value. The bivariate analysis in this study reveals a statistically significant

association between employment status and anaemia in pregnancy, with more cases (91.3%) than controls (66.7%) among the respondents who were unemployed. Furthermore, the multivariate logistic regression analysis showed that the occupation of a woman was an independent determinant of anaemia in pregnancy. The respondents who were unemployed were 23 times likely to have anaemia in pregnancy than those who were employed. This implies that the unemployment status of a woman puts her at high risk of having anaemia in pregnancy. The findings were in agreement with the studies done by Ogbeide and others, (1994) and Singh and others, (1998) which show that women of low socio-economic class were at higher risk of anaemia in pregnancy. This was also supported by Msolla and Kinabo (1997) who said that the existence of anaemia in pregnancy in the community was due to lack of economic access to appropriate food.

6.5.2 Husband's Occupation and Anaemia in Pregnancy

The husband who is the head of the household is expected to provide for the needs of the family members, including the nutritional needs of the wife and children. An employed husband could help the woman access foods of high value and so prevent anaemia in pregnancy. The current study shows that the majority (63.0%) of the respondents' husbands are employed, with more controls (63.8%) than cases (62.3). This shows that the employment status of the husband has some protective effect against anaemia in pregnancy. However, no association was observed between husband's occupation and anaemia in pregnancy, this could be because there are minor differences between cases and controls.

6.6 ASSOCIATION BETWEEN FOODS COMMONLY EATEN BY PREGNANT WOMEN AND ANAEMIA IN PREGNANCY

Nutritional deficiencies are a major contributing factor for anaemia in pregnancy. The review of anaemia in pregnancy in developing countries by Van den Broek

(1998) reveals that the nutritional imbalance results from low nutrient intake, poor absorption, and increased nutrient loss or demand.

6.6.1 Frequency of Eating Foods from Grains and Anaemia in Pregnancy

Iron absorption is often inhibited by high phytates content of many of the grain based diets in the tropics (Van den Broek, 1998). In this study the bivariate analysis showed a significant association between the frequency of eating foods from grain in 7 days and anaemia in pregnancy, with more controls (85.5%) than cases (76.0%) among the respondents who ate foods from grains 15-28 times (high intake) in 7 days. However, those who ate foods from grains for 1-14 times in 7 days (low intake) had more cases (24.0%) than controls (14.7%). This implies that low intake of foods from grains is a risk factor of anaemia in pregnancy. The findings contradicts with those of Haidah and colleagues,(1999) which reveals the highest rate of anaemia among the respondents who lived in sorghum and maize dependent areas. It was not significant in the multivariate logistic regression analysis in the current study.

6.6.2 Frequency of Eating Green Vegetables and Anaemia in Pregnancy

A significant association is observed was between the frequency of eating green vegetables (spinach, pumpkin leaves, sweet potato leaves, green beans and 'bondwe') and anaemia in pregnancy , with more cases (82.7%) than controls (29.3%) among the respondents who ate green vegetables for 1-7 times in 7 days. The multivariate logistic regression analysis revealed that those who had green vegetables for 1-7 times in 7 days (low intake) were 16 times more likely to have had anaemia in pregnancy than those who had green vegetables for 8-14 times in 7 days. This suggests that women who are exposed to low intake of green vegetables are at high risk of anaemia in pregnancy. The findings are consistent with the study done by Ma and others, (2002) which shows lower intake of green vegetables in the anaemia group than the control group.

6.6.3 Frequency of Eating Fruits rich in Vitamin C and Anaemia in Pregnancy

A statistically significant association is observed during the bivariate analysis between the frequency of eating fruits rich in vitamin C in 7 days and anaemia in pregnancy, with more cases (71.3%) than controls (56.0%) among the respondents who had fruits rich in vitamin C for 1-7 times in 7 days. This could be due to the fact that absorption of food iron can be influenced by other constituents in the diet such as ascorbic acid (vitamin C) and phenolics. Phenolics (e.g. tannins and phytates) reduce the bioavailability of iron by binding to it, while ascorbic acid increases the bioavailability of iron by counteracting the effect of the phenolics (Verster and van der Pols, 1995; Gaffney, et al., 2004). The low intake of fruits with vitamin C could not have provided adequate ascorbic acid to increase the bioavailability of non-haem iron. However, it was not significant in the multivariate logistic analysis. In the study done by Ma and colleagues, (2002) low intake of fruits is also shown more in the cases than the control group. This could be because multivariate analysis which controls for the confounders was not done in the study by Ma and others, (2002).

6.6.4 Frequency of Eating Proteins and Anaemia in Pregnancy

Proteins in the diet are necessary to provide for haem-iron which has high bio-availability. It also enhances the absorption of non-haem iron (Verster and van der Pols, 1995). Thus, consumption of animal based proteins can help in the prevention of anaemia in pregnancy. In the current study a statistically significant association is observed between the frequency of eating proteins (beef, chicken, fish or eggs) in 7 days and anaemia in pregnancy, with more cases (88.7%) than controls (58.7%) among the respondents who ate proteins for 1-7 times in 7 days. This demonstrates that a low intake of proteins puts pregnant women at risk of anaemia in pregnancy. These findings are consistent with the results in the study by Nti and colleagues, (2002) where the consumption of very small quantities of animal products is found to be not adequate to provide the required proteins.

6.6.5 Diet during Pregnancy and Occurrence of Anaemia in Pregnancy

One more significant association was observed during the bivariate analysis between diet during pregnancy and anaemia in pregnancy, with more controls (75.3%) than cases (26.0%) among the respondents who had balanced diet. In addition, diet during pregnancy is inferred to be independently associated with the occurrence of anaemia in pregnancy by the multivariate logistic regression analysis which shows that the respondents who had balanced diet during pregnancy were eighty percent less likely to have had anaemia in pregnancy compared to those who had poor diet during pregnancy. The findings were in conformity with those in the study by Nti and others, (2002) which reveals that forty-seven percent of the women interviewed were anaemic, with higher prevalence of anaemia being observed in the rural community who had poor diets.

6.7 ASSOCIATION BETWEEN COMPLIANCE WITH PREVENTIVE INTERVENTIONS AND ANAEMIA IN PREGNANCY

Ministry of Health recommends that the antenatal services incorporate various interventions to prevent anaemia in pregnancy. These include: Iron/Folate supplementation, Information Education and Communication (IEC) on prevention of anaemia in pregnancy, prevention of malaria; IPT and use of ITNs, and prevention of worm infestation.

6.7.1 Iron/folate Supplementation and Anaemia in Pregnancy

Iron/Folate supplementation is probably the available option to effectively address iron deficiency in pregnant women. It improves the iron status of pregnant women. In line with World Health Organization recommendation (WHO), Ministry of Health (MoH) in conjunction with Central Board of Health (CBoH) recommends that women attending antenatal care services be supplemented with Iron/Folate for at least three months during pregnancy (CSO, 2003; CBoH, 2002).

Distribution of iron and folate tablets is routine for all pregnant women in Zambia. In this study the bivariate analysis shows a statistically significant association between being given iron/folate tablets and instructions on how to take the drugs and anaemia in pregnancy; with more controls (88.7%) than cases (78.7%) among the respondents who were given the drugs. This suggests that distribution of iron/folate to pregnant women reduce the risk of anaemia in pregnancy. Nonetheless, this is not significant on the multivariate logistic regression analysis.

Furthermore, a statistically significant association is observed during the bivariate analysis between compliance with iron/folate supplementation and anaemia in pregnancy; which shows more controls (83.3%) than cases (43.2%) among the respondents who complied. The multivariate logistic regression analysis reveals that the respondents who complied with iron/folate supplementation were eighty-nine percent less likely to have had anaemia in pregnancy compared to those who did not comply. This indicates that compliance with supplementation reduces the occurrence of anaemia in pregnancy. Moreover, those who did not comply with the supplementation of iron/folate gave various reasons for non-compliance which included: shortage of drugs, side effects (nausea and vomiting, abdominal discomfort and epistaxis), fear of having a big baby and PPH, forgetting to take the drugs, and others said that their supply finished before the review date. These reasons reflect the attitudes of the respondents and myths associated with the supplementation of iron/folate. This implies that there is need for health care providers to put measures in place which can reduce the occurrence of these hindrances in order to promote compliance with the iron/folate supplementation programme. This is supported by the study done by Galloway and McGuire, (1994) which elucidated the similar reasons for non-compliance. This study showed higher rate of compliance than the findings of ZDHS (CSO, 2003).

Additionally, a bivariate analysis showed a statistically significant association between availability of drugs for supplementation at the health centre and anaemia in pregnancy; with more controls (85.7%) than cases (71.2%) among the respondents who said that the drugs were always available at the health centres. This suggests that availability of these drugs can help in reducing the occurrence of anaemia in pregnancy. However, this factor is not independently associated with anaemia in pregnancy.

6.7.2 Information on How to Prevent Anaemia in Pregnancy and Occurrence of Anaemia in Pregnancy

Information on prevention of anaemia in pregnancy gives the women an opportunity to make an informed choice and is the greatest tool they have to protect themselves against anaemia in pregnancy. However, this is not the picture reflected in the current study. Overall, the majority (53.7%) of the respondents did not receive any information on prevention of anaemia in pregnancy and these showed more cases (56.0%) than controls (51.3%). Among those who received information on prevention of anaemia in pregnancy, the majority (85.6%) received inadequate information, with more cases (86.4%) than controls (84.9%). This shows that most of the pregnant women attending antenatal services either receive inadequate or no information on prevention of anaemia in pregnancy. The information on prevention of anaemia in pregnancy is also rarely heard on the media. The results of the current study shows that only one (0.3%) respondent said that she heard a health message on prevention of anaemia in pregnancy from the media, and she was a control. This implies that the sources of information are not effective tools of preventing anaemia in pregnancy. There is need to evaluate the type of information given to pregnant women so that comprehensive information on prevention of anaemia in pregnancy can be given to woman during the antenatal services and on the media. There was no significant association observed between information on how to prevent anaemia in pregnancy and anaemia in pregnancy. The findings are supported by Msolla and Kinabo (1997) findings which reveals that having

information about anaemia was not associated with anaemia in pregnancy. This may be attributed to the traditional belief system someone may have which may influence her behaviour.

6.7.3 Compliance with Prevention against Malaria Infection and Anaemia in Pregnancy

Pregnant women are a major risk group for malaria infection in endemic areas. CBoH through the Roll Back Malaria (RBM) programme recommends the use of Insecticide Treated bed Nets (ITNs) and Intermittent Presumptive Treatment (IPT) of malaria infection as preventive measures against the adverse effects of malaria among pregnant women.

(a) Malaria during Pregnancy and Anaemia in Pregnancy

There were more cases (56.7%) than controls (43.3%) among the respondents who reported having suffered from malaria during the present pregnancy. This intimates that exposure to malaria infection during pregnancy puts pregnant women at high risk of anaemia in pregnancy. The findings are similar to those in a study by Guyatt and Snow (2001) which shows high prevalence of anaemia among those who had malaria infection. Nonetheless, the bivariate analysis in the current study showed no statistical significance. This may be attributed to low peak season for malaria (Sharp, et al., 2002) at the time the study was conducted.

Additionally, a sub-sample of 60 (30 were cases and the other 30 were controls; this is about 20% of the study sample) respondents had blood slides taken for malarial parasite examination and the results were all negative for both cases and controls. This suggests that malaria is not a risk factor. However, there are four probable explanations to the negative result. First explanation could be due to the fact that the sample was too small to yield significant results. Secondly, it could be because peripheral parasitaemia does not reflect the actual disease burden of malaria in pregnancy because most of the cases are asymptomatic

burden of malaria in pregnancy because most of the cases are asymptomatic and the blood slide examination may test negative for peripheral parasitaemia though there could be serious placental infection (McDermott, et al.1988; Katherine, et al. 2002). Thirdly, it could be that, at the time blood slides were taken these women had already taken 2-3 doses of IPT with Sulphadoxine-Pyrimethamine which could have cleared any peripheral parasitaemia. Fourthly, it could be due to low peak season for malaria.

(b) Compliance with IPT and Anaemia in Pregnancy

The current study showed more controls (98.0%) than cases (96.0%), among the respondents who complied with IPT. There is no association between compliance with IPT and anaemia in pregnancy. This indicates that compliance with IPT does not influence the occurrence of anaemia in pregnancy.

(c) Use of ITNs and Anaemia in Pregnancy

A statistically significant association was observed in bivariate analysis between the type of the mosquito net used and anaemia in pregnancy, with more controls (79.2%) than cases (60.3%) among the respondents who used ITNs. Those who used untreated nets gave various reasons for doing so (see figure 5) such as not knowing where to buy ITNs, with more cases (73.9%) than controls (36.4%); followed by those who said that they could not afford to buy ITNs, with more controls (45.5%) than cases (13.0%). Overall, it was observed that the use of ITNs had a protective effect for pregnant women. The results suggest that exposure to the use of ITNs can reduce the occurrence of anaemia in pregnancy. The findings are consistent with those in the studies done by Marchant, and others, (2002) and TerKuile, and colleagues, (2003) where ITNs are associated with the reduction in the prevalence of anaemia caused by malaria during pregnancy. However, it was not significant in the multivariate logistic regression analysis.

6.7.4 Compliance with Prevention against Worm Infestation and Anaemia in Pregnancy

The association between helminthic infestation and anaemia in pregnancy has been observed worldwide and eliminating it, would reduce the burden of anaemia in pregnancy (Shah and Biag, 2001).

(a) Soil-eating and Anaemia in Pregnancy

Soil-eating leads to transmission of most of helminthic infestation especially roundworm (*Ascaris lumbricoides*) and whipworm (*Trichuris trichiura*). There were more cases (53.3%) than controls (50.0%) among the respondents who did not eat soil, but it was not significantly associated with anaemia in pregnancy. The antenatal women are routinely dewormed once in the second trimester with Mebendazole at ANC (Huffman, et al. 2001). No significant difference existed for deworming between cases and controls.

(b) Wearing of Shoes and Anaemia in Pregnancy

Wearing of shoes is a measure of prevention against hookworm infestation, especially when in contact with soil. In some African cultures not wearing shoes when doing daily activities like gardening is a normal practice. In this study, the bivariate analysis exhibited a significant association between wearing shoes always when doing daily activities such as gardening and sweeping the surroundings and anaemia in pregnancy, with more cases (70.0%) than controls (58.7%) among the respondents who did not wear shoes consistently when doing daily activities. This implies that exposure to not wearing shoes puts pregnant women at risk of anaemia in pregnancy. Nonetheless, it was not significant in the multivariate logistic regression analysis. Hookworm infestation is transmitted when the infective larvae infect humans by burrowing through the skin (Hotez, et al., 2005). Stoltzfus and colleagues, (1997) acknowledged the association between wearing of shoes and hookworm infestation. In addition, the study by

Shah and Baig (2001) reveals an association between hookworm infestation and anaemia in pregnancy.

6.8 ASSOCIATION BETWEEN HIV INFECTION AND ANAEMIA IN PREGNANCY

In recent years, infection with HIV has been associated with increased prevalence and severity of anaemia in pregnancy (van den Broek, et al. 1998). The bivariate analysis revealed a statistically significant association between HIV infection and anaemia in pregnancy, with more cases (28.8%) than controls (15.0%) among the respondents who were HIV positive. This suggests that exposure to HIV infection puts the pregnant women at risk of anaemia in pregnancy. However, it was not significant in the multivariate logistic regression analysis. On contrary the results from the studies done by Meda and others, (1999) and Ayisi and others, (2000) the multivariate logistic regression analysis showed that HIV infection was significantly associated with anaemia in pregnancy.

6.9 ASSOCIATION BETWEEN CULTURAL BELIEFS AND ANAEMIA IN PREGNANCY

Some food restrictions for pregnant women exist among many cultures in Zambia. Food restrictions deprive the mother and the fetus of the needed nutrients and may lead to malnutrition and anaemia in pregnancy. There were more cases (18.0%) than controls (12.0%) among the respondents who had food restrictions during pregnancy in their culture. This shows that existence of food restrictions in one's culture influences the occurrence of anaemia in pregnancy. There was no association between food restrictions and anaemia in pregnancy. However, it is worth noting that the myths regarding food for pregnant women still exist in the communities which could be detrimental to maternal health.

6.10 CONCLUSION

The current study revealed varied determinants which are the major factors influencing anaemia in pregnancy in Lusaka Urban District. These include unemployment status of the respondents, low intake of green vegetables in 7 days, poor diet during pregnancy and non-compliance with iron/folate supplementation. Therefore, there is need for policy makers, reproductive health care providers and other stakeholders to work together to reduce the burden of anaemia in pregnancy in the community by addressing the specific determinants.

6.11 RECOMMENDATIONS

In view of the results of the current study, the following recommendations are made:

1. The fact that the majority of the respondents were unemployed with more cases than controls suggests a need to improve the economic status of the women so that they can access a variety of foods. The reproductive health providers should encourage the pregnant women to participate actively in income generating activities to improve their economic and nutritional status. They can direct the women to the Non-Governmental Organisations (NGOs) dealing with micro-financing projects so that they can access their services.
2. The current study shows that exposure to low intake of green vegetables puts the pregnant women at high risk of anaemia in pregnancy. There is need for the reproductive health care providers to sensitize pregnant women on the importance of eating plenty of green vegetables such as spinach, sweet potato leaves, green beans and 'bondwe' to prevent against anaemia in pregnancy.
3. The current study further reveals that eating balanced diet during pregnancy is a proactive measure against anaemia in pregnancy. Therefore, reproductive health care providers should teach the pregnant women on the importance of eating balanced diet during pregnancy.

4. This study reveals that compliance with supplementation protects against anaemia in pregnancy. We encourage the reproductive health care providers to continue educating the pregnant women on the importance of compliance with the supplementation and overcome the myths encompassing the taking of iron and folate during pregnancy. Results suggest that there is need for the policy makers to re-address this issue so that it is accessible to all women who need it. May be they ought to consider inclusion of prenatal supplementation of iron/folate to women in the child bearing age on contact with them during under-five clinics, family planning clinic and outpatients' attendance. This will help the women to start pregnancy with optimal iron requirements. Furthermore, the policy makers should consider fortification of some food stuffs such as mealie-meal, wheat flour and sugar with iron.

5. Though the information on prevention of anaemia in pregnancy was not statistically significant. This study shows that the majority of the respondents had no information on prevention of anaemia in pregnancy. This suggests that the dissemination of this information is not adequately done. Therefore, there is need for the reproductive health care providers to make the information available for women in reproductive age in different ways such as through the varied media approaches such as television, radio, distribution of pamphlets or brochures written in various languages, news letters, putting posters in strategic places like the markets, bus stops and health institutions and health education teaching sessions to antenatal women during antenatal services and on other contacts with women.

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APPENDIX: I



THE UNIVERSITY OF ZAMBIA SCHOOL OF MEDICINE

DEPARTMENT OF COMMUNITY MEDICINE

Telephone: 252641,
Fax: + 260-1-250753, .

P.O. BOX 50110
Lusaka, Zambia.

15th July 2005.

The District Director,
Lusaka District Health,
Management Board,
LUSAKA.

Dear Sir/Madam,

**RE: PERMISSION TO UNDERTAKE A RESEARCH STUDY IN LUSAKA
URBAN HEALTH CENTRES**

This is to introduce Ms. Emily Sikawetu Chipaya a student in Masters Degree in Public Health in the Department of Community Medicine, School of Medicine, University of Zambia. The student is undertaking a Research Study in partial fulfilment of the above mentioned degree.

The Research programme for study is "Analysis of the Determinants of Anaemia in Pregnancy" her target population are pregnant women attending antenatal clinic at the health centres.

We shall be most grateful if you could let her use the laboratory facilities at your Health Centres and any other assistance the student may require.

Yours Faithfully,

A handwritten signature in black ink, appearing to read 'T. Glover-Akpey'.

Mr. T. Glover-Akpey,

COURSE CO-ORDINATOR - COMMUNITY MEDICINE.

APPENDIX:

II

P.O. Box 50827
Lusaka
Tel: 233554
Fax: 236429



*In reply please quote
No.*

MINISTRY OF HEALTH

LUSAKA DISTRICT HEALTH MANAGEMENT BOARD

14th August, 2005

Ms. Emily Sikawetu Chipaya
UNZA – School of Medicine
Department of Community Medicine
LUSAKA.

RE: PERMISSION TO CARRY OUT RESEARCH STUDY

The above subject refers.

This office has no objection for you to proceed. However the study shall be at one (1) Health Centre – CHAWAMA instead of the requested six (6).

You are hereby obliged to provide the steel specimen containers and glass slides for the intended purpose. You are also to liaise with the In-Charge and the Laboratory personnel for the logistical support.

The research study should be done with minimal disruption at the Health Centre and the information obtained shall be treated with strict confidence.

By copy of this letter, the Health centre In-Charge is hereby informed forthwith.


DR. ANTHONY YETA
ACTING CLINICAL CARE EXPERT
FOR/DISTRICT DIRECTOR OF HEALTH-LDHMB

Cc: In-Charge
Chawama Health Centre

APPENDIX: III

P.O. Box 59827
Lusaka
Tel: 235554
Fax: 236429



In reply please quote
No.

MINISTRY OF HEALTH

LUSAKA DISTRICT HEALTH MANAGEMENT BOARD

16th August, 2005

Mrs. Emily Sikawetu Chipaya
UNZA – School of medicine
Dept of community medicine
LUSAKA.

RE: PERMISSION TO CARRY OUT RESEARCH STUDY

The above subject refers.

This Office has no objection for you to proceed. This study is strictly non-interventional (only interviews).

The research study should be done with mutual agreement at the following Health centres: Matero Main, Bauleni, Ng'ombe and Mandevu.

By copy of this letter, the Health Centre In-Charges are hereby informed forthwith.


DR. ANTONY YETA
ACTING CLINICAL CARE EXPERT
FOR/DISTRICT DIRECTOR OF HEALTH-LDHMB

Cc: In-Charges
Matero Main Health Centre

Cc: Bauleni Health Centre

Cc: Ng'ombe Health Centre

Cc: Mandevu Health Centre

APPENDIX: IV



THE UNIVERSITY OF ZAMBIA

RESEARCH ETHICS COMMITTEE

Telephone: 260-1-256067
Telegrams: UNZA, LUSAKA
Telex: UNZALU ZA 44370
Fax: + 260-1-250753
E-mail: unzarec@zamil.zm

Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia

Assurance No. FWA00000338
IRB00001131 of IORG0000774

13 July, 2005
Ref.: 003-05-05

Mrs Emily Sikawetu Chipaya, BSc Nursing, ZRM, ZRN
Department of Community Medicine
School of Medicine
University of Zambia
LUSAKA

Dear Mrs Chipaya,

RE: SUBMITTED RESEARCH PROPOSAL

The following research proposal was presented to the Research Ethics Committee meeting held on 8 June, 2005 where changes were recommended. We would like to acknowledge receipt of the corrected version with clarifications. The proposal has now been approved. Congratulations!

Title of proposal: **"The determinants of Anaemia in pregnancy in Lusaka Urban District"**

CONDITIONS:

- This approval is based strictly on your submitted proposal. Should there be need for you to modify or change the study design or methodology, you will need to seek clearance from the Research Ethics Committee.
- If you have need for further clarification please consult this office. Please note that it is mandatory that you submit a detailed progress report of your study to this Committee every six months and a final copy of your report at the end of the study.
- Any serious adverse events must be reported at once to this Committee.
- Please note that when your approval expires you may need to request for renewal. The request should be accompanied by a Progress Report (Progress Report Forms can be obtained from the Secretariat).

Yours sincerely,

Prof. J. T. Karashani, MB, ChB, PhD
CHAIRMAN
RESEARCH ETHICS COMMITTEE

Date of approval: 13 July, 2005

Date of expiry: 12 July, 2006

APPENDIX: V



THE UNIVERSITY OF ZAMBIA

RESEARCH ETHICS COMMITTEE

Telephone: 260-1-256067
Telegrams: UNZA, LUSAKA
Telex: UNZALU ZA 44370
Fax: + 260-1-250753
E-mail: unzaee@zamel.zm

Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia

Assurance No. FWA00000338
IRB00001131 of IORG0000774

14 September, 2005
Ref.: 003-05-05

Mrs Emily Sikawetu Chipaya
Department of Community Medicine
School of Medicine
University of Zambia
P.O. Box 50110
LUSAKA

Dear Mrs Sikawetu,

RE: CHANGE OF THE METHODOLOGY: "DETERMINANTS OF ANAEMIA IN PREGNANCY IN LUSAKA URBAN DISTRICT"

Reference is made to your letter dated 17 August, 2005 concerning the above-mentioned study

We note that you wish to change the methodology of the approved study because of the major interventional studies currently being undertaken on PMTCT targeting pregnant women in the District, and that you have been advised to do laboratory examinations only in one health centre and just interview the women in the other health centres. We also note that you have been allowed to do the study in five centres instead of six.

Clearance and approval for the modification is hereby given as advised by the District, and that is, to do interviews and laboratory examination of blood slides for malaria infection and stool for worm infestation at Chawama Health Centre and just administer a structured questionnaire to the women in the other four Health Centres.

With best wishes.

Yours sincerely,

Prof. J. T. Karashani, MB, ChB, PhD
CHAIRMAN

APPENDIX: VI

INFORMATION SHEET: PARTICIPANT

INTRODUCTION

This form gives you information on the study in which you are being requested to participate in. To make sure that you have all the facts about this study you must read this form or have someone read it for you. If you agree to participate in this study you must sign the consent form or put your thumbprint in the space provided, if you cannot write. You will be allowed to keep a copy of this form and to discuss anything that is not clear to you concerning this study with the staff of the study. If you feel that you cannot take part in the study, you are free not to participate in it and your refusal will in no way jeopardise the care you will receive from the health providers.

PURPOSE OF THE RESEARCH AND PROCEDURES

Mrs. Emily Chipaya of the Department of community medicine, School of Medicine, University of Zambia, is carrying out this study. This is done in partial fulfillment of the requirement of the Masters of Public Health degree, which will be submitted to the School of Medicine, Department of community medicine, University of Zambia. If you have any queries please direct them to Mrs. Emily Chipaya, P.O.Box 50110, Lusaka, Tel.262558, Cell – 095881703, or to the head of the Department of Community Medicine, P.O.Box 50110,Lusaka, Tel.252641, or to the Chairman, Research Ethics Committee of the University of Zambia, Ridgeway Campus,P.O.Box 50110,Lusaka, Zambia. Telephone: 256067.

You are being requested to take part in a study that seeks to analyse the determinants of anaemia in pregnancy. Anaemia is the reduction in the quantity of oxygen-carrying pigment in blood. Anaemia is a major public health problem worldwide, which affects women in the reproductive age and requires regular reviews to identify any factors that may hinder its prevention. Anaemia in pregnancy has numerous consequences which include: maternal deaths, low birth weight, neonatal deaths, low productivity of the woman, and lowered resistance to infections if left untreated. Anaemia is associated with many factors such as poor nutrition, malaria and hookworm infections, HIV infection, some cultural beliefs and practices which hinder pregnant women to

eat some nutritious foods such as eggs, and unwillingness of women to participate in the preventive measures against anaemia. All these factors are preventable. The Ministry of Health and Central Board of Health have put in place various interventional measures, but anaemia is still a problem among pregnant women in our communities. Recognising that anaemia is a serious problem which has adverse effects on the mother and her baby, the researcher desires to undertake a study in order to identify any factors which may hinder the prevention of anaemia or perpetuate its existence among pregnant women. The study is intended to provide information that can be used to develop appropriate interventional measures.

This study will involve a face-to-face interview with the staff that will ask you a set of questions using a structured questionnaire about the factors that may lead to anaemia in pregnancy. You will be asked questions regarding the type of foods you regularly eat during this pregnancy, how you protect yourself from getting malaria and hookworms, and how you are taking the iron tablets you are given from the antenatal clinic. After signing the consent form, the staff will proceed to ask you the relevant questions and the interview will be completed in one day. We will also be checking in your antenatal records for the haemoglobin level and the HIV results after the VCT.

RISKS, DISCOMFORTS AND BENEFITS OF THE STUDY

There are no risks associated with being a participant in this study. However, you will be requested to give us a blood slide for malarial parasites and a stool specimen for worm infection, which are associated with anaemia in pregnancy, and taking of blood slide may cause a bit of pain when pricking. As a participant you will benefit by gaining more knowledge on the benefits of preventing anaemia in pregnancy. By preventing anaemia in pregnancy you will abate the effects caused by anaemia. If you will be found with malaria and/or hookworm infection the research staff will ensure that you are referred to appropriate people for treatment.

CONFIDENTIALITY

The information you will give in this study will remain confidential and will not be made available to any one who is not connected with the study. Furthermore, your name will not be written on the questionnaire for confidentiality purposes.

Note: The above section should be given to the participant.

APPENDIX: VII

CONSENT FORM

By signing below I confirm that I understand participation in this study and is entirely voluntary. The materials in this consent have been explained to me and my questions have been answered to my satisfaction. I freely and voluntarily choose to participate. I understand that participation or not will not affect my health care or that of my family members.

I understand that my rights and privacy will be maintained.

I hereby give my consent to participate in study "The determinants of anaemia in pregnancy in Lusaka Urban District."

.....
Signature (thumbprint) of Participant.

.....
Date

.....
Name of Participant (Block Letters)

.....
Witness (Name and Signature)

.....
Date

For any questions please contact, the Chairman, Research Ethics Committee, Ridgeway Campus, and P.O.Box 50110, Lusaka, Zambia. Telephone: 256067.

APPENDIX: VIII

THE UNIVERSITY OF ZAMBIA

SCHOOL OF MEDICINE

DEPARTMENT OF COMMUNITY MEDICINE

STRUCTURED QUESTIONNAIRE FOR INTERVIEW SCHEDULE

STUDY ON THE DETERMINANTS OF ANAEMIA

IN PREGNANCY IN LUSAKA

URBAN DISTRICT

QUESTIONNAIRE NUMBER:

NAME OF THE HEALTH CENTRE:

DATE OF INTERVIEW:.....

INTERVIEWER'S NAME:.....

INSTRUCTION TO THE RESPONDENT

1. Do not write your name on the questionnaire.
2. Please tick ☒ the most appropriate answer in the spaces provided on the right side or write in the space provided.
3. Kindly answer all questions.

NOTE: The information you give is highly confidential.

SECTION A: DEMOGRAPHIC DATA

1. DoB...../...../.....

2 Where do you live?

- 1. High density area
- 2. Medium density area
- 3. Low density area

3. What kind of accommodation do you reside in?

1. Rented

2. Owner-occupied

4. What is your marital status?

- 1. Single
- 2. Married
- 3. Widowed
- 4. Divorced
- 5. Separated

5. What highest level of education did you attain?

- 1. No education
- 2. Primary
- 3. Secondary
- 4. College/University

6. What do you do for a living (occupation)?

- 1. House wife
- 2. Student
- 3. Self employed
- 4. Employee
- 5. Employer

7. What is your husband's occupation?

- 1. Unemployed
- 2. Self employed
- 3. Employee
- 4. Employer

8. What health messages have you listened to, on either radio or television?

.....
.....
.....

SECTION B: OBSTETRIC CHARACTERISTICS

9. What number of pregnancy is this?.....

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

11. If you have one child or more, how many months did you rest in between pregnancies?

1. From birth of the child to 2nd pregnancy ____ months.

2. From birth of the second child to third pregnancy
_____ months

3. From birth of the third child to fourth pregnancy
_____ months

4. From birth of fifth child to sixth pregnancy _____
months

5. From birth of sixth child to seventh pregnancy ____
months

12. At what age of the pregnancy did you started attending antenatal clinic?

.....Weeks.

SECTION C: COMMON FOODS EATEN

13. How many main meals do you have per day?

1. One meal

2. Two meals

3. Three meals

4. Four meals

5. Other (specify).....

14. Indicate the number of times you have eaten the following foods in the past 7 days?

1. Any food made from grains like maize
millet, sorghum, rice, wheat or other grains?

.....

2. Any food made from roots or tubers like
Irish potatoes, sweet potatoes, cassava, or
other local roots/tubers..... ☐
3. Any green vegetables like spinach,
cassava leaves, sweet potato leaves, pumpkin
leaves, bean leaves or green beans?
..... ☐
4. Mango, paw-paw, Pumpkin, or carrots?
..... ☐
5. Any other fruits like bananas,
apples, avocados, tomatoes, citrus fruits?
..... ☐
6. Meat, chicken, fish, kapenta, caterpillars or eggs?
..... ☐
7. Soya beans, beans, groundnuts, or pounded
pumpkin seeds?
..... ☐
8. Any food prepared with oil, fat or butter?
..... ☐
15. Do you have any particular food(s) you like most
during this pregnancy?
1. Yes (go to 14) ☐
2. No ☐
16. What is that food(s)?
..... ☐
.....
..... ☐

SECTION D: ADHERENCE TO PREVENTIVE MEASURES
PREVENTION AGAINST ANAEMIA IN PREGNANCY

IRON/FOLATE SUPPLEMENTATION

17. Were you given iron/ folate tablets when you last attended antenatal clinic?

1. Yes (go to Q 17-20)

2. No
-

18. Were you given any instructions on how to take the drugs?

1. Yes (go to 18)

2. No
-

19. What instructions were you given?

(Do not read the list, but probe by asking, 'Any other instructions?' Tick all that apply.)

1. Take one tablet daily

2. Take after a meal

3. Avoid drinking tea

4. Watch out for dark stool, it is normal.

5. Continue taking the drugs throughout pregnancy

6. It is a way of preventing anaemia in pregnancy.

7. Other, specify.....

.....

.....
-

20. Are you taking the drugs as per instructions, continuously?

1. Yes (go to Q20)

2. No (go to Q22)
-

21. How long have you been taking iron/folate tablets?

.....

22. Are the iron/folate tablets always available at the health centre?

.....

23. Why were you not taking the iron/folate tablets

as per instructions?

(Do not read the list, but probe by asking, 'Any other reasons?' Tick all that apply.)

- | | |
|--------------------------------------|--------------------------|
| 1. Nausea and Vomiting | ☐ |
| 2. Abdominal discomfort | ☐ |
| 3. Dark stool | ☐ |
| 4. I forget | ☐ |
| 5. Baby will be too big | ☐ |
| 6. Shortage of drugs | ☐ |
| 7. Excessive bleeding after delivery | ☐ |

☐

8. Other, specify.....

24. During your antenatal visit, were you given any information on how to prevent anaemia in pregnancy?

☐

- | | |
|--------------------|--------------------------|
| 1. Yes (go to Q24) | ☐ |
| 2. No | ☐ |

25. What information were you given?

(Do not read the list, but probe by asking, 'Any other information?' Tick all that apply.)

- | | |
|--|--------------------------|
| 1. Take iron/folate tablets throughout pregnancy | ☐ |
| 2. Eat mixed diet | ☐ |
| 3. Prevent against malaria | ☐ |
| 4. Prevent against hookworm infection | ☐ |
| 5. Child spacing (Family Planning methods) | ☐ |

☐

6. Other, specify.....

.....

.....

PREVENTION AGAINST MALARIA

26. Have you had malaria during this pregnancy?

- | | |
|--------------------|--------------------------|
| 1. Yes (go Q26-29) | ☐ |
| 2. No | ☐ |

☐

27. How many times have you had malaria?

.....

☐

28. Did you take any medicine each time you had Malaria?

☐

- 1. Yes ☐
- 2. No ☐

29. What medicine did you take?.....

30. Where did you get the medicine from?

- 1. Health facility (go Q30-31) ☐
- 2. Drug shop ☐
- 3. Friends ☐
- 4. Family member ☐

31. Was a blood slide for malarial parasite taken?

- 1. Yes (go to Q31) ☐
- 2. No ☐

32. What was the result?

- 1. Positive ☐
- 2. Negative ☐

33. Were you given fansidar (Sulfadoxine-Pyrimethamine) as prevention against malaria during this pregnancy?

- 1. Yes (go Q33-38) ☐
- 2. No ☐

34. Did you take the drug?

- 1. Yes ☐
- 2. No (go Q39) ☐

35. How many tablets were given as a dose?

.....

36. How many times have you taken fansidar during this pregnancy?

.....

37. At what age of pregnancy did you take the first dose?

.....

38. Did the health care provider observe you take the drug?

.....

Is Sulfadoxine Pyrimethamine always available at the health centre?.....

40. What are the reasons for not taking the drug?

.....
.....
.....
.....

41. Did you sleep under a mosquito net last night?

1. Yes (go to Q41)

2. No
-

42. What type of mosquito net did you use?

1. Insecticide treated mosquito net

2. Untreated mosquito net (go to Q42)
-

43. What are the reasons for not using Insecticide treated Mosquito Net?

(Do not read the list, but probe by asking, 'Any other reasons?' Tick all that apply.)

1. I cannot afford

2. I feel suffocated

3. The smell puts me off.

4. I don't know where to buy the ITNs

5. I have never heard of ITNs

6. Other, specify.....

.....
-

44. What are other ways of preventing malaria?

(Do not read the list, but probe by asking, 'Any other ways?' Tick all that apply.)

1. In- door residual spraying

2. Environmental modification measures

3. Mosquito repellent coils

4. Mosquito repellent aerosols and liquids

5. Covering windows in the late afternoon

6. Other, specify.....

.....
-

45. Which ones do you use?

.....
.....
.....

PREVENTION AGAINST WORM INFESTATION

46. Do you eat soil/clay?

1. Yes

2. No

47. Do you know of any dangers of eating soil?

1. Yes (go to Q47 & 48)

2. No

48. What are those dangers?

.....
.....
.....

49. Where did you get the information about the dangers of eating soil?

1. Health provider

2. Friend

3. Family member

4. Read from books

50. If you fail to stop eating soil, what else can you do to the soil to prevent worm infestation?

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.....

51. Were you given any drugs for worm infestation during this pregnancy?

1. Yes (go to Q51)

2. No

52. Did you take the drug?

1. Yes

☐

2. No (go to Q52)

☐☐

53. What are the reasons for not taking the drug?

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☐

54. Do you always wear shoes when you are doing your daily activities?

1. Yes

☐

2. No (go to Q54)

☐☐

55. What are the reasons for not wearing shoes?

1. Have no shoes

☐

2. Feel uncomfortable

☐

3. Other, specify.....

.....

.....

☐

SECTION E: CULTURAL/TRADITIONAL BELIEFS

56. Could you list at least five foods you are not allowed to eat during pregnancy by your culture/tradition.

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☐

Any comments about the interview?

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THANK YOU FOR YOUR CO-OPERATION AND PARTICIPATION

APPENDIX: IX

CHECK LIST ON LABORATORY RESULTS

- 1. Haemoglobin level.....
- 2. Blood slide for malarial parasites.....
- 3. Stool for microscopy.....
- 4. Review of records on HIV test results.....