

**A CROSS-SECTIONAL STUDY OF THE FACTORS  
CONTRIBUTING TO ANAEMIA IN PREGNANCY IN  
WOMEN ATTENDING ANTENATAL AT ARAKAN  
CAMP HOSPITAL**

BY

Msc  
Thesis  
5/10/19  
2020

DR. F. L. SIMAPUKA, BSc (HB). MB. ChB (UNZA LUSAKA)

MASTER OF PUBLIC HEALTH (MPH) Post graduate Student

***A DISSERTATION FOR SUBMISSION TO THE DIRECTORATE OF  
RESEARCH AND GRADUATES STUDIES, IN PARTIAL FULFILMENT  
OF MASTERS DEGREE OF PUBLIC HEALTH***

THE UNIVERSITY OF ZAMBIA

LUSAKA

\*\*\*\*\*

2000

258724

CONTENTS

	Page
Declaration .....	
Statement .....	
Approval.....	
Dedication .....	
Acknowledgements .....	
Executive Summary .....	
List of Tables .....	
Glossary of Abbreviations .....	
CHAPTER ONE	
1.0 INTRODUCTION.....	1
CHAPTER TWO	
2.0 STATEMENT OF THE PROBLEM .....	2
2.1 Effects of maternal anaemia.....	3
CHAPTER THREE	
3.0 LITERATURE REVIEW .....	6
3.1 Causes of anaemia.....	6
3.2 Pathophysiology of anaemia.....	8
3.2.1 Stage of compensation.....	9
3.2.2 Stage of decompensation.....	10
3.2.3 Stage of anaemia heart failure.....	11
3.3 Malaria in pregnancy.....	12
3.3.1 Effect on mother.....	13

3.3.2	Effect on the fetus.....	13
3.4	HIV and anaemia.....	14
3.5	Sickle cell anaemia in pregnancy.....	15
3.6	Iron deficiency anaemia.....	15
CHAPTER FOUR		
4.0	<b>OBJECTIVES</b> .....	23
4.1	General.....	23
4.2	Specific Objectives.....	23
CHAPTER FIVE		
5.0	<b>METHODOLOGY</b> .....	24
5.1	Study Design.....	24
5.2	Study setting.....	24
5.3	Sample and sample size.....	24
5.4	Data processing and analysis.....	27
5.5	Ethical consideration.....	27
5.6	Pretest .....	28
CHAPTER SIX		
6.0	<b>RESULTS</b> .....	29
6.1	Age distribution of anaemia in pregnancy.....	30
6.2	Malaria and anaemia.....	30
6.3	Worm infestation and anaemia.....	30
6.4	HIV infection and anaemia.....	31
6.5	Urinary tract infection and anaemia.....	31

CHAPTER SEVEN

7.0 DISCUSSION ..... 34

CHAPTER EIGHT

8.0 CONCLUSION..... 37

CHAPTER NINE

9.0 INTERVENTIONS ..... 39

References ..... 44

ANNEX:

A. Questionnaire..... 48

B. Consent ..... 50

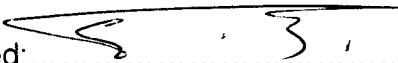
C. Budget ..... 55

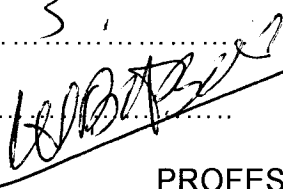
D. Letter of approval from Research Ethics Committee..... 56

E. Letter of authority to conduct research at Arakan  
Camp Hospital..... 57

**DECLARATION**

I hereby declare that the work presented in this study for degree of Master of Public Health has not been presented for any other degree.


Signed:.....

Approved by:.....

SUPERVISOR: PROFESSOR KS. BABOO  
MBBS, MED, FRSH  
Diplomat American Board of Tropical Medicine  
MPH Co-ordinator  
Department of Community Medicine  
University of Zambia

**STATEMENT**

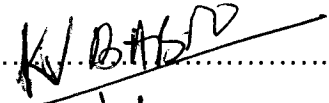
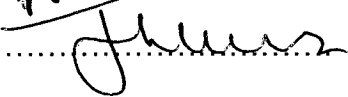
I hereby certify that this study is entirely the result of my own independent investigation. The various sources to which I am indebted are clearly indicated in the text and in the references.

Signed:  .....

**APPROVAL**

This dissertation of FANWELL LAWSON SIMAPUKA    BSc.   HB.   MB ChB  
(UNZA) is approved in partial fulfillment for the requirements for the award of the  
degree in Master of Public Health (MPH) by the University of Zambia.

**Examiner’s name and signature:**

Prof. KS Baboo.....  
Dr. L Chiwele.....

**Date:**

29/06/2020.....  
10/07/2020.....

**DEDICATION**

I dedicate my dissertation to my wife, Nakaubi and my children Roy, Inonge and Lawson Jnr.

## ACKNOWLEDGEMENTS

Special thanks to my supervisor, Prof. KS Baboo who I constantly consulted during the writing of the dissertation and for his parental guidance which I cherished so much.

I also wish to thank Dr L Chiwele, Head of Department for his support and guidance.

I gratefully acknowledge the dedicated work shown in my data collection by my staff at Arakan Camp Hospital. Special thanks to S/sgt Ben Nyirenda, whose commitment to the success of the project was remarkable.

Thanks to Mrs Namakau Lubinda and Ms H Sikombe for typing the dissertation.

My appreciation to Brig Gen Paul Garry Simapuka for facilitating the preparation of the dissertation.

I extend my gratitude to the Director of Medical Services (Army) Col EL Amatende and the Director General of Medical Services Brig Gen JB Simpungwe for partially sponsoring the project.

## EXECUTIVE SUMMARY

**Objective:** To determine the factors contributing to anaemia in pregnancy at Arakan Camp Hospital.

**Design:** A cross-sectional study of pregnant women attending antenatal clinic at Arakan Camp Hospital between March 1999 and July 1999.

**Setting:** Arakan Camp Hospital is situated in Arakan Barracks. It has a well established antenatal centre which is supported by the Ministry of Health.

**Subjects:** 112 pregnant women of gestation age 20 weeks and above. With the majority (94%) being below the age of 35 years. Data was collected by questionnaire based on the variables in the study. Age, Husband's occupation, HIV status, worm infestation, malaria, UTI, Syphilis, sickle cell disease were the major variables measured in the study.

**Main out come:** Association was found between HIV infection, malaria and anaemia. Anaemia was found to be more common among the younger age group.

**Results:** A total number of 113 respondents were recruited for the study, out of which 112 fully completed the questionnaires. One did not complete and was thus not included in the study. This gave a response of more than 80%. The

respondents ranged between 16 – 46 years old. The majority being in the age group of 20 – 29 years old. Thirty of the women tested positive for HIV which gave a percentage of 26.8% compared to the Lusaka Sero-positive of 26.5%, 1997. Nine tested positive for syphilis, two had hookworms (*Ascaris Lumbricoids*), nine had urinary tract infection.

Anaemia was more common in women below 25 years old with the majority being in age group 15-24 years old. Anaemia and HIV infection showed a strong positive association (OR 2.5 (95% CI 1.13 < OR 3.18 P=0.04). Malaria in pregnancy had a significant association with anaemia (OR 5.13, 95% CI 4.17 < OR < 6.16 P=0.006). Exposure to worms before was not statistically significant (P=0.50). Evidence of worms in stool was also not statistically significant (Fischer exact test, 1 tailed P value =0.40).

Socio-economic status (P=1.00). Accessibility to MCH facility (P=0.312). For the two variables the association to anaemia in pregnancy was statistically insignificant.

**Conclusion:** HIV infection and malaria appear to have significant association to anaemia in pregnancy in the subjects at Arakan Camp Hospital. The prevalence of worm infestation was found to be very low in this study, this could be due to the prevailing sanitary conditions in the barracks. Almost everybody uses latrines and wear shoes. Socio-economic status played a major role in

anaemia during pregnancy due to the availability of free bags of mealie meal and an average income of K150,000 per family. This is not the case for the rest of the country. This little gain was however defeated by the prevalence HIV and malaria during pregnancy.

## **GLOSSARY OF ABBREVIATIONS**

1. CI - Confidence Interval
2. HIV - Human-Immuno Deficiency Virus
3. OR - Odds Ratio.
4. UTI - Urinary Tract Infection.
5. MCH - Maternal and Child Health
6. MOH - Ministry of Health
7. P - Value Probability value.

## CHAPTER ONE

### 1.0 INTRODUCTION

Arakan Barracks is situated in Woodlands. A low density residential area in the city of Lusaka. The barracks is divided into two in terms of residential areas. There is a section for Commissioned Officers and one for Non-Commissioned officers. The Commissioned Officers residents are self contained with piped water and electricity like the surrounding residential areas in woodlands. While the non-Commissioned Officers are in housing equivalent to those found in high density residential areas of Zambia. The health status of the officers, soldiers and their families is said to be above average, although officers tend to enjoy better health and social amenities.

The barrack has a Camp Hospital which attends to service personnel and their families. The camp hospital is usually devoid of drugs but the MCH is supported by the Ministry of Health. From a pilot study carried out at the Camp Hospital Anaemia in pregnancy was seen to be a more prevalent condition hence the need to study some of the factors that could be contributing to the problem.

## CHAPTER TWO

### 2.0 STATEMENT OF THE PROBLEM

Anaemia in Pregnancy is very important as it affects both the mother and the out come of pregnancy. In well established MCH facilities this does not pose to be a problem. At Arakan Camp Hospital despite the Support given by the Ministry of Health anaemia in pregnancy seems to be a significant problem. The problem affects the non-commissioned officers, as they seem to have lesser access to better health facilities. This becomes worrisome as at some occasions the Ministry of health through the Lusaka district Management team as indicated that they may stop sponsoring the MCH facility, because their resources do not seem to be adequate. The District Health Management team have asked whether the army would be able to sustain the requirements of the MCH centre.

Of the various haematological disorders that may occur in pregnancy, anaemia is the most common. Even in the developed countries, many women enter pregnancy with depleted body stores of iron and in the developing countries this depletion is marked. Anaemia is closely related to social and economic status: The lower the status the greater is the incidence of anaemia, and in each social group the degree of anaemia is always greater in women than in men.

In pregnancy the plasma volume increases proportionately more than the red cell volume, so that an apparent hydraemia occurs with a fall in haemoglobin concentration to about 12g/dl after the 20th week of pregnancy. However, the total red cell mass is greater than in the non-pregnant women, and there is adequate oxygen-carrying capacity to meet the needs of mother and fetus. Anaemia can result from: (1) Inadequate iron in the diet; (2) Malabsorption; or (3) Excess iron loss (in menstruation, pregnancy or hookworm infestation) Infections like HIV and malaria. Initially the body stores become depleted, but later anaemia becomes apparent. In tropical countries where the diet often contains insufficient iron, where pregnancy is frequent and hook- worm infection is common, the average female has a mean haemoglobin of 10.5g/dl as compared with one of 13.5g in women of higher socio-economic groups of the developed countries.

## **2.1 Effects of maternal anaemia:**

The effects of severe anaemia was studied in 2,250 women in Malaysia. Maternal mortality amongst anaemic women was five times as high as in non-anaemic patients, refer to table 1 and 2 for detailed information on page 4.

Table 1: **THE EFFECT OF SEVERE ANAEMIA (HAEMOGLOBIN LESS THAN 6.5g/dl). ON THE MATERNAL MORTALITY RATE**

MOTHERS	ANAEMIC	NON-ANAEMIC
Died	35	248
Lived	2,215	70,550
Total (73,048)	2,250	70,798
Maternal death rate/1000	15.5	3.5

Table 2: **FETAL MATURITY AND LOSS RELATED TO MATERNAL ANAEMIA**

FETAL LOSS	INFANTS BORN OF MOTHERS THAT WERE	
	ANAEMIC (Hb<6.5g)	NON-ANAEMIC (Hb>6.5g)
Premature	215	2,358
Mature	85	1,555
TOTAL SURVIVAL		
Premature	202	1,775
Mature	1,795	66,308
Premature rate(%)	18.1	5.7
Fetal loss-overall(%)	13.1	6.8
Mature babies only(%)	51.6	57.0
Still birth rate/1000	91.0	15.7
Neonatal death rate/1000	43.1	40.3

Table 3:       **ZAMBIAN STATISTICS**

	INFANTS BORN OF ANAEMIC MOTHERS	
FETAL LOSS	ANAEMIC	NON-ANAEMIC
Premature	250	2,956
Mature	110	1,658
FETAL SURVIVAL		
Premature	195	1,865
Mature	2,150	80,398
Total	2,705	86,877

The situation in Zambia is not very different from the figures in Malaysia.

The infant crude death rate due to anaemia in 1992, stood at 13.7% compared to 1982 which was 11.2%. This shows a gradual increase over a period of 10 years. Further reports of CBoH, NMCC (1999) and the Department of Community Medicine have stated that, the frequency of malaria among sero-positive pregnant women is very high. The women suffer severe anaemia resulting in increased maternal and infant mortality rates. This is quite significant hence the need to evaluate the situation presently prevailing at Arakan Camp Hospital. With the results from the study, it is hoped that the Army Administration would be encouraged to support the MCH facility, so as to improve the quality or life of both the pregnant mother and the outcome of pregnancy.

## CHAPTER THREE

### 3.0 LITERATURE REVIEW

Anaemia is usually discovered accidentally since this clinical condition presents vague non-specific symptoms and commonly occurs in such a slow and chronic fashion that the patient may not realise that he or she is unwell.

Anaemia is usually defined as a significant decrease in red corpuscles or Haemoglobin. The laboratory measurements used to determine the presence or absence of anaemia are packed red cell volume or Hematocrit and Haemoglobin concentration of the peripheral blood. (Weathral et al). On the next page is a table for levels of Haemoglobin which indicate anaemia.

#### 3.1 Causes of Anaemia:

Iron deficiency.

Malaria especially in children in areas where malaria is very prevalent.

- |   |                                 |   |             |
|---|---------------------------------|---|-------------|
| * | Other infections including AIDS | } |             |
| * | Folate deficiency               | } | less common |
| * | Sickle cell disease             | } |             |

Table 4: **LEVELS OF HAEMOGLOBIN WHICH INDICATE ANAEMIA**

	HAEMOGLOBIN/100mls
Children 6 months to 4 months	<11
Children 5 to 11 years	<11.5
Children 12 to 14 years	<12
Women/Adolescent girls-not pregnant	<12
-pregnant	<11
Men/Adolescent boys	<13

Mild anaemia: If haemoglobin is between 10g/100mls and cut of level in the table above

Moderate anaemia: If the haemoglobin is 7-10g/100mls

Severe anaemia: If haemoglobin is below 7g/100mls.

Adopted from Topley et al.

In pregnancy because of the Haematological changes that occur the Haemoglobin may fall to 11g/dl. This is referred to as physiological Anaemia of pregnancy. The fall is due to the increase in plasma volume more than the red cell volume so that an apparent hydraemia occurs with a fall in Haemoglobin concentration after 20 weeks of pregnancy. However the total red cell mass is greater than in non-pregnant women and there is adequate oxygen carrying capacity to meet the needs of the

mother and the foetus. The Haemoglobin reaches its lowest at about 32-36 weeks of pregnancy. The Haemoglobin rarely falls below the level of 10-11 g/dl. (Dereck et al, 1990).

During pregnancy there is an increased demand for Hematinics. The amount of iron consumed may be 500mg or more and women in the child bearing age are often in a precarious state of iron balance, even in the western industrialised nations. In the tropics, factors that increase the severity of iron deficiency are hook worm infestation, schistosomiasis, malaria and generally poor health. (Manson et al, 1994).

Folate deficiency is fairly common in pregnancy but the rate is variable in different populations, there is an increased demand of Folate which is most marked during the third trimester.

In most MCH facilities Iron and Folate are supplemented during pregnancy and lactation which is a standard practice where antenatal follow up of patients is available.

### 3.2 Pathophysiology of anaemia

Anaemia progresses through three stages, of increasing severity,

(i) Compensated anaemia, (ii) Decompensated anaemia, and (iii)

Anaemic heart failure. The severity of anaemia does not depend only on the haemoglobin (Hb) concentration, but also on (i) the age of the subject, the young being better able to compensate, (ii) the rapidity of development of anaemia, compensatory mechanisms being more effective in insiduously developing anaemias (eg, aplastic anaemia) and chronic anaemias (eg, sickle-cell disease), and (iii) plasma volume expansion, which occurs in pregnancy (especially multiple pregnancy) and with splenomegaly, and which increases the risk of circulatory congestion and cardiac failure (Harrison, 1967, 1970).

### 3.2.1 Stage of compensation

Anaemia stimulates the production of red cell 2,3-diphosphoglycerate (2,3DPG), which has the properties of fixing Hb in the deoxygenated state, shifting to the right the Hb-oxygen dissociation curve, and enhancing oxygen extraction from Hb by the tissues by as much as 40% (Bellingham, 1974). There is an exaggerated rise of cardiac output in response to exercise, but this a minor compensatory mechanism in the maintenance of tissue oxygenation compared to 2,3DPG in mild anaemia.

Plasma volume (PV) expands to replace the missing red cell volume (RCV) and the total blood volume (TBV) remains unchanged (Harrison, 1967, 1970). There is a redistribution of blood flow, with increase perfusion of the brain, the myocardium and skeletal musculature.

There is a reduced functional reserve, and subjects become breathless on exertion. Tolerance to exercise, and the abilities to work, to earn and to care for children all decline in women as in men (Viteri and Torum, 1974; Florencio, 1981). The effects of mild maternal anaemia on fetal oxygenation will be discussed latter.

### **3.2.2 Stage of decompensation**

When the Hb falls below about 70g/l, the major compensatory mechanisms are cardiovascular. Cardiac output is raised even at rest from about 5L/minute to as much as 13L/minute, through there being an increased of myocardial contractility and a greater stroke volume. There is an exaggerated tachycardia only on exertion. Peripheral vasodilatation and reduced viscosity of the blood help to reduce the load on the ventricles.

The TBV and central blood volume are reduced, which increases the risk of shock following acute haemorrhage (Harrison, 1970).

Compensation is inadequate: lactic acid accumulates and patient are breathless even at rest, because subjects are unable to perform their work, they present for treatment most often in this stage of anaemia in the developing world.

The clinical signs , besides pallor, are those of the cause of anaemia, and of a hyperdynamic circulation.

### **3.2.3 Stage of anaemia heart failure**

Cardiac output continues to increase with the severity of anaemia, but the heart is performing more work in the face of diminishing oxygenation, until with  $Hb < 30g/l$  there is no further rise of cardiac output.

Reduced renal blood flow causes retention of sodium. The plasma volume increases and there develop peripheral oedema, ascites, pulmonary oedema, raised jugular venous pressure hepatomegaly, evidence of incipient or actual left-sided and right-sided cardiac failure. Death may ensue from

anaemic heart failure alone. Some patients die without evidence of heart failure, but apparently as a consequence of gross tissue hypoxia. In either case, death is the direct consequence of anaemia, and other complications such as haemorrhage or infection, are not necessary but may be contributory causes of death.

### 3.3 Malaria in pregnancy:

Malaria is an important cause of anaemia during pregnancy. There is an increased incidence and severity of malaria. This is thought to be due to diminished immunity.

There is evidence of maternal immuno-suppression in the second half of the pregnancy which is caused by many factors: Hormonal, placental and lymphocytes depression. (MANSON et al, 1991).

Studies have shown that women have decreased resistance to malaria during pregnancy. According to WHO (1991) 60% prima-para and 30% multi-para are infected with the malaria parasite during pregnancy. Episodes of malaria are frequent and infection is very severe. There is also placenta parasitemia resulting into greater consequences. Ninety eight percent of malaria in meso and hyperendemic areas of malaria in Zambia are due to falciparum

infection. The prevalence of urban malaria is far more than rural malaria (Chewe Luo, 1989). One of the serious consequences of such interactions is the existence of severe anaemia in pregnant women. Fleming (1988) in Ndola, found malaria to have 84% association to all cases of anaemia in pregnancy. McDemont et al in 1996 and Ahmed 1998 found an increased proportion of maternal mortality attributed to malaria over the past 10 years.

### **3.3.1 Effect on mother**

Falciparum Malaria is more hazardous in pregnancy with a high mortality effecting chiefly primi-grandae, with hyperpyrexia and abortion common in the first trimester. A severe haemolytic anaemia with splenomegaly may develop in the second half of pregnancy that responds to anti-malarial treatment. All these effects can be prevented by chemoprophylaxis.

### **3.3.2 Effect on the fetus.**

In hyperendemic areas 47% (Manson et al, 1991) of the placentas of primi-gravidae are usually parasitised. There is no increase in still-births but the birth weight of the first born infant is usually low, although succeeding infants are

normal, subsequent acquisition of immunity after delivery accounts for this. (PARK et al, 1997).

#### 3.4.0 HIV and anaemia:

The pattern of anaemia in tropical Africa has been transformed in hospital practice during the past decade. About 70% of persons with AIDS are anaemic mechanisms are multiple and include the following:

Anaemia of chronic ill health, secondary to complicating infections (e.g. tuberculosis)

- Infection by parvovirus B19.

- Direct action of HIV on Erythroid precursor cells.

- Disturbed balance of cytokines and growth factors.

- Hemolysis.

- Nutritional deficiencies of folate, Vitamin B12, Vitamin A and pyridoxine.

Sero prevalence amongst women is often in excess of 30% and amongst hospital patients over 70%. In UTH during 1995 –1997 (Fleming et al), 10 to 15 blood films with Hb <60g/l were examined daily. In almost all the red cells showed the normochromic, normocytic pattern of anaemia, secondary to HIV infection.

- Interaction of malaria and HIV in pregnancy is very well documented. Whitworth et al in 1999 found that malaria was more frequent and severe among HIV positive in Uganda. This contributed to low CD4 counts with high parasite densities specifically in sero-positive women who suffered from malaria. The majority of these women were very anaemic resulting into mortality rate of about 80%. From clinical experience anaemia due to HIV is worse during pregnancy (Bullen et al, 1987. NMCC. 1999).

#### **3.5.0 Sickle Cell anaemia and pregnancy:**

There is an increased severity of anaemia in pregnancy in patients with sickle cell disease. This is due to a high demand of Folate and an increased incidence of sequestration crises. In tropical Africa Malaria is an added factor. (MANSON et al, 1991).

It is advocated that patient with Sickle cell anaemia should have regular malaria chemoprophylaxis during pregnancy in addition to Hematinic supplementation. (Draper et al, 1997).

#### **3.6.0 Iron deficiency anaemia**

Iron is a mineral present in the body as a constituent of Hemoglobin and in some enzyme and electron carriers. Because it

cannot be made in the body, iron, like all essential nutrients must be obtained from food.

It is generally thought that iron deficiency anaemia is the most common nutritional deficiency in many developing countries, second only to protein energy malnutrition (PEM). Physiological status determine the degree of vulnerability of the individual: rapidly growing infants, children, pregnant and lactating women are the at high risk for iron deficiency. In 1990 the United Nations (UN) estimated that 1-3 billion people suffer from iron deficiency. Below is a table showing regional presentation of anaemia in children and pregnant women.

Table 5: **REGIONAL PRESENTATION OF ANAEMIA IN WOMEN AND CHILDREN**

COUNTRY	CHILDREN 0 – 4 YEARS		WOMEN 15 – 49 YEARS	
	PERCENTAGE	NUMBER IN MILLIONS	PERCENTAGE	NUMBER IN MILLIONS
America	56	48.0	63	11.3
Latin America	26	13.7	30	3.0
East Asia	20	3.2	20	0.5
South Asia	56	118.7	65	27.1
Developing Regions (a, b)	51	183	59	49.9

- (a) Excluding China
- (b) Including sub-Sahara Africa

Adapted from A Report from the Sub-Committee on Nutrition of the Administrative Committee on Coordination (ACC/SCM) of the United Nations.

Severe iron deficiency results in anaemia (Low Haemoglobin level), which impairs the transport of oxygen and basic cell functions. People with mild iron deficiency may not have low haemoglobin (Hb) levels but yet they have reduced body Iron stores (Ferritin) (Skills and Young, 1988). Iron deficiency refers to any depletion of ferritin). An individual may be Iron deficient without manifesting iron deficiency anaemia, but all those with iron deficiency anaemia are iron deficient. Closely associated with iron deficiency is Folate deficiency, so therapy usually includes a combined Iron-Folate tablet.

In populations in which the prevalence of Iron deficiency is high, the deficiency usually is the result of the interaction between dietary factors, chronic Iron loss due to parasitic infections (for example hook-worm or schistomiasis (Stephenson 1987) or elevated needs (for example during pregnancy and periods of rapid growth).

It has been assumed that iron deficiency in pregnant women does not put the fetus at risk because the fetus would have priority access to maternal iron stores (Bothwell and Chalton, 1981). In a study in Benin, however, Hercberg and others (1987) found out that when multiple indicators of iron status were used to assess

maternal anaemia, there was a positive correlation between maternal and infant iron deficiency. Increased prenatal and perinatal risk (low birth weight, prematurity and mortality) has been associated with low levels of haemoglobin and hematocrit in the mother (Brabin 1988).

Maternal anaemia, malaria and deficiency of folic acid during pregnancy decrease oxygen available to the fetus resulting in increasing fetal death, prematurity, low birth weight and infant death. Surviving infants have low birth weight, immunodeficiency and poor stores of iron and folic acid. These children enter a vicious cycle of malnutrition and infection resulting in high mortality among children to nearly 80%. Low nutrition status and recurrent malaria deplete the iron reserves in pregnant women. Thus when compounded with HIV infection results in almost 100% mortality among pregnant women.

Besides HIV infection, malaria is the single most important factor contributing to iron deficiency in pregnancy. Because malaria is associated with the impairment of iron release from reticulo-endothelial stores, it causes a secondary folic acid deficiency and consequences are low physical activity, mental concentration and productivity.

High morbidity has been noted in anaemic pregnant women (Flemming 1989) reasons for this may be that iron deficiency influences the risks of infection in distinct ways it is associated with abnormalities in cell mediated and non-specific Immunity (Higash and others 1967, Klebanoff 1970; Chandra, 1973; Prasad 1979; Chandra and Puri 1985; Dallman 1987). The production of T-Cells is specifically compromised (Srikantia and others 1976, Bagchi, Mohanran, and Peddy 1980, cited in Fleming 1989). and the capacity of Neutrophils to kill bacteria is significantly diminished during iron deficiency (Walter and others 1986)

Since iron deficiency anaemia compromises immuno-competence, it is likely to increase mortality among the high risk groups like pregnant women. There is a good deal of evidence that relates maternal mortality to severe anaemia. In Maharashtra, India, 90 percent of all maternal deaths occurred in women with Hb levels less than 7 grams/ml of blood, (Masani 1969, cited in Fleming 1989). In Nigeria, Harrison (1975) found that 4 percent of mothers with severe anaemia (Hb levels less than 5 gams/ml of blood) in childbirth. Some evidence suggests that 20 percent of all maternal deaths in West Africa and India (when blood transfusion was not available) were directly attributed to anaemia and that additional mortality resulting from hemorrhage was indirectly caused by

maternal anaemia (Fleming 1989) In order to avoid consequences of iron deficiency during pregnancy many developing countries have embarked on reduction of iron deficiency anaemia. This has been done by country wide coverage. But more countries are lagging behind as shown below in table 6.

Table 6: **PREVALENCE OF IRON DEFICIENCY AND PROGRAM COVERAGE BY COUNTRY**

		FORTIFICATION	
COUNTRY	PREVALENCE	LEGISTRATION	PROGRAMME STATUS
Benin	39.0	None	None
Burundi	7.2(b)	None	None
Chad	25.0(b)	None	None
Ethiopia	6.0(b)	None	None
Kenya	6.0(b,a)	None	None
Mali	4.6	None	None
Zimbabwe	4.5(b)	None	None
Zambia	4.9(b)	None	None

Adapted from Pollitt 1989

- (a) Many countries distribute iron tablets as part of MCH program, but there is little data on coverage, compliance and so forth.
- (b) Regional or sporadic prevalence, or known regionally in some age groups and sexes.

Table 7: **RECOMMENDED DAILY INTAKE BASED ON BIOAVAILABILITY IN DIET ADULT FEMALES**

BIOAVAILABILITY	ABSORBED IRON REQUIREMENT(mg/day)	IRON INTAKE IN (mg/day) BY QUALITY OF THE DIET		
		Low	Medium	High
Pregnant	3.60	120	60	33
Lactating	1.31	44	22	12
Menstruating	2.38	79	48	22

**NOTE:** As defined by Monsen and others 1978, a diet with low Bio Availability contains no meat, fish or poultry; non of the iron is heme-iron, and 3% of the total iron is absorbed. A diet with medium BioAvailability contains 1 ounce of fish per day; 4 % of the iron is heme-iron, and 6% of total iron is absorbed. A diet with high BioAvailability contains 3 ounces of beef per day; 21% of the iron is heme-iron, and 11% of total iron is absorbed. Source: D.E. Maeyer 1989.

From studies carried out in women in Malaysia. The maternal mortality rate amongst anaemic woman was five times that of non-anaemic woman. The effect on the foetus was even greater, the still-birth rate being six times higher in anaemic women (Dereck et al 1990). Maternal mortality due to anaemia from a field study carried out by Cerne and Oderback et al in 1991 stood at 49 per 100 000 which is quite significant. The infant Crude fatality rate stands at 13.7% (Bulletin of Health Statistics 1992).. compared to 11.2% 1982. The increase has been gradual over the last 10 years.

So far not much work has been done on anaemia in pregnancy in Zambia.

## CHAPTER FOUR

### 4.0 OBJECTIVES:

#### 4.1 General

To determine factors leading to anaemia in pregnancy among women attending Antenatal clinic at Arakan Camp Hospital.

#### 4.2 Specific:

- (1) To verify the extent to which the following factors contribute to anaemia in pregnancy:
  - (i) Malaria.
  - (ii) Worm infestation.
  - (iii) Urinary tract infections.
  - (iv) HIV infection.
- (2) To determine the age distribution of anaemia in pregnancy.
- (3) To investigate the role of socio-economic status in anaemia in pregnancy.
- (4) To establish the extent to which accessibility to antenatal care contributes to anaemic in pregnancy.

## CHAPTER FIVE

### 5.0 METHODOLOGY:

#### 5.1 Study Design

A Cross-sectional study of pregnant women attending ante-natal clinic at Arakan Camp Hospital between March 99 and July 99.

#### 5.2 Study Setting

The study was carried out at Arakan Camp Hospital. Arakan camp Hospital is situated in Arakan Barracks, Woodlands, in the City of Lusaka - Woodlands is a Low density residential area. It is about 10 km east of the city centre. The Camp Hospital has a well established Maternity and child Health Centre. Which is supported by the Ministry of Health.

#### 5.3 Sample and sample size

The subjects were drawn from the barrack population while a few came from L85 in Lusaka West which is a Military Cantonment. Systematic sampling was used. The target population was women attending ante-natal clinic at Arakan Camp Hospital. From the daily attendances every fourth pregnant woman was recruited into the study. Only women of 20 weeks and above gestation age were included in the study over a period of five months from March 1999

to July 1999. Those women who did not fulfill the criteria of selection were not included in the study.

The sample size was 113 (one hundred and thirteen) with the proportion of anaemia in pregnancy estimated at 8%  $Z = 1.96$ . Sampling error estimated at 5%.

$$\begin{aligned}\text{Sample size} &= \frac{Z^2 P (100-P)}{d^2} \\ &= \frac{(1.96)^2 \times 8 \times (92)}{5^2} \\ &= 113.1 \quad \text{where: } P = \text{Proportion of estimated pregnant women with anaemia.} \\ &\quad d = \text{Sampling Error.}\end{aligned}$$

The power of the study was more than 80%:

- \* Only women of 20 weeks gestation and above were given questionnaires.
- \* Anaemia was defined as a Haemoglobin of 10.5mg/dl and below. Anaemia was not reclassified into mild moderate and severe.
- \* All the women recruited in the study were counselled and consent was obtained before their participating in the study.

#### 5.4 **Data collection**

The study was conducted from 8-12 hours in the morning and 14-16 hours in the afternoon on all the working days starting from Monday to Friday. Saturday and Sunday being holidays and 12 – 14 hours being lunch time no selection of study subjects was done during this time.

The selection procedures became more specific in the event when a particular subject refused to participate in the study or refused to adopt a procedure like collection of blood samples.

The data was collected in 3 stages:

- (a) A coded questionnaire was prepared which included information about the demographic status, socio-economic background of individuals who participated in the study.
- (b) Collection of stool and urine to isolate worm infestation and UTI.
- (c) *Blood collection- routine blood was collected in the antenatal clinic, which was used for isolating malaria parasites, sickle cell disease, STDs and identification of HIV antibodies.* Anonymity was maintained while collecting blood for HIV infection and care was taken to preserve confidentiality of each participating subject.

Maternal data collected included age, Marital Status, Gestation Age. husbands occupation (officer/soldier) - this was used as a measure of socio-economic Status. Other major variables measured were worm infestation, malaria, sickle cell disease, HIV status and syphilis. The outcome being measured was anaemia using the Haemoglobin concentration in g/dl.

#### 5.5 **Data processing and analysis:**

The EPI - INFO programme was used producing frequency distributions and cross-tabulations. The odds ratio and the 95% confidence intervals were produced from the programme. Odds ratio was used as a measure of association in some cases, the Fischer Exact test was used where the chi-square was not valid because of the numerals in the cells being less than five. A P value of 0.05 or less was considered to be statistically significant.

#### 5.6 **Ethical consideration.**

Approval was obtained from the Research Ethics Committee of the University of Zambia. Clearance was also taken from the Zambia Army authorities to carry out the study in Arakan Camp Hospital. Informed consent was obtained from each subject.

### 5.7 **Pretest**

Pre-test was done at Arakan Camp Hospital. This helped in redesigning the questionnaire and eliminating certain variables.

## CHAPTER SIX

### 6.0 RESULTS

A total of 113 respondents were recruited for the study. Out of which 112 fully completed the questionnaires, one did not complete and was not included in the study. The respondents ranged between the age of 16 years to 46 years old. The majority of the subjects were between 20-28 years of age and one was separated. The majority of the subjects were non-commissioned officers' spouses. Eighty (76.2%) of the women who participated in the study were below 28 weeks gestation age, 16 (15.2%) were between 28 and 36 weeks with 9 (8.6%) being above 36 weeks. Seventy-five of the women did not acknowledge to having had worms before, 34 (30.4%) had worms before with only 3 (2.7%) being ignorant of having had worms before.

Ninety-seven percent had recurrent fever which was diagnosed as malaria clinically with the rest not having had recurrent Malaria. Ninety-four of 113 had not been on Malaria prophylaxis with only 16 (14.5%) having been on Malaria prophylaxis.

Most of the subjects questioned had not had anaemia before and had been enjoying good health. There was no sickler recruited in the study.

Thirty of the women tested positive for HIV which gave a percentage of 26.8% compared with Lusaka Sero-prevalence of 26.5% (HIV AIDS in Zambia MOH December 1997). Nine tested positive for syphilis. Two had hookworms (*Ancylostoma Duodenale*). Nine had urinary tract infections. Sixty subjects brought stool samples and only 44 subjects brought urine samples, the majority 34 (30.4%) of the subjects had positive malaria parasite slides, see table 8.

#### **6.1 Age distribution of anaemia in pregnancy.**

Anaemia was more common in the women below the Age of 25 years with the majority being in the age group 15 - 24 years. This is a diversion from what is expected.

#### **6.2 Malaria and anaemia.**

From a total of 66 women who were found to have anaemia 62 had recurrent attacks of Malaria with only 4 having had no history of recurrent Malaria. Anaemia was significantly associated to having recurrent attacks of Malaria. Odds Ratio 5.13, 95% C.I. 4.17 < OR < 6.61, P = 0.04.

#### **6.3 Worm infestation and anaemia.**

Out of 110 subjects a total of 34 women gave past history of having worms while 73 did not. Of these that had worms 20 had Anaemia.

Anaemia was present in 51 women yet they had not had worms before. The Association between worm infestation and anaemia was non-significant (Fischer Exact Test: 1 tailed,  $P = 0.40$ ).

#### 6.4 **HIV Infection and Anaemia:**

A total of 73 who were found to be anaemic 24 were HIV positive, the association between anaemia and HIV was significant (OR 2.5 95%, CI 1.13 < OR < 3.18).

#### 6.5 **Urinary tract infections and anaemia.**

Out of the 60 Women who brought urine samples 24 had urinary tract infections and were found to be anaemic while 14 were anaemic and had not had urinary tract infections. The Association was significant (OR 1.71, 95% CI: 0.51 < OR < 5.76).

The association between socio-economic status, accessibility to antenatal care, residence and anaemia was non significant with P values of 1.00, 0.31, 0.63 respectively.

Table 8:       **FREQUENCY TABLE FOR MEASURED VARIABLES**

LABORATORY TEST	POSITIVE	NEGATIVE
HIV (ELISA)	30 (26.8%)	82(73.2%)
Syphilis (RPR)	9(8%)	103(92%)
Stool (Microscopy)	2(3.3%)	58(96.7%)
Urine (Microscopy)	9(19.6%)	37(80.4%)
Malaria parasite slide	38(33.9%)	74(66.1%)
Anaemia	73(66.4%)	37(33.6%)

Table 9:       **AGE DISTRIBUTION OF ANAEMIA IN PREGNANCY**

AGE GROUP	ANAEMIC	NON-ANAEMIC
15-24	38	24
25-34	31	11
35-44	4	1
45-54	0	1
TOTAL	73(66.4%)	37(33.6%)

Table 10: **CROSS-TABULATIONS FOR MAJOR MEASURED VARIABLES IN ANAEMIA IN PREGNANCY**

VARIABLES	ANAEMIA					
	PRESENT	ABSENT	TOTAL	(OR) ODDS RATIO	95% CI	P VALUE
<b>Malaria</b>						
Yes	62	33	95	5.13	4.17<OR	0.006
No	4	11	15		<6.61	
TOTAL	66	44	110			
<b>PAST EXPOSURE TO WORMS</b>						
Yes	30	34				0.400
No	51	73	-	-	-	Fisher
I don't know	2	3				Exact Test
TOTAL	73	37	110			
<b>HIV STATUS</b>						
Positive	24	6	30	2.5	1.13<OR	0.040
Negative	40	31	80		<3.18	
TOTAL	73	37	110			
<b>UTI</b>						
Present	24	11	35	1.71	0.51<OR	0.020
Absent	14	11	25		<5.76	
TOTAL	38	22	60			

## CHAPTER SEVEN

### 7.0 DISCUSSION

According to the objectives of the study the single most common cause of anaemia was found to be malaria, that is 33.9% (38). closely followed by HIV 26.8% (30). Both of these brought down the nutritional status of the majority of the participants, who had anaemia 66.4%, see table 8. It is also interesting to note that the most 62 (15 – 24 years old) of the participants belong to the active reproductive age group out of which 38 were anaemic and 24 were non-anaemic and another 31 anaemic participants came in the age group 25 – 34. This proves the theory that early sexual activity among antenatal mothers and attacks of malaria in the 1<sup>st</sup> trimester (see table 9) was very common.

Twenty four individuals gave evidence of UTI in the study even though the numbers were not large yet it proves that some amount of interaction is going on somewhere, unless sexual activity being the contributory factor, detailed investigations and history could have brought some evidence as to what the exact cause of the cases of UTI. Chronic UTI has proved to bring down the resistance of individuals to fight simple infections and in the long run

## CHAPTER SEVEN

### 7.0 DISCUSSION

According to the objectives of the study the single most common cause of anaemia was found to be malaria, that is 33.9% (38), closely followed by HIV 26.8% (30). Both of these brought down the nutritional status of the majority of the participants, who had anaemia 66.4%, see table 8. It is also interesting to note that the most 62 (15 – 24 years old) of the participants belong to the active reproductive age group out of which 38 were anaemic and 24 were non-anaemic and another 31 anaemic participants came in the age group 25 – 34. This proves the theory that early sexual activity among antenatal mothers and attacks of malaria in the 1<sup>st</sup> trimester (see table 9) was very common.

Twenty four individuals gave evidence of UTI in the study even though the numbers were not large yet it proves that some amount of interaction is going on somewhere, unless sexual activity being the contributory factor, detailed investigations and history could have brought some evidence as to what the exact cause of the cases of UTI. Chronic UTI has proved to bring down the resistance of individuals to fight simple infections and in the long run

contribute to the existence of malaria among those that suffer from UTI's.

Only 2 of the participants were found to have Ancylostoma Duodenale, almost 99% of all the antenatal mothers were housewives and did not have any other activities rather than house work, which could be contributory to worm infestation. Worm infestation normally results from contaminated soil infested through indiscriminate defecation and no use of pit latrines. Incidentally in the Barracks proper latrines have been provided preventing indiscriminate defecation, thus contamination of the soil does not arise. This is the contributory factor to the reduced prevalence of worm infestation. It would be interesting to note if the same is true for the children.

This study also shows a significant association between HIV and malaria among the antenatal mothers. Socio-economic status played a major role in the prevalence of anaemia during pregnancy due to the availability of food supplements (i.e. 2 free bags of mealie meal per family) and an average income of K150,000 per family. This is not the case for the rest of the civil service. This little gain was however defeated by the prevalence of HIV and malaria during pregnancy.

This study was meant to highlight the factors, which contribute to Anaemia in pregnancy and its age distribution, so as to alert the authorities. And with their support implement measures which are in place country wide. The high prevalence among the young is of great concern as they form the productive age group.

## CHAPTER EIGHT

### 8.0 CONCLUSION

The study clearly demonstrates a significant association of HIV infection and recurrent malaria in the production of anaemia in pregnancy. Malaria produces severe placenta parasitemia and also contributes to the destruction of RBCs (Specifically causing hemolysis) when it attacks women in the 1<sup>st</sup> trimester. This is a major factor in the increased prevalence of infant and maternal mortality rate. Infants born to such mothers are of low birth weight with the remotest chance of survival.

Twenty six percent of the women had evidence of HIV infection. This is in line with the national figures where every 3<sup>rd</sup> woman is found to be sero-positive. This also proves another factor that spouses of these women are heterosexual. However this study did not focus on the investigation of HIV infection in males that would have otherwise identified discorded couples. It is a proved fact that it is mostly the soldiers that are three times more prone to acquire HIV infection because of their out door activities rather than women who remain indoors. This shows that it is their male counterparts who are contributing to infection in their female partners.

Sixty four percent of the women gave a history of recurrent attacks of malaria of which 38 gave a clear evidence of positive malaria parasite

slides. This shows that even though Arakan Barracks is in the heart of the capital city of Lusaka, just opposite the state house, it appears to have a high percentage of mosquito density which are coming probably from nearby breeding sites. This needs to be investigated.

Pregnancies were very common among women of a younger age group in Arakan Barracks. These were also found to have a very high incidence of HIV infection and malaria. The incidence and prevalence of malaria and HIV infection was surprisingly at very low levels in age groups above 35 years.

Demographically there could be a total of 1500 women belonging to Arakan Barracks, which is not a large number. With time and resources these could be screened which then would have a different meaning in this study.

Statistically the sample size justifies the number but the positive predictive value of the results is debatable specifically when the sample size is small. For arguments sake HIV and malaria together have a compounding effect on the pregnancy which could be worse in a multiparous woman with already existing anaemia. This However, did not look into this factor as no grandmultiparous woman were recruited in the study.

## CHAPTER NINE

### 9.0 INTERVENTIONS

1. Iron deficiency anaemia in pregnancy can be prevented by adequate consumption of the micro-nutrients through food, even before a woman becomes pregnant. Recommended daily intake is shown in the table in Literature Review

When the intake of the food is limited, specific interventions are needed to prevent and address micronutrient deficiencies. Most micronutrient interventions represent both preventive and curative therapies. The two main interventions are (i) Micronutrient supplementation (administration of pills, capsules or injections containing one or more of the micronutrients) (ii) Fortification (addition of micronutrients to foods in processing). Other interventions such as nutrition education and agriculture programmes can be used as long term measures to promote the intake of these micro-nutrients by vulnerable groups e.g. women in reproductive age group.

These programmes of Fortification and Supplementation should be fully supported by nutrition education. Failure to educate the public and the politicians to support such problems as been implicated as

a significant reason for failure of programmes in Central and south America (Schaefer 1974, as cited in Trilly and Hetzel 1980).

2.     **Primary preventive strategies for helminthes infection**

Table 11

PARASITE	IMMUNISATION	CHEMOPROPHY-LAXIS	HEALTH EDUCATION
<b>Nematodes:</b> 1. Ascaris 2. Trichuris	Inadequately studied	Albendazole Ivermectin	Personal hygiene, latrine building,
<b>Hookworms:</b> Stronggyloides	No immediate prospects	Albendazole Ivermectin	Personal hygiene, latrine building and soil contact
<b>Cestodes:</b> Tenia	Adequately studied	Praziquantel	Food preparation, latrine building, livestock management and personal hygiene

Women in childbearing age groups to be de-wormed depending on how heavily infected the population is. If worm infestation is discovered during pregnancy, appropriate chemotherapy should be given as shown above.

3.     Malaria and other infections e.g. PTB must be identified early and treated. Recurrent attacks of malaria can be controlled by putting the pregnant women on malaria prophylaxis. This is done in

certain MCH facilities. PTB if identified early a therapeutic termination of pregnancy can be advised. In cases of malaria personal protection must be encouraged which include use of bed nets, impregnated with insecticides, modification of evening activities and clothing. For bed nets a subsidy on their sale is recommended.

4. Better general health for women In general when women are healthy, they are better equipped to handle pregnancy and their infants will be healthy. Good health for all women requires an integrated set of actions, including health services, community development and education for female children.
5. Women need better services through out their life. Nutrition is important at all ages so that a woman enters child bearing age with normal height, weight, pelvic size, and nutritional status. Nutrition programs can include a variety of components e.g. nutrition and health education, anaemia screening and prevention (iron and folate supplementation). (Letten and Meire, 1985)
6. Family Planning Interval of more than two years between pregnancies improves the health of the mother and the outcome. This results in a few term pregnancies. Hence fewer grand multi-

parous women who are at risk of developing anaemia in pregnancy. Wider spacing has been recommended for improving maternal morbidity and mortality. Too many births too closely spaced seem to cause a general decline in the health and nutritional status of some women. This decline is called the maternal depletion syndrome (Winikoff and Castle 1987).

The Freedom to plan the time of offspring and education is required to help a woman make this choice are undeniably appropriate goals for any maternal health program.

7. The WHO (World Health Organisation) estimates mother-to-infant transmission as the second most important transmission mode for HIV infection in developing countries accounting for up to 11 percent of all cases. HIV infection has an impact both on the mother and outcome in pregnancy. HIV infection contributes to anaemia in pregnancy. HIV infected women, especially if pregnant should receive extra gender specific voluntary counseling.
8. The use of Impregnated bed nets (ITC) could reduce the incidence of malaria by about 30% in the Barracks. Tackling of breeding sites would further reduce malaria by 15%. Its also suggested that proper enforcement of mosquito extermination act (1966) would further reduce malaria by 10%. In totality if all this was done

simultaneously, incidence and prevalence of malaria will reduce by 50%. This would be a major gain and achievement. The Army could take a leading role in demonstrating the reduction of malaria in its headquarters and residential areas.

## REFERENCES:

1. Ahmed et al: Maternal Mortality Attributed to Malaria in Pregnancy UTH (Unza), Lusaka, 1998.
2. Allen LH, Improving Iron Status Through Diet. Ahluwalia. Omni, 1616 N Fort Myerdrive, 11th Floor, Arlington VA 222 09 USA 1997.
3. Bulletin Of Health Statistics, Ministry Of Health 1989 - 1992 Page 11, 13, 44.
4. Bullen J J. Griffiths E. Iron And Infection, Chichester, 1987.
5. Bothwell T H, and R W Charlton, 1991. Iron Deficiency in women. International nutritional Anaemia Consultative group. Washington D C
6. Brabin BY, 1988 Consequences of Maternal Anaemia on fetal and Early Infant development in a Malarial endemic area. Perinatal morbidity and Mortality. Paper presented at the International Nutritional Anaemia Consultative Group meeting on Anaemia and Pregnancy, November 14 16 1988, Geneva.
7. Cerne And Order Back Et Al Maternal Morality And Mobility At UTH. A Pilot Study. 1991.
8. Dereck Llewellyn-Jones, Fundamentals Of Obstetrics And Gyneacology, Volume One Obstetrics, Fifth Edition UK 1990 Page 233 - 232.
9. Draper A. The Oxford Brief: Child Development And Iron Deficiency. Omin, 1616 Ert Myer Drive, 11th Floor, Arlington VA 22209, USA, 1997.

10. Demaeyer EM, Dallman P, Gurney J M Et Al. Preventing And Controlling Iron Deficiency Anaemia Through Primary Health Care, World Health Organisation. Geneva 1989.
11. De maeyer E, 1989. Preventing and Controlling Iron Deficiency Anaemia through Primary Health Care WHO Nutrition Unit. Geneva.
12. Elizabeth Topley, Anaemia In Rural Africa, Supplement Africa Health, Cambridge U K, 1998.
13. Florentino, R F and R M Gurriec, 1984. ôPrevalence of Nutritional Anaemia in Infancy and Childhood with emphasis on developing countriesö. In Abraham Stekel, ed., Iron nutrition in Infancy and Childhood. Westle nutrition workshop, series 4, New York: Raven Press
14. Fleming A F, 1989. Consequences of anaemia in Pregnancy on the Mothersö. Liverpool School of Tropical Medicine, Department of Tropical Medicine and Infectious Diseases. Liverpool, England.
15. Fleming A F, Tropical Obstetrics and Gynaecology. 1. Anaemia in Pregnancy in Tropical Africa. Transactions of the Royal Society of Tropical Medicine and Hygiene. 1989) 83: 441-448.
16. Green Wood BM, David P Otoo-Forbes LN Et Al, Mortality And Morbidity From Malaria After Stopping Malaria Chemoprophylaxis.
17. Global Programme On Aids: Current And Future Deminsions Of The HIV/Aids Pandemic: A Capsule Summary. Who Geneva 1992.
18. Gillespies, Kevany J, Manson J. Controlling Iron Deficiency Anaemia: Nutrition Policy Discussion Paper 9. ACC/SCN Who Geneva. 1991.

19. Hercberg and others: Iron Deficiency Anaemia in Pregnancy, Benin. 1987.
20. HIV/Aids In Zambia, Back Ground Projections Impacts Interventions. Ministry Of Health. Central Board Of Health. December 1997.
21. Harrison K A, 1975. Maternal Mortality in Anaemia in Pregnancy. West African Medical Journal: 27 ÷ 31.
22. Kelly P Feldman R. Ndubani P. High Adult Mortality in Lusaka, Lancet 1988; 351-883.
23. Lee Gr. The Anaemia of Chronic Disease: Seminars In Haematology 1983: 20:61-80.
24. Lettenmeier, C., Laurie Liskin C, A Church and J A Harris 1988 "Mothers" Lives Matter: Maternal Health in the Community. Population Information Programme, Baltimore.
25. Lienellyn-JONES 1965. Severe Anaemia in Pregnancy. Australian and Newzealand Journal of Obstetrics and Gynaecology 5: 191-97
26. Manson P.E.C. Bahr D.R. Bell, Mansons Tropical Diseases Nineteenth Edition, London 1991 Page 974.
27. Major Health Trends, Ministry Of Health 1982 – 1992, Page 11, 13, 44.
28. McDemont et al: Maternal Mortality Attributed to Malaria in Pregnancy UTH (Unza), Lusaka, 1996
29. Nkowane, B.M. Prevalance And Incidence Of HIV Infection In Africa. 1991. 55:57-15.

30. Park D.K, Parks Text Book Preventive And Socio Medicine, 20th Edition India. 97 Page 340, 451, 418, 560.
31. Primary Surgery, Volume One, Non-Trauma, USA 1991 Page 17.2
32. Skills, ME., and V R Young, 1988, Modern nutrition in Health and Disease, Philadelphia: Lea and Febiger
33. Stephenson L S., 1987. The Impact of Infections on Human Nutrition. London: Taylor and Francis.
34. Thilly, C H, and B S Hetzel, 1980. An Assessment of prophylactic programmes: Social, Political, Cultural, and Economic Issues. New York: John Wiley and Sons
35. Weathral D J , Ledingham H G G Warrell D.A. Anemia: Pathophysiology, Classification And Clinical Features. Oxford Text Book Of Medicine 3rd Edition. Oxford, Oxford University Press, 1966 Pp. 3457 – 3462
36. WHO (World Health Organisation). 1957. Expert Committee on Malaria: Report of the Sixth Session Technical Report 123, Geneva WHO 1978 Malaria Control Strategy. Report by the Director General. A31/19 Geneva.
37. Winicoff, Beverly, and M A Castle 1987 The Maternal Depletion Syndrome: Clinical Diagnosis of Eco-demographic condition?ö Population Council. New York.

## QUESTIONNAIRE

**MASTER OF PUBLIC HEALTH PROJECT  
DEPARTMENT OF COMMUNITY MEDICINE UNZA**

**TITLE: TO DETERMINE FACTORS LEADING TO ANAEMIA IN PREGNANCY AMONG WOMEN ATTENDING ANTE-NATAL AT ARAKAN CAMP HOSPITAL.**

**Instructions to research assistants:**

Reading through the questionnaire carefully and answer the questions by ticking, circling or writing the answer in the space provided.

**A. SOCIO-DEMOGRAPHIC DATA**

1. Name of Client:.....
2. a) Age.....
3. Marital Status: Single/Married/Divorces/Separated
4. Residential address:.....
5. Occupation:.....
6. Parity:..... Gestational age.....
7. Officer/Soldiers wife

**B. OTHER DETAILS**

8. Have you had worms before?  
1 = YES      2 = NO      3 = I DONÆT KNOW
9. Have you been treated for recurrent fever? Malaria  
1 = YES   2 = NO   3 + I DONT KNOW
10. Are you on Malaria prophylaxis?  
1 = YES   2 = NO
11. How many years pass before the next pregnancy?  
1 = 1,   2 = 2,   3 = 3,   4 = 4,

12. At how many months of pregnancy did you start ante-natal?  
1 = 1st Trimester 2 = 2nd Trimester 3 = 3rd Trimester
13. Have you ever had anaemia before?  
1 = YES 2 = NO 3 = I DONÆT KNOW
14. Have you been enjoying good health the last year?  
1 = YES 2 = NO 3 = I DONÆT KNOW
15. Are you a sickler?  
1 = YES 2 = NO 3 = I DONÆT KNOW
16. Have you ever had TB before?  
1 = YES 2 = NO 3 = I DONÆT KNOW
17. Have you ever passed blood in urine?  
1 YES 2 = NO 3 = I DONÆT KNOW

**C. LAB RESULTS**

18. HIV STATUS : NEGATIVE/POSITIVE
19. RPR: NEGATIVE/POSITIVE
20. SICKLING TEST: NEGATIVE/POSITION
21. FBC RESULTS:  
Hb:.....  
N:.....  
L:.....  
M:.....  
B:.....  
Eos:.....  
ESR:.....
22. Stool R/M .....
23. Urine P/M: .....
24. MP slide.....

**THE END**

Thank you very much for your participation.

Questionnaire filled in by:

Date:.....

**PATIENT INFORMATION LEAFLET AND INFORMED CONSENT**

Document issued from the declaration of Helsinki, EC Directive 75/78/EC.

Patients Name,.....

Address:.....

Hospital Number:.....

Case Number:.....

Sponsor:       Zambia Army,  
                  Army Headquarters  
                  LUSAKA   ZAMBIA

Investigator: Dr Simapuka Lawson F

Protocol Number: MPH.01.97

A cross-section study of the factors contributing to anaemia in pregnancy in women attending ante-natal at Arakan Camp Hospital.

**INTRODUCTION:**

Madam:

You have been recruited in this study to investigate the factors contributing to anaemia in pregnancy.

The research protocol was submitted to the Research Ethics Committee of Zambia Defence Force and written approval has been granted by the Committee. The study has been structured in accordance with the declaration of

Helsinki (last updated in October 1996) which deals with the recommendations guiding doctors in bio medical research involving human subjects. A copy which will be submitted from the investigator should you wish to review.

## **PURPOSE OF THE RESEARCH**

The purposes of this research is:

To verify the extent to which:

Recurrent infections like: **Malaria**, Worm Infestation, Urinary Tract Infection and HIV contribute to anaemia in pregnancy.

To determine the age distribution of anaemia in pregnancy

To determine the role of Socio-economic status in anaemia in pregnancy

To establish the extent to which accessibility to ante-natal care contributes to anaemia in pregnancy, you qualify to participate in this study because you are 20 weeks of pregnancy and above and you meet the criteria established for participation.

## **DESCRIPTION ON RESEARCH**

### **1. Study design:**

If you meet the requirements for participation in this study and give written consent, you will require to give blood for:-

HIV Screening

Haemoglobin estimation

Helsinki (last updated in October 1996) which deals with the recommendations guiding doctors in bio medical research involving human subjects. A copy which will be submitted from the investigator should you wish to review.

## **PURPOSE OF THE RESEARCH**

The purposes of this research is:

To verify the extent to which:

Recurrent infections like: Malaria, Worm Infestation, Urinary Tract Infection and HIV contribute to anaemia in pregnancy.

To determine the age distribution of anaemia in pregnancy

To determine the role of Socio-economic status in anaemia in pregnancy

To establish the extent to which accessibility to ante-natal care contributes to anaemia in pregnancy, you qualify to participate in this study because you are 20 weeks of pregnancy and above and you meet the criteria established for participation.

## **DESCRIPTION ON RESEARCH**

### **1. Study design:**

If you meet the requirements for participation in this study and give written consent, you will require to give blood for:-

HIV Screening

Haemoglobin estimation

Syphilis and Sickle Cell disease screening.

Stool and urine samples will be collected for the search of parasites.

Blood will be drawn from a vein in your arm. These tests will provide useful information that will be useful for the assessment of your health.

After this process, you will be followed by the investigator until you deliver.

### **RISKS AND DISCOMFORTS:**

You will have blood drawn once during the course of this study. The risk of discomfort when a sample is taken include slight discomfort or bruise at the site of the needle entry and commonly the formation of a small blood clot or swelling of the vein and surrounding tissue and bleeding from the puncture site.

### **BENEFITS:**

There is no guarantee that health condition might improve from receiving this treatment in this study. If injury occurs, immediate treatment will be available by the study doctor.

### **FINANCIAL COMPENSATION:**

You will receive no financial compensation for participating in this study, except for transport fees for those who live outside the barracks

## CONSENT TO PARTICIPATION IN STUDY:

Participation in this study is voluntary. The principle investigator will be happy to answer any questions, either at the time of your enrolment in the study or at anytime. Thereafter, you may withdraw your consent at anytime without affecting your present or future medical care you will suffer no penalty or loss of any benefits to which you are otherwise entitled should you decide not to participate.

## INFORMED CONSENT

PROTOCOL NUMBER: MPH – 01.97

Title: **A cross sectional study of the factors contributing to anaemia in pregnancy in women attending antenatal clinic at Arakan Camp Hospital.**

I ..... the undersigned declare that: ..... I am a female aged ..... years. I was born on .....

I consent to take part in the study voluntarily – no compensation will be given for participation. I am free to withdraw my consent to participate in this study at any time without prejudice to your subsequent care. In the event that I withdraw from the study, I will continue to be followed and clinical data will continue to be collected from my medical record. I authorize my medical records relating to research to be relocated to the sponsor, Zambia Army, Research Ethics Committee and Regulating Authority for source verification of data, but on the strict understanding that complete confidentiality is maintained. I agree that the

sponsor or its agent can process data during this study. I understand that I have right to access, which allows me to correct my data.

I can reverse my right of correction of data with my physician in charge. I have received a copy of this document and I understand that a copy will be kept confidentially by the sponsor of the study

Write "Read and Approved"

Patient Signature:.....

Print name:.....

Date:.....

I Dr. ....(print name) hereby confirm that the above patient has been informed fully about the nature, conduct and risks of the above trial.

Investigator's signature,.....(Print name).....

Date:.....

## BUDGET

SER	PARTICULARS	COST/UNIT	UNITS	TOTAL
1.	Research Assistant	K5,000=00	90 Days	K450,000=00
2.	Statistician	K150,000=00	-	K150,000=00
3.	Pens and pencils	K10,000=00	-	K10,000=00
4.	Paper	K12,000=00	5 reams	K60,000=00
5.	Specimen bottles	K1,000=00	565 bottles	K565,000=00
6.	Laboratory technician	K100,000=00	-	K100,000=00
7.	Secretary for typing	K50,000=00	-	K50,000=00
8.	Photocopying	K200=00	226 pages	K45,200=00
9.	Binding of final report	K50,000=00	-	K50,000=00
10.	Lab examinations: HIV, RPR, Stool, MPS)	-	113 study units	K8,000,000=00
11.	Grand Total	-	-	K9,480,200=00

258724



# THE UNIVERSITY OF ZAMBIA

## RESEARCH ETHICS COMMITTEE

Telephone: 252641  
211440 (UTH) 254824 (Pre-Clinical) Ridgeway Campus  
Telegrams: UNZA, LUSAKA.  
Telex: UNZALU ZA 44370

DEAN'S OFFICE  
P.O. box 50110  
Lusaka Zambia

Your Ref.:

Our Ref.:

Fax: + 260-1-250753

22 January 1999

Dear Dr Simapuka

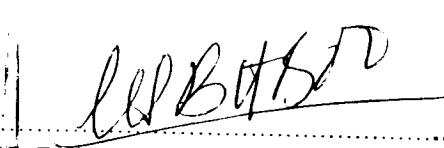
The following research proposal presented to the Research Ethics Committee in December 1998 was approved. Congratulations.

Title: **"A cross-sectional study of the factors contributing to anaemia in pregnancy in women attending antenatal at Arakan Camp Hospital"**

Please keep the committee informed on the progress of your research.

Yours sincerely,

Signed: .....

  
**Prof. KS Baboo MBBS MMED FRSH DABTM**  
**CHAIRMAN, RESEARCH ETHICS COMMITTEE**



# DEFENCE FORCE MEDICAL SERVICES



Telephone: 261137, 260301-4, Ext. 211  
263883

MEDICAL DIRECTORATE  
DEFENCE HEADQUARTERS  
P.O. BOX 31931  
LUSAKA  
ZAMBIA

DFMS/A 151

The Directorate of Research and  
Graduate Studies  
UNZA  
P O Box 32379  
LUSAKA

15 February 2000

## MEDICAL RESEARCH - ARAKAN CAMP HOSPITAL

1. This is to confirm that Major F L SIMAPUKA (Dr) was given authority by the Research Ethics Committee of the Defence Force Medical Services to conduct a research on "Factors contributing to Anaemia in pregnant women attending Antenatal Clinic at Arakan Camp Hospital".

2. For your attention.

J MWAPE BSc (Ned)  
Lieutenant Colonel  
for Director General of Medical Services