

TITLE:

**PREVALENCE OF ANAEMIA AMONG PREGNANT WOMEN ATTENDING
ANTENATAL CLINIC AT MBAGATHI DISTRICT HOSPITAL**

PROPOSAL PRESENTED IN PART FULFILMENT

OF

MASTERS OF MEDICINE

IN

OBSTETRICS AND GYNAECOLOGY

UNIVERSITY OF NAIROBI

COLLEGE OF HEALTH SCIENCES

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ACKNOWLEDGEMENT

I thank God for enabling me to undertake this study. I am also very grateful to the following for their support and contribution to this study.

1. My supervisors Prof. Koigi Kamau and Dr. Harrison Tamooh for their guidance throughout the study.
2. The funding is from the Linked-Strengthening Maternal, Newborn and Child Health Research Training in Kenya. The grant is linked to Partnership for Innovative Medical Education in Kenya (PRIME-K). The project described was supported by Award Number 5R24TW008907 from the US National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the US National Institutes of Health.
3. My lecturers in the department of Obstetrics and Gynecology for their inputs/critique.
4. The nurses and clinical officers at Mbagathi District Hospital under the guidance of Dr. Wachira and Dr. Okutoyi.
5. The University of Nairobi Pediatric Laboratory for their great and professional input of handling the laboratory investigations.
6. My family for their unwavering and unending moral and financial support.

TABLE OF CONTENTS

List of abbreviations	6
Abstract	7
Introduction	10
Literature Review	11
Study Justification	17
Conceptual Framework	18
Research questions and objectives.....	21
Methodology	21
Study population and design.....	22
Study instrument	23
Sample size calculation.....	23
Datacollection, management, analysis.....	24
Research timelines.....	28
Results.....	29
Discussion.....	34
Conclusion.....	36
Appendix I Questionnaire.....	38
Appendix II Lab Form.....	41

Appendix III Informed Consent Form	43
Appendix IV Consent Form	45
Appendix V Dummy analytical tables	53
REFERENCES	55

LIST OF ABBREVIATIONS

- ANC - Antenatal Care
- AIDS - Acquired Immunodeficiency Syndrome
- E. Histolytica- Entamoeba histolytica
- Hb - Hemoglobin
- HIV - Human Immunodeficiency Virus
- MCH - Mean Corpuscular Hemoglobin
- MCHC- Mean Corpuscular Hemoglobin Concentration
- MCV - Mean Corpuscular Volume
- PCV - Packed Cell Volume
- PRIME-K - Partnership in Innovative Medical Education in Kenya
- S. mansoni- schistosoma mansoni
- SPSS - Statistical Package for Social Sciences
- WHO - World Health Organization

PREVALENCE OF ANAEMIA AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT MBAGATHI DISTRICT HOSPITAL

ABSTRACT

BACKGROUND

In the world, more than half of pregnant women are anemic. The burden of disease is heavy yet poorly estimated. Knowledge of the current situation in our environment is necessary. This knowledge will enhance early detection and timely management of anemia in pregnancy.

PROBLEM STATEMENT

The prevalence of anemia in Kenya has been variously studied with no reliable statistics by region though estimates exist. In Nairobi specifically, there are no documented studies on prevalence. However, pregnant women attending antenatal clinics are routinely put on iron supplementation in their second through to third trimester of pregnancy but the burden of disease remains high as determined by anemia related fetal and maternal mortality and morbidity. This study will seek to determine the prevalence of anemia in Nairobi as well as its associated etiological factors. The results of this study as well as its recommendations will help put in place policies to effectively investigate and manage anemia in pregnancy and therefore reduce the burden of disease.

OBJECTIVE

To determine the prevalence of anemia among pregnant women attending antenatal care at Mbagathi District Hospital.

STUDY SITE

The study was carried out at Mbagathi District Hospital. This is a Government owned Level Four Hospital located in Nairobi West District in Nairobi in Kibra Constituency at the antenatal clinic.

STUDY DESIGN

This was a Cross-Sectional Descriptive Study conducted within a four month period at Mbagathi District Hospital.

STUDY POPULATION

The study population comprised of 381 pregnant women aged between 15 -49 years attending Antenatal clinic at Mbagathi District Hospital for the first time and who had not been on any iron supplementation.

DATA COLLECTION AND MANAGEMENT

A structured questionnaire was administered to all eligible women to determine their sociodemographic and economic status, reproductive and clinical state. All women found to have a hemoglobin concentration of less than 11g/dl on their routine antenatal profile tests underwent further tests i.e. full haemogram, blood slide for malaria parasites and a stool examination.

Data was transferred and analyzed using SPSS software. Inferential analyses were conducted using Chi square and T-test.

RESULTS

Out of 381 women enrolled in the study, one hundred and thirty eight (36.2%) were found to be anemic. Anemia was more prevalent in the second (46.0%) and third (52.6%) trimesters. Seventy one women (51.4%) had mild anemia, sixty six women (47.8%) had moderate anemia while only one had severe anemia. One hundred women (72.5%) had microcytic anemia while thirty eight (27.5%) had normocytic anemia. There was no case of macrocytic anemia. Associations between presence of malaria and helminthic infestations were not found to be statistically significant. Twenty women (5.3%) had their first visit in their first trimester while one hundred and fifty nine (42.7%) had their first visit in their second trimester and one hundred and ninety three (43.8%) in their third trimester. Other sociodemographic characteristics had no statistically significant relationships with anemia in pregnancy.

CONCLUSION

Microcytic anemia most likely due to iron deficiency was the most prevalent type. Routine iron supplementation should be encouraged early in pregnancy and educating women on early initiation of antenatal clinic attendance would reduce the problem of anemia in pregnancy.

RECOMMENDATIONS

There is need for more stringent measures in investigating and screening of pregnant women for anemia by taking blood samples for full haemogram. Corrective measures should then be instituted immediately. Routine iron supplementation should be encouraged as a prophylactic measure. Educating women on early initiation and compliance would be beneficial in reducing the burden of disease.

INTRODUCTION

World Health Organization defines anemia as hemoglobin below 11g/dl as the lower limit acceptable and 10.5g/dl in the second half of pregnancy. Anemia can further be classified into mild anemia (10 -10.9g/dl), moderate anemia (7-9.9g/dl) and severe anemia (<7g/dl)^[1]. An estimated 58.27 million women worldwide are anemic during pregnancy, 95.7% of whom live in developing countries^[1]. In Africa, the prevalence of anemia in pregnancy is estimated to be between 35% and 75% as compared to the developed countries where prevalence is at 15%^[1-3]. The true prevalence of anemia in pregnancy in Kenya is unknown but estimates show overall prevalence is 54% while in pregnancy prevalence is between 20-70%^[19, 22, 23].

Anemia has been a topical issue in many developing countries because of its association with adverse pregnancy outcome such as increased rates of maternal and perinatal mortality, premature delivery, low birth weight, low APGAR scores, fetal physical growth and mental impairment and infant deaths etc.^[3,5] Anemia may worsen the sequelae of postpartum hemorrhage and predispose to puerperal infection both of which are leading causes of maternal mortality in developing countries.^[3]

Iron deficiency anemia is the most common type^[19] contributing to 50% of all anemia, and result to almost a million deaths per year, with three-quarters of these deaths occurring in Africa and south East Asia. Close to 500,000 maternal deaths ascribed to childbirth or early post-partum occur every year, with vast majority occurring in the developing world. Anemia poses a 5-fold increase in overall risk of maternal death related to pregnancy and delivery.^[20]

The common causes of anemia include parasitic infestations such as malaria and hookworm; infections like HIV and hemoglobinopathies^[11,13,24,25]the predisposing factors are grand-multiparity, young age, low socioeconomic status, and illiteracy. ^[1,11]Others include inter-pregnancy spacing of <1 year and late booking, rural vs. urban dwellers among others.^[6] These factors abound among pregnant women in Kenya, making anemia in pregnancy an important reproductive health problem.^[19]

With the attainment of the MDGs becoming increasingly distant, it is important to keep surveillance on causes of mortality and morbidity. Anemia is certainly one of the causes of mortality and morbidity requiring constant surveillance. Thus, the objectives of this study are to examine the prevalence of anemia at Mbagathi District Hospital which serves the urban poor populace of Nairobi. This would give an indication as to the extent of anemia in pregnancy as a cause of pregnancy-associated morbidity among the urban poor.

LITERATURE REVIEW

In 1993, the World Bank rated anemia as the eighth leading cause of disease in young girls and women in the developing world. According to World Health Organization- World health Statistics 2005, the average prevalence of anemia in the world is 41.8%. Many studies show that anemia in pregnancy is globally common but Africa and Asia bear the greatest burden. In Africa and South East Asia, the prevalence is estimated at 57.1% and 48.2% respectively. This is twice as common as in America and Europe where prevalence is estimated at 24.1% and 25.1% respectively.

Sub Saharan Africa bears the major burden of disease. Prevalence of anemia in pregnancy in Nigeria is between 30-40%. ^[5,26] In Ethiopia, overall prevalence of anemia was found to be 41.9%

with urban areas having a prevalence of 35.9% compared to the rural population at 56.8%.^[6]In 1996, a study carried out on selected countries in South Eastern Africa showed a prevalence of 58%, 76%, 75.6% and 74.4% in Mozambique, Rural Zaire, Coastal Kenya and Tanzania respectively.^[4]

In Malawi, between July 1997 and June 1998, a study done on the urban population on women attending antenatal clinic at St. Elizabeth Hospital in Blantyre, 57.1% were found to be anemic.^[3] In Kenya, a study on prevalence conducted in Kakamega put prevalence of anemia in pregnancy at 25.7%.^[22] Another one conducted in Kericho District had prevalence of anemia in pregnancy at 24.5%^[23]. According to The Global Micronutrient survey done in May to October 1999, prevalence of moderate anemia in pregnancy was 54% in Kenya, while almost 70% of pregnant women in Kenya were moderately anemic. This is despite routine supplementation with iron for all pregnant women attending antenatal clinics.

A prospective study on severe anemia in pregnancy was done in Kisumu District and it studied prevalence and risk factors. Of the respondents who developed obstetric complications, 22% were found to be anemic. Poor pregnancy care, illness during pregnancy, socioeconomic conditions of the mother and the sanitary conditions of the household among other things also significantly increased prevalence of anemia in their subjects.^[9] A study done in Kilifi District, 10% of women booked for antenatal care had severe anemia (Hb<7g/dl) with 76% having Hb ,11g/dl and the main causes for the anemia were reported as iron deficiency often exacerbated by hookworm infestation, malaria, folate deficiency and HIV infection.^[31]

The etiology of anemia varies from region to region and is thought to be environmentally determined. World Health Organization reports the commonest cause to be nutritional. Iron deficiency is the most common and widespread nutritional disorder in the world. ^[19]As well as affecting a large number of children and women in developing countries, it is the only nutrient deficiency which is also significantly prevalent in industrialized countries. The numbers are staggering: 2 billion people – over 30% of the world’s population – are anemic, many due to iron deficiency, and in resource-poor areas, this is frequently exacerbated by infectious diseases. Malaria, HIV/AIDS, hookworm infestation, schistosomiasis, and other infections such as tuberculosis are particularly important factors contributing to the high prevalence of anemia.

Iron deficiency affects more people than any other condition, constituting a public health condition of epidemic proportions. More subtle in its manifestations than, for example, protein-energy malnutrition, iron deficiency exerts its heaviest overall toll in terms of ill-health, premature death and lost earnings. ^[19,21]Iron deficiency and anemia reduce the work capacity of individuals and entire populations, bringing serious economic consequences and obstacles to national development. There is documented loss of cognitive function. ^[27,28]

Other micronutrients like Vitamin B-12, Folic acid and Zinc deficiencies have also been associated with anemia in pregnancy ^[7,10,15] leading to a combination of both microcytic and megaloblastic anemia.

Soil transmitted helminthes also contribute to anemia in pregnancy leading to secondary iron deficiency anemia. Hookworm and *Trichuris* infection in the second trimester significantly increases risk of pregnant women developing anemia in the third trimester of pregnancy. Those with moderate infection with *trichuris* were found to be at a higher risk of developing anemia and

the highest risk was in women who had co-infection with hookworms.^[11, 16] In Kwa Zulu Natal province in South Africa, urinary schistosomes caused anemia as they cause iron deficiency and chronic Hemorrhage. Similarly HIV infection increased the risk of anemia twofold. This is due to poor nutritional intake, malabsorption syndromes and bone marrow suppression from the disease. Some of the antiretroviral drugs like Zidovudine cause bone marrow suppression and thus increase the risk of anemia. Those who tested positive had higher rates of anemia than those who tested negative.^[29]

Malaria in pregnancy has been a cause of severe anemia. In areas with high prevalence of malaria, prevalence of anemia among pregnant women with Malaria was up to 68.75% as compared to those without malaria infection (42.31%).^[13] Malaria causes hemolytic anemia and in severe cases is also a risk factor for stillbirths, low birth weight and fetal anemia.^[15]

In many developing countries, the physiologic changes that occur during pregnancy can be aggravated by under nutrition, leading to micronutrient deficiency states, such as anemia, that can have disastrous consequences for both mothers and newborn infants. This means that therefore, women in developing countries would benefit from multiple-micronutrient prophylaxis in pregnancy.^[13]

Factors that put women at risk of acquiring anemia in pregnancy include twin or multiple pregnancy, spacing between two pregnancies is short and heavy menstrual flow before pregnancy due to either fibroids or abnormal uterine bleeding. Other risk factors for anemia included older maternal age, education below junior high school, farming occupation, mild pregnancy-induced hypertension (PIH) and severe PIH. Also rate of anemia was higher among those who do not practice any form of family planning and those with increased parity.^[5,29] Adolescent

primigravidas also have a higher risk of anemia in pregnancy due to their age and more often than not poor nutritional status. [3]

Anemia in pregnancy is also affected by co-morbidities. In a study done in Pumwani Maternity Hospital on socio-economic characteristics, dietary pattern of pregnant women and investigated the relationship between iron deficiency anemia (IDA) and HIV/AIDS in pregnancy. Iron deficiency anemia was more prevalent and severe among the cases i.e. HIV positive mothers (prevalence=68%, mean Hb=9.551g/dl) than the controls i.e. HIV Negative mothers (prevalence=26.3 %, mean Hb=11.974g/dl). The relative risk of being anemic was about two times higher for HIV-infected as of the uninfected pregnant women, (Relative risk=2.33). It is concluded that pregnant women from low socio-economic status consume diets with iron of low biological value, have low Hb and are generally anemic. Moreover, HIV-infected pregnant women have lower Hb and are two times more likely to be anemic than the uninfected. The HIV/AIDS infection is therefore associated with low Hb and higher anemia prevalence and severity among pregnant women. There is, therefore, a need for prenatal nutrition care system that emphasizes improved consumption of essential nutrients including iron of high biological value and implementation of interventions tailored to check anemia prevalence and severity among pregnant women within the context of HIV/AIDS pandemic and low socioeconomic settings. [32]

In an effort to reduce the burden of anemia in pregnancy, the Ministry of Health has issued guidelines on routine iron supplementation for pregnant women at antenatal care clinics. National strategies to improve mothers' intake of iron and other key nutrients, and Fortification of staple

foods with iron and folate at industry and community levels have been undertaken. ^[30]In areas where malaria is endemic, intermittent preventive treatment with effective antimalarials and the distribution of insecticide-treated bed nets need to become implemented on a large scale as per The Roll Back Malaria a global partnership founded in 1998 by World Health Organization (WHO), The United Nations Development Programme (UNDP), The United Nations Emergency Children's Fund (UNICEF) and World Bank with the goal of halving the malaria burden by the year 2010. Other preventive measures include ensuring comprehensive obstetric and social history at the antenatal clinic, proper dietary counseling on proper sources of iron available to the community, family planning services encouraging at least three year intervals and discouraging eating of soil during pregnancy. Profound IDA has serious consequences for both woman and fetus and requires prompt intervention with intravenous iron. This is especially important for the safety of women who for various reasons oppose blood transfusions. Whenever possible, the cause of anemia should be determined before instituting treatment. Blood transfusion can only be used where the hemoglobin is dangerously low, where there is risk of further dangerous fall like in rapid bleeding or where no other effective treatment of anemia is available.

STUDY JUSTIFICATION

A total of an estimated 58.27 million women worldwide are anemic during pregnancy, 95.7% of whom live in developing countries . In Africa, the prevalence of anemia in pregnancy is estimated to be between 35% and 75% as compared to the developed countries where prevalence is at 15%. The burden of disease is heavy and more so in Sub Saharan Africa.

Anemia poses a 5-fold increase in overall risk of maternal death related to pregnancy and delivery. Non-fatal maternal complications during antenatal period includes: poor weight gain, preterm labors, pregnancy induced hypertension, placenta previa, accidental hemorrhage, eclampsia, premature rupture of membranes and increased susceptibility to infections like urinary tract infections. On the fetus, complications include prematurity, low birth weight, low APGAR scores, fetal mental impairment and infant deaths.

In Kenya, the Ministry of Health has laid out policy on Iron supplementation to all women attending antenatal clinic. However the prevalence of anemia is not known but is estimated at between 24-70%. Thus the burden of disease i.e. anemia in pregnancy is poorly studied hence the extent is not known. This is especially in people of low social economic status. Mbagathi District Hospital caters to the urban poor people. A majority of the patients attended to live in the sprawling Kibera slums. These people live on less than a dollar a day, signifying lack of adequate and well balanced diets in addition to living in unsanitary conditions.

There is therefore a need to determine prevalence of anemia in pregnant women of all populations particularly in the lower economic strata. This would enable the design of specific public health interventions. It is expected that this study will go a long way into obtaining information relating to anemia in pregnancy as seen in the urban poor Nairobi area and hence help in paving the way forward towards objective intervention measures. Given the high prevalence of anemia in Kenya, this study is presumed to represent prevalence of anemia among the urban poor in the country and hence interventions can be generalized without necessarily precluding a similar study population.

CONCEPTUAL FRAMEWORK

NARRATIVE

Anemia in pregnancy is a major Public Health concern and more so in Sub-Saharan Africa. Poverty is an important contributing factor. People afflicted by poverty live in unsanitary conditions leading to parasitic infestations such as malaria and soil transmitted helminthes. This leads to secondary iron deficiency anemia. These pregnant women cannot afford adequate and well balanced diets and hence end up with micronutrient deficiency. Increasing parity also aggravates the poverty which causes depletion of the iron stores in the pregnant woman. This leads to anemia in the pregnant woman.

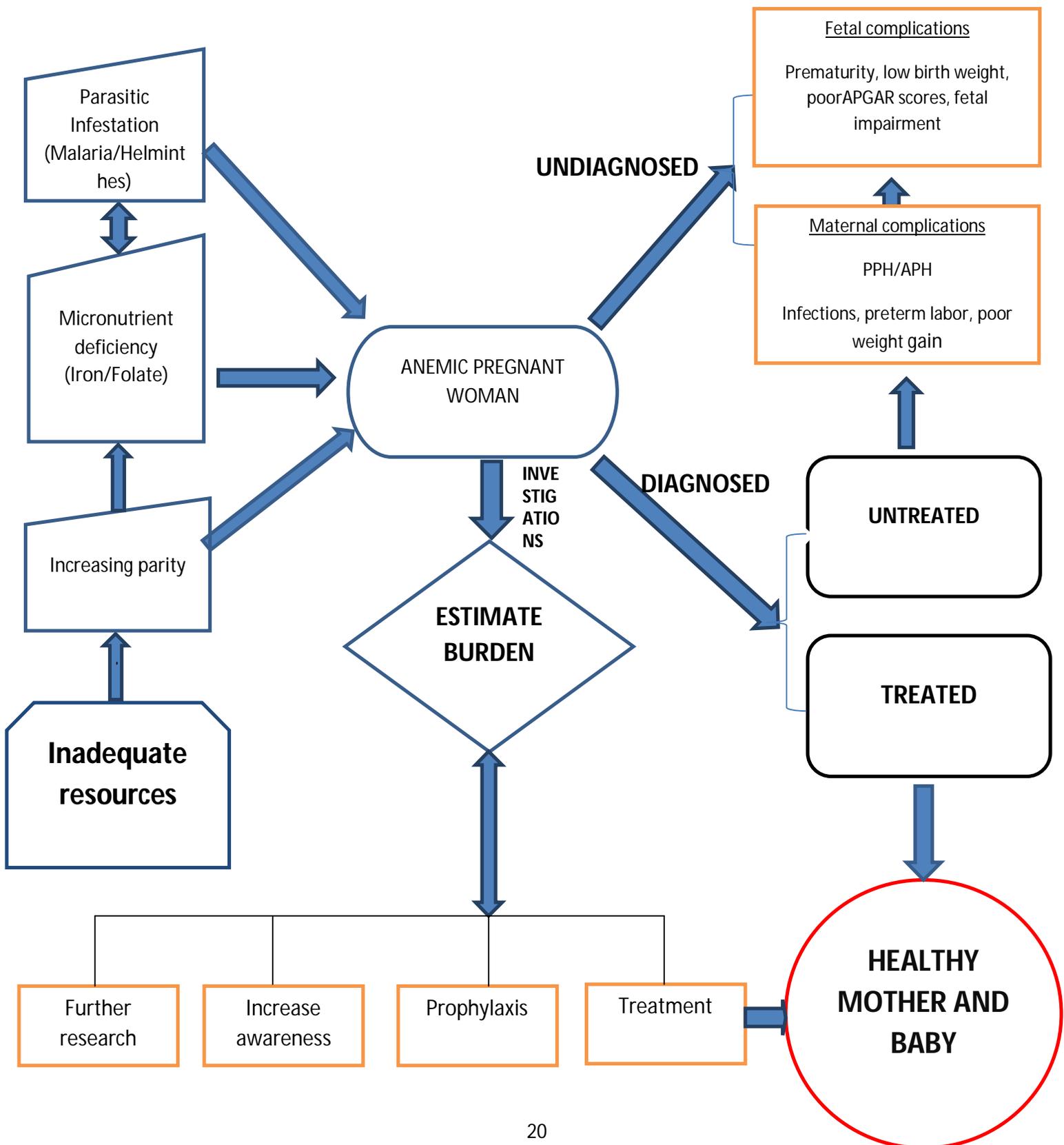
Without any interventions, anemia in pregnancy leads to maternal and fetal morbidity and mortality such as puerperal infections, preterm labor, poor weight gain, postpartum hemorrhage, prematurity, low birth weight, fetal cognitive impairment and poor APGAR scores and even infant deaths.

This grave situation can be improved by carrying out studies on the anemic pregnant women to determine the actual prevalence, etiologic type and socio-demographic factors predisposing the pregnant women to anemia and thus estimate burden of disease. From the study, policies and interventions will be formulated for corrective action in terms of either treatment of anemia or prophylaxis for every pregnant woman.

With good policy formulation, pregnant women will be encouraged to have good health seeking habits and in so doing, receive prophylaxis or treatment for anemia early in pregnancy. Also, through comprehensive laboratory investigations, other causes of anemia will be determined and effectively treated. This will eliminate the risk of getting bad outcomes and have a healthy mother and child bringing us closer to achievement of Millennium development Goals 4 & 5.

The schematic representation of this conceptual framework is shown below:

CONCEPTUAL FRAMEWORK SCHEMATIC: Fig. 1



RESEARCH QUESTION

Is anemia a common pregnancy-associated morbidity among mothers attending antenatal clinic at Mbagathi District Hospital?

OBJECTIVES

Broad:

To determine the prevalence of anemia among pregnant women attending antenatal clinic at Mbagathi District Hospital.

Specific:

1. To determine the overall prevalence of anemia among women attending antenatal clinic at Mbagathi district Hospital.
2. To Determine the prevalence of parasitic infestation among the anemic women attending antenatal clinic at Mbagathi district Hospital
3. To Determine the prevalence of anemia in relation to reproductive and sociodemographic characteristics among women attending antenatal clinic at Mbagathi district Hospital

METHODOLOGY

STUDY SITE:

The study was carried out at Mbagathi District Hospital. This is a Government owned Level Four Hospital located in Nairobi West District in Nairobi in Kibra Constituency. It has a 200 bed capacity. Majority of the patients are urban poor. Mbagathi District Hospital offers full range of comprehensive health services i.e. medical, surgical, pediatric, obstetrics and gynecology and basic emergency services. The hospital Obstetrics and Gynecology department consists of the maternal

and child health/family planning, gynecology ward and maternity unit. The Maternity unit is made up of labor ward, operating theatre, antenatal and postnatal wards and a new born unit. The maternity unit is managed by two consultant obstetrician/gynecologists, 2 medical officers, two medical officer interns, one clinical officer and nursing staff. Majority of Kenyan women seek antenatal care in public hospitals. Average monthly attendance for ANC is 280 patients with 80 new patients every month and an average of 20 patients per week. Hence the site was suitable because of the large numbers of women seen in this facility.

The hospital was built to provide services to the urban poor populace so as to reduce the work load on Kenyatta National Hospital which is a referral center. The work load is very high and it would thus be suitable for this hospital based prevalence study of anemia in pregnancy.

STUDY POPULATION

The study population comprised of 381 pregnant women of reproductive age group, aged between 15 -49 years on their first Antenatal visit at Mbagathi District Hospital during their current pregnancy. The choice of this population was suitable because the antenatal women had not received any supplementation and they constituted the urban poor populace.

STUDY DESIGN:

This was a descriptive cross-sectional study. Although it may not have the strength to change policy, being a pioneering study, it can generate interest for better designed controls. The aim was to determine the prevalence of anemia among pregnant women attending antenatal clinic at Mbagathi District Hospital and the outcome was to be whether or not anemia in pregnancy is a

prevalent condition. This design enabled the description of antenatal women suffering from anemia as well as estimation of the disease burden.

STUDY INSTRUMENT

The study instrument was a structured questionnaire which was both categorical and open ended. It was administered to the study participants who fulfilled eligibility criteria. The questionnaire had the following sections:

1. Socio-demographic and economic data
2. Reproductive history including the index pregnancy
3. Clinical examination findings
4. Laboratory investigation results

The questionnaire is attached as appendix I.

SAMPLE SIZE DETERMINATION

Literature review done in Kenya and Africa as a whole shows that prevalence of anemia in pregnancy ranges between 35-70%. For purposes of this study, prevalence of anemia in pregnancy was taken as an average of 35 and 70% thus 52.5%. The formula shown below was used to determine the sample size.

Fisher's formula for estimating means and proportions was used to determine the sample size.

$$\begin{aligned} n &= \text{minimum sample size} \\ &= 1.96^2 \times p(1-p)/d^2 \end{aligned}$$

p = proportion in target population estimated to have certain characteristics in this case
overall prevalence of anemia

$$=52.5\%$$

d =precision/reliability to determine p=5%

Therefore; sample size of ANC mothers

$$n=1.96^2(0.525(1-0.525)/ 0.05^2$$

Thus n=384

A sample of 381 antenatal women was achieved. Three questionnaires were spoilt.

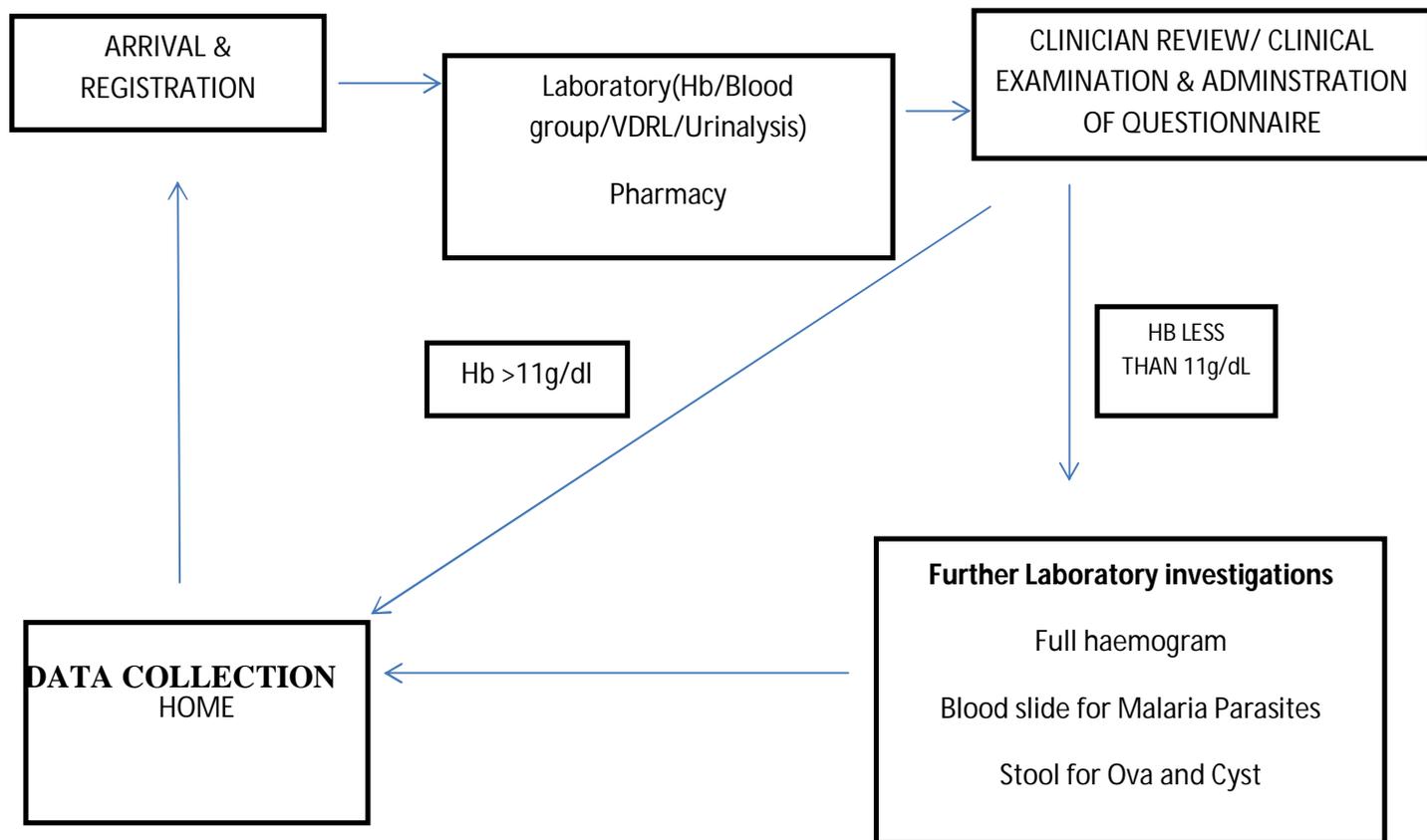
DATA COLLECTION

Mbagathi District Hospital has a busy ANC clinic. Every week they have approximately 20 new clients and we managed to recruit an average of 19 per week . The sample was collected between August and December 2012.

The study was done on the total population thus no sampling was done. The principal investigator was responsible for conducting all interviews assisted by research assistants. The research assistants were qualified nurses and clinical officers involved in the daily management of patients. They had one day training on the administration of the questionnaire and clinical examination to be carried out before data collection started. They were also involved in the pretesting of the questionnaire. The questionnaires were examined for clarity, ambiguity, time taken to fill it out and analyzability. Appropriate adjustments were then made.

The study participants were identified as follows: After clients received the routine ANC services, the research assistants informed the clients about the study, its objectives, risks and benefits. Ultimate benefits to the patients were stressed upon after which an informed consent was signed (Appendix III). Medical records were examined and the patients interviewed in a private study room. The interviews were conducted in a safe, secure and confidential environment. A clinical examination was then carried out. From the antenatal cards, any client found to have a hemoglobin level of less than 11g/dl then underwent further laboratory investigations after completion of the questionnaire. Double participant recruitment was prevented by enquiring from the client if they had completed the interview before.

The client flow is provided below:



All specimen collected were stored in a safe place awaiting transfer to the laboratory. The University of Nairobi Pediatrics Laboratory processed all the specimens and analysed them.

- I. A questionnaire was filled out (appendix I)
- II. Physical examination was carried out by the principal investigator who had the initial contact with the clients as depicted in the Informed consent (Appendix III) and physical examination for pallor, jaundice, splenomegaly, edema and fundal height were done and findings recorded in the questionnaire (Appendix I)
- III. After hemoglobin level was determined, those with a hemoglobin of less than 11.0 g/dl underwent further investigations thus: (appendix II)
 - a. Two milliliters of blood was drawn from the antecubital vein and put in a sequestered bottle and sent to the laboratory for full haemogram
 - b. A thick blood slide was made in the laboratory and examined under a microscope for the presence of malaria parasites
 - c. The client was then given a plastic container to put a stool specimen. A slide was then prepared and examined under the microscope for presence of worms such as ascaris, hookworms, trichuris trichuria, s. mansoni and E. histolytica.

Once results were available, they were discussed with the patient and recorded in the laboratory form questionnaire Appendix II.

INCLUSION AND EXCLUSION CRITERIA

Inclusion Criteria

1. All pregnant women attending antenatal clinic for the first time at Mbagathi district Hospital during the study period (August-December 2012)
2. Willingness to participate in the study

Exclusion criteria

1. History of micronutrient supplementation during current pregnancy
2. Clients too sick or those not willing to participate in the study

QUALITY ASSURANCE PROCEDURES

Pretesting of the pre-designed questionnaire guide was carried out at Kenyatta National Hospital Antenatal Clinic before actual data collection. The questionnaires were analyzed. Feedback obtained informed the changes and adjustments that needed to be addressed before a final draft was made for administration to the research participants. In order to avoid double recruitment, the participants' file numbers were entered in a register upon recruitment for serialization. This register was counter checked on a regular basis for double entries and if so discovered, one of the questionnaires would be withdrawn and discarded and the serialization rectified before recruitment is continued. We did not encounter any cases of double recruitment and thus no questionnaires were discarded during the study.

The Blood and Stool samples collected were stored in a safe, cool dry place and were analyzed in the laboratory. Random samples were sent to the University of Nairobi Paediatric Department Laboratory for quality assurance.

DATA MANAGEMENT/ANALYSIS

The data collected was transferred into a Microsoft Access database and then analyzed using SPSS software. Data was entered into basic frequency and data cleaning done to identify outliers. The data was then presented in frequencies, cross tabulations and diagrams as necessary. A descriptive analysis included measures of central tendency like the mean, measures of variability like standard deviation and range and univariate analysis. Inferential analysis was also carried out using chi square and T-test. Data was analyzed as per the dummy tables in Appendix IV. All the analysis was based on the stated study objective.

ETHICAL CONSIDERATIONS

There were no major ethical issues in this study as it was carried out within the confines of routine antenatal care. Those found to be anemic were provided with corrective measures and treated immediately. Approval was sought from the KNH/UON Ethics and Research committee. Informed consent was obtained from all new antenatal mothers who consented to the study, records were coded and patients'/clinicians' names were not used. All the information collected remained confidential and would be used for purposes of the study only. Participation was voluntary and no incentives were given. At any stage the participants were free to withdraw from the study or not answer some questions without penalty.

STUDY LIMITATIONS

1. Being a hospital based study generalizations could not be made because it was a self selected sample. This was in a population with poor antenatal attendance in a poor slum population. However it gives a good indication of the overall situation.
2. There were two national strikes by the health workers during this period and this delayed the collection of data.

RESEARCH TIMELINES

The research timelines were as follows:-

1. Proposal writing – September –December 2011
2. Ethical committee revisions and corrections – April –June 2012
3. Data collection- August-December 2012
4. Data analysis- December 2012-March 2013
5. Departmental presentation, corrections and writing of thesis- April-June 2013

RESULTS

Overall baseline characteristics of study population

A total of three hundred and eighty (380) antenatal mothers were enrolled in the study. Majority were primigravidae at 46.4% (176). The mean age of the antenatal mothers was 26.6years with a standard deviation of 5.6years. Two hundred and fifty (65.8%) had attained secondary education and above. Three hundred and twenty two (84.7%) were married, with three hundred and four (87.4%) of their spouses were employed. One hundred and eighty seven (49.3%) of the antenatal mothers were employed as shown in Table 1.

Table 1: Socio-demographic and reproductive characteristics of study population

Characteristic	No.	%
Sociodemographic		
Age (years)		
15-20	47	12.4
21-30	256	67.4
>30	77	20.3
Education level		
Primary/Secondary	299	78.7
College/University	81	21.3
Marital Status		
Married	322	84.7
Single	58	15.3
Occupation		
Gainfully employed	187*	49.3
Not employed	192	50.7
Reproductive		
Parity		
Primigravida	176*	46.4
Para 1	111	29.3
>Para 1	92	24.2
Trimester		
First	20*	5.4
Second	159	42.7
Third	193	51.9

*missing data-some of the questionnaires had missing information

Majority of the antenatal women were in their third and second trimester at 51.9% and 42.7% respectively showing that there was late initiation of antenatal booking at 94.6%.

Overall prevalence of anemia among antenatal women attending clinic at Mbagathi District Hospital

Table 2: Prevalence among pregnant women at Mbagathi District Hospital

Parameter	Number	%
Overall prevalence of anemia n=380		
Anemia	138	36.3
No anemia	243	63.8
Severity of anemia n=138		
Mild anemia	71	51
Moderate anemia	66	48
Severe anemia	1	1
Aetiologic type n=138		
Normocytic	38	28
Microcytic	100	72

Table 2 above shows that the overall prevalence of anemia among antenatal mothers attending clinic at Mbagathi District Hospital was 36.2% (138). Seventy one women (51.5%) had mild anemia (Hb 10-10.9g/dl), sixty six women (47.8%) had moderate anemia (Hb 7-9.9g/dl) whilst one (0.72%), a primigravidae at seven weeks gestation with a twin pregnancy had severe anemia (Hb <7g/dl). Mild and moderate anemias were predominant. Of the mothers who were found to be anemic, one hundred (72.5%) had a microcytic pattern while the rest, thirty eight (27.5%) displayed a normocytic picture. There was no macrocytic anemia reported.

Table 3: Prevalence of parasitic infection in the anemic antenatal mothers attending clinic at Mbagathi District Hospital

Parasite	Mild anemia		Moderate anemia	
	N	%	N	%
Malaria parasite				
Yes	1	(100)	0	
No	70	(51.5)	66	(48.5)
Helminthic infection				
Yes	7	(63.6)	4	(36.4)
No	64	(50.8)	62	(49.2)

In the study population of the anemic patients, only one patient had a blood slide that was positive for malaria parasites. A stool examination for ova and cyst was done on all the women who were found to be anemic. Eleven (0.08%) had helminthic infestation. A total of 11 antenatal mothers had E.histolytica and were treated for it. Only 2 patients had hookworm infestation. P value for helminthic infestation and association with anemia was found to be 0.55 and had no statistical significance.

Prevalence of anemia in relation to reproductive and socio-demographic characteristics among antenatal mothers at Mbagathi District Hospital

Anemia was found to be more prevalent in women aged between 21-30years at 39.1% as compared to 29.8% in the 15-20year age group and 29.9% in the above thirty age group. However a statistical analysis of age being a factor in predicting anemia in pregnancy (p-value 0.21) was not statistically significant.

Mothers who had attained secondary and college/university level of education had higher percentage of anemic patients at 36.7% and 40.7% respectively as compared to those who had primary education and below at 32.3%. However this difference was not statistically significant.

Presence of anemia was higher in the single women 42.1% as compared to the married women at 35.1%. On statistical analysis, p-value was 0.37 and thus there is no predictive relationship between marital status and anemia in pregnancy.

There were as many employed patients as were unemployed in this study (49.3% and 50.7% respectively). Anemia was found to be more prevalent in those who were gainfully employed at 39% as compared to those who were unemployed at 33%. However, this was of no statistical significance. This is summarized in Table 4 below.

Table 4: Prevalence of anemia in relation to socio-demographic characteristics of antenatal mothers at Mbagathi District Hospital

N=380	Anemia		Total	P value
	Yes N (%)	No N (%)		
Socio-demographic characteristic				
Age (years)				
15-20	14 (29.7)	33 (70.2)	47	0.21
21-30	100 (39.1)	156 (60.9)	256	
>30	23 (29.9)	54 (70.1)	77	
Education level				
Primary/Secondary	104 (34.8)	195 (65.2)	299	0.45
College/University	33 (40.7)	48 (59.3)	81	
Marital Status				
Married	113 (35.1)	209 (64.9)	322	0.37
Single	24 (42.1)	33 (57.9)	57	
Patient occupation				
Gainfully employed	73 (39.0)	114 (61.0)	187	0.25
Not employed	64 (33.3)	128 (66.7)	192	

Prevalence of anemia in relation to reproductive characteristics

94.6% of all the women in this study initiated antenatal visits in their second or third trimesters, with only 5.4% coming in their first trimester. Majority of the women were in their third trimester (51.9%) and 42.7% in their second trimester. The highest percentage of women with anemia was noted in the second trimester at 39.6%, followed by the third trimester at 37.3%. Only 10% of the women in their first trimester had anemia. There was a strong relationship between trimester and anemia in pregnancy as shown by p value of 0.026. Thus anemia is shown to be more prevalent in the second and third trimesters of pregnancy.

The highest percentage of anemia was found in the Para 1's (43.2%) as compared to 33.5% and 32.6% for the primigravidae and more than Para 1 respectively. Statistical analysis did not show any significant predictive relationship between parity and prevalence of anemia as shown by the p value=0.32. This is summarized in Table 5 below.

Table 5: Prevalence of anemia in relation to reproductive characteristics among antenatal mothers at Mbagathi District Hospital

N=381	Anemia		Total	P value
	Yes N (%)	No N (%)		
Reproductive characteristic				
Parity				
Primigravida	59 (33.5)	117 (66.4)	176	0.32
Para 1	48 (43.2)	63 (56.8)	111	
>Para 1	30 (32.6)	62 (67.4)	57	
Trimester at booking				
First	2 (10.0)	18 (90.0)	20	0.026
Second	63 (39.6)	96 (60.4)	159	
Third	72 (37.3)	121 (62.7)	193	

Discussion

Anemia in pregnancy is one of the most widespread public health problems especially in developing countries and has important health and welfare, social and economic consequences. Anemia in pregnancy poses a 5-fold increase in overall risk of maternal death related to pregnancy and delivery. Non-fatal maternal complications during antenatal period includes: poor weight gain, preterm labors, pregnancy induced hypertension, placenta previa, accidental hemorrhage, eclampsia, premature rupture of membranes and increased susceptibility to infections like urinary tract infections. On the fetus, complications include prematurity, low birth weight, low APGAR scores, fetal mental impairment and infant deaths.

The prevalence of anemia as seen in this study 36.2%, (95% CI of 31.4-41.3%) is an indication that anemia during pregnancy is still a major problem in Kenya [Table2]. More than one third of pregnant women were found to be anemic. This prevalence is higher than what was in the study by Khadija (2006, Kakamega) and Sawe (1992, Kericho) at 25.7% (95% CI of 20.7-31.2%) and 24.5 % (95% CI, 19.6 – 30.0%) respectively ^[22, 23]. However, it's lower than the Global Micronutrient Survey (1999) which put prevalence of anemia in pregnancy at 69.3% (95% CI of 66.2-72.1%) in Kenya ^[20]. The variance could be attributed to differences between urban and rural prevalence probably as a result of diet differences.

In keeping with the WHO report that the commonest cause of anemia in pregnancy is nutritional i.e. iron deficiency ^[19]the most prevalent was microcytic anemia (72.5%) [Table 2]. Similar findings were reported in the study by Khadija (2006, Kakamega) and Sawe (1992, Kericho) at

46.3% and 53.6 % respectively^[22,23]. Though no iron estimation studies were done, the commonest cause of microcytic anemia is iron deficiency.

Soil transmitted helminthes, particularly hookworm and *Trichuris* contribute to anemia in pregnancy leading to secondary iron deficiency anemia^[11, 16]. In this study however, no significant helminthic infections were identified and no significant relationship between those with helminthic infestation and the presence of anemia in pregnancy [Table 3]. The low level of helminthic infections may be because it was done in an urban set up which is likely to have proper sanitation and clean drinking water as opposed to a rural set up. A significant number were also in employment (49.3%) and 65.8% had formal education of secondary level and above and thus are able to observe good hygiene practices. Also, the stool sample was only taken once thus making it difficult to ascertain whether helminthes were a contributory factor. Repeat samples should be done in future to take into consideration the ova maturation cycle of helminthes.

Malaria, also known to be a major cause of anemia in pregnancy^[13, 31] was not found to be a significant factor in this study as only one woman was found to have a positive blood slide for malaria parasite [Table 4]. This may be explained by the study being based in Nairobi which is not a predominantly malaria endemic area.

From a study done in Pumwani maternity hospital, it was concluded that pregnant women from low socioeconomic status consumed diets with iron of low biological value, have low Hb and are generally anemic^[32]. In Mbagathi District Hospital, 84.7% were married and 87.4% of their spouses were in employment while 49.3% of the women were employed generally indicating a

good socioeconomic status [Table 4]. This may explain why the socioeconomic status was not a major factor in this study.

According to the KDHS 2008-09, only 15% of women obtain antenatal care in the first trimester in Kenya and only about half (47%) receive care before 24 weeks (second trimester). This study found that only 5.4% of women initiated antenatal care in their first trimester and 42.7% and 51.9% in their second and third trimester respectively. This is consistent with the KDHS study which concluded that attendance of antenatal care in the first trimester is poor.

In a World Health Organization report ^[1], anemia in pregnancy peaks in the third trimester. In this study, the prevalence of anemia was highest in the second trimester at 39.6% [Table 5] coinciding with the period when haemodilution is highest indicating that this may have aggravated the anemia. Prevalence was at 37.3% in the third trimester and 10% in the first trimester. The high prevalence of anemia in the second and third trimester may also be attributed to late initiation of antenatal care. This causes late detection and missing of opportunity to correct the deficiency through iron supplementation early in pregnancy.

Other causes of anemia in pregnancy like HIV and use of antiretroviral medications, recurrent urinary tract infections, spacing and type of contraception used prior to conception need further evaluation and assessment in future studies.

Conclusion

This study shows that anemia in pregnancy is still a significant problem whereby more than a third of the women attending antenatal care were found to be anemic. Iron deficiency anemia is the commonest etiologic type. Late antenatal booking was clearly associated with high prevalence of anemia in pregnancy.

Recommendations

There is need for more stringent measures in investigating and screening of pregnant women for anemia by taking blood samples for full haemogram. Corrective measures should then be instituted immediately. There is also need for improvement of diagnostic ability of anemia by the health workers. Routine iron supplementation should be encouraged as a prophylactic measure.

Other interventional measures and programs to educate the mothers on the need to initiate antenatal care early should be instituted. Screening and treatment of parasitic infections should be encouraged. Health education talks on nutrition needs for the mother and the growing fetus should also be carried out. On a national scale, consideration should be made on fortification of foods with iron to curb anemia.

APPENDIX I

QUESTIONNAIRE

ANC No.....

STUDY No.....

CONTACT MOBILE NUMBER/ ID NUMBER.....

1. General Information

- 1. Age
 - a. 15-20yr
 - b. 21-30yr
 - c. 30-40yr
 - d. >41yr
 - 2. Parity.....
 - a. Primigravida
 - b. Para 1
 - c. Para 2
 - d. >Para 3
 - 3. Ages of the children.....
 - 4. Education level
 - a. Primary.....
 - b. Secondary.....
 - c. College/university.....
 - d. None
- 5. Marital status.....
 - a. Married
 - b. Single
 - c. Separated/divorced.....
 - 6. Occupation
 - a. Employed.....
 - b. Not employed.....
 - 7. Husband's Occupation
 - a. Employed.....
 - b. Not employed.....

Physical examination

(Yes/No)

1. Pallor
2. Jaundice
3. Edema
4. Splenomegaly
5. Temperature
6. Fundal height

TIMELINE

PROJECT MONTHS	1	2	3	4	5	6	7	8	9
Research question									
Presentation of proposal									
Correction/oral presentation									
Data instrument/testing									
Oral proposal presentation									
1 st supervisors review									
Handed to ethics									
Ethical comments									
2 nd supervisors review									
Data collection									
Data analysis									
Data presentation/report									
Final marking									
Poster presentation									
Stakeholders meeting.									

APPENDIX II

LABORATORY FORM

ANC NO.

STUDY NO.

1. FULL HEMOGRAM

- a. Hemoglobin concentration g/dl
 - i. 10-10.9g/dl
 - ii. 7-9.9g/dl
 - iii. <7g/dl
- b. Red cell count
- c. Leucocytes
 - i. Total
 - ii. Differential:
 - Neutrophils
 - Lymphocytes
 - Basophils
 - Eosinophil
 - Monocytes
- d. Platelet count
- e. PCV
- f. MCV
- g. MCH
- h. MCHC.....

2. Peripheral Blood Film Picture

- a. Malaria parasite present
- b. Malaria parasite absent

3. Stool for ova and cyst (yes/no)

- a. Ascaris.....
- b. Trichuris trichuria
- c. Hookworms
- d. E. histolytica
- e. S. mansoni

APPENDIX III

INFORMED CONSENT

INTRODUCTION: I am Dr. Carolyne Wanjiru Nduhiu, a postgraduate student registered for masters in medicine-Mmed obstetrics and gynecology in the University of Nairobi.

PURPOSE OF THE STUDY: I am carrying out a study as part of the requirement for Mmed qualification. My objectives are to determine the prevalence of Anemia among pregnant women attending Ante Natal Clinic at Mbagathi District Hospital.

I am requesting your participation in this study as a client at Mbagathi District Hospital Ante Natal Clinic. I would like to bring to your attention the following ethical considerations which will guide your participation.

1. Participation in this study is purely voluntary
2. You may withdraw from the study at any time and there are no consequences for your decision to withdraw.
3. After you read the explanation, please feel free to ask any questions that will allow you to understand the nature of the study.
4. Any information you provide including details on your demographic characteristics will be treated as confidential.
5. The study protocol has been reviewed by an ethics committee. The protocol can be accessible to you should you choose to know the details.

I will be available to answer any questions that will help you to understand the nature of the study. If you wish to seek any clarification, kindly contact me on 0721498515.

STUDY PROCEDURE: A structured questionnaire will be administered. It should take approximately 10-15 minutes to complete. The principle investigator will ask the questions. You will give consent by signing the consent forms.

BENEFITS: There are no direct personal benefits for participating in this study.

RISKS: These include embarrassment, worry, or anxiety when answering questions of a personal nature.

It is expected that study findings will help foster a better understanding of the prevalence of anemia among pregnant women at Mbagathi district Hospital.

APPENDIX IV

CONSENT FORM

University of Nairobi

Study participation consent form

Prevalence of anemia among pregnant women attending Ante Natal clinic at Mbagathi District Hospital.

Investigators

Dr. Carolyne Wanjiru Nduhiu-Githinji, MBChB. Postgraduate student in Department of Obstetrics and Gynecology, University of Nairobi, 0721-498515

Investigators' statement

We are asking you to be in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study. Please read this form carefully. You may ask questions about what we will ask you to do, the risks, the benefits and your rights as a volunteer, or anything about the research or in this form that is not clear. When all your questions have been answered, you can decide if you want to be in this study or not. This process is called “informed consent”.

Purpose and benefits

The aim of this study is determine the factors that determine the prevalence of anemia among pregnant women attending ante natal clinic at Mbagathi district Hospital. Through this study we want to understand the prevalence of anemia and factors that predispose women to anemia and which type of anemia is prevalent among pregnant women.

This study will benefit society by providing information that can be used to improve services to ensure more pregnant women are diagnosed and treated early for anemia so as to manage the

potential complications that arise. This will ultimately lead to healthier births and improved rates of maternal and neonatal mortality.

Procedures

This is what will happen if you decide to participate in this study. I will ask you questions about yourself, your past pregnancies, and your social economic status and on the current pregnancy. If your hemoglobin level is less than 11g/dl I will do further examinations i.e. I will draw 2ml of blood for a full haemogram and blood slide for malaria parasites. Also I will require a stool sample to investigate further causes of the anemia.

Risks, stress, or discomfort

You may become embarrassed, worried, or anxious when answering some of the questions as they are of a personal nature e.g. the socio-economic history.

Participation in the study will require you to commit your time. Completing the questions will take 30-40 minutes. However, we will try to serve you as quickly as possible.

Other information

We will keep your identity as a research subject confidential. Only the investigator, institutional review board of University of Nairobi Ethics and Research Committee will have access to information about you. The information about you will be identified by the study number and will not be linked to your name in any records. Your name will not be used in any published reports about this study.

Although we will make every effort to keep your information confidential, no system for protecting your confidentiality can be completely secure. It is still possible that someone could find out you were in this study and could find out information about you.

You may withdraw from the study; refuse to answer any of the questions asked or to have any of the tests described above at any time without loss of benefit or penalty.

If you have any questions regarding the study you can contact the investigator listed above. You are free to refuse to participate in the study, if you decide not to participate in the study you will receive similar care to that provided to ANC mothers participating in the study.

Signature of investigator _____ Date _____

Name of Investigator _____

Subject's statement:

This study has been explained to me. I volunteer to take part in this research. I have had a chance to ask questions. If I have questions later on about the research I can ask the investigator listed above. If I have questions about my rights as a research subject, I can call the University of Nairobi Ethics and research Committee at 2726300. I will receive a copy of this consent form.

Signature of subject _____ Date _____

Or

Left thumbprint of subject _____ Date _____

Name of Subject _____

Signature of witness (If thumbprint used) _____

Name of Witness _____

University of Nairobi Ethics and Research Committee

Hospital Road along Ngong Road

P.O. Box 20723 Code 00202

Nairobi

Telephone 2726300 Ext 44355

Email: uonknh_erc@uonbi.ac.ke

Website: www.uonbi.ac.ke/activities/KNHUoN

Secretary, KNH/UON-ERC: PROF, A.N. GUANTAI

Copies to: 1. Subject 2. Investigator's file

IDHINI YA MAKUBALIANO

CHUO KIKUU CHA NAIROBI

Kiasi cha wamama waja wazito wanao hudhuria kliniki ya wamama waj wazito hospitali ya Mbagathi wanao ugonjwa wa ukosefu damu mwilini.

MCHUNGUZI

Carolyne Wanjiru Nduhiu-Githinji, MBchB., mkufunzi MMed OB/GYN Chuo Kikuu cha Nairobi

Nambari ya simu:

Dr. Carolyne Wanjiru Nduhiu-Githinji, Ofisi ya Obstetrics and Gynecology, Chuo Kikuu cha Nairobi, 0721 498515

Mawaidha ya mchunguzi

Twakuomba uwe mmoja wa washirika katika uchunguzi huu. Kiini cha idhini hii ya makubaliano ni kukupa maneno ambayo utahitaji ili kuweza kupatiana ilani ya kwamba ungependa kuhusika na uchunguzi huu. Tafadhali yasome mawaidha haya kwa makini. Unaweza uliza maswali kuhusu mambo tutakayo kuuliza, uzuri na ubaya wowote unaohusiana nayo, na haki zako kama mwenye kujitolea, ama swala yoyote kuhusu uchunguzi huu, ama chochote katika idhini hii ambayo hauyaelewi. Maswali yako yote yakijibiwa na utosheke, unaweza amua ama utahusika nu uchunguzi huu au la. Utaratibu huu unaitwa “idhini uliyoarifiwa”.

Sababu na mazuri

Kiini cha uchunguzi huu ni kudadisi kiwango gani cha wamama waja wazito wanaotembelea hospitali ya Mbagathi wanaathiriwa na ukosefu wa damu mwilini. Tungependa kujua ni sababu gani ambazo sinawafanya hawa wamama kuathiriwa na ugonjwa huu na kiini haswa cha huu ugonjwa.

Uchunguzi huu utanufaisha jamii kwa kuwapa maelezo zaidi ambazo zinaweza tumiwa kuboresha msaada unaopewa wanao ukosefu wa damu mwilini ili kuhakikisha wanapata misaada ya matibabu yanayofaa.

Mtandao

Ukikubali kushiriki katika uchunguzi huu, yafuatayo ni maelezo ambayo tutakayo yatekeleza. Utaulizwa maswali ya kibinafsi kuhusu mimba za kale, mimba uliyo nayo, makazi yako na kiwango cha pesa ambacho mnatumia kila mwezi.

Ukiyajibu haya maswali, utashauriwa juu ya njia za kuendelea na afya nzuri. Ukipatikana kuwa na kiwango cha damu chini ya 11g/dl, nitatoa damu kwenye mshipa ili niangalie kwa makini kiini haswa cha ugonjwa wa ukosefu damu mwilini. Baada ya hapo nitahitaji kupima choo chako ili niangalie kiini cha ugonjwa huu.

Madhara

Waweza ona haya ama uhisi umefadhaika unapojibu maswali ya kibinafsi kama vile kuhusu historia ya pesa mnazotumia kwa mwezi na kazi ambayo mnafanya.

Ushirika katika uchunguzi huu utahitaji mda wa dakika 30-40. Tutajaribu kuharakisha ili tusikupotezee wakati.

Maelezo zaidi

Utambulisho wako katika uchunguzi huu utawekwa siri. Mchunguzi tuu na watafiti wenzake wa Chuo Kikuu cha Nairobi ndio pekee watakuwa na maandishi yako. Haya maandishi yatakodiwa na nambari ya siri ambayo haitalinganishwa na jina lako. Jina lako halitatumika katika maandishi ya finali.

Ingawa tutafanya chochote kinachohitajika kuyafanya maandishi yako siri, hakuna misheni ambayo haina hitilafu ndogo ndogo. Bado inaweza fanyika mtu kugundua maandishi yako na ushirika katika uchunguzi huu.

Unaweza kujitenga na uchunguzi huu, ukatae kujibu maswali unayeulizwa ama utafiti wa mwili wakati wowote bila madhara ama uzuri wowote.

Ukiwa na maswali kuhusu uchunguzi huu unaweza shirikiana na mchunguzi ambaye jina lake lapatikana kwenye idhini hili. Unaweza kataa kushiriki katika uchunguzi huu, huduma na matibabu utapokea kama ilivyo haki yako.

Mhuri wa Mchunguzi _____ Tarehe _____

Jina la mchunguzi _____

Idhini ya mshirika:

Nimeelezwa juu ya uchunguzi huu. Nakubali kushirikiana na wachunguzi. Nimepata fursa ya kuuliza maswali. Nikiwa na maswali zaidi nitaweza kuuliza mchunguzi mkuu. Nikiwa na

maswali juu ya haki yangu katika uchunguzi huu, naweza piga simu Chuo Kikuu cha Nairobi
Katiba ya Uchunguzi kwenye namba za simu 2726300. Nitapata barua langu la idhini hili.

Idhini ya muhusika _____ tarehe _____

ama

idhini ya kidole cha kushoto _____ Tarehe _____

Jina la muhusika _____

Idhini ya mshuhudia _____

Jina la mshuhudia _____

Chuo kikuu cha Nairobi Halmashauri ya Maadili na utafiti

Hospital Road katika Ngong Road

Sanduku la Posta 20723-00202, Nairobi

Nambari ya simu 2726300 Ext 44355

Barua Pepe: uonknh_erc@uonbi.ac.ke

Tovuti: www.uonbi.ac.ke/activities/KNHUoN

Mhazili, KNH/UON-ERC: PROF, A.N. GUANTAI

Kupitia: 1. Mshirika 2. Mchunguzi

APPENDIX V

PREVALENCE OF ANEMIA BY SOCIO-DEMOGRAPHIC CHARACTERISTICS

OVERALL PREVALENCE	N=384	% PREVALENCE	P-VALUE
BY AGE IN YRS			
15-20			
21-30			
30-40			
>41			
BY PARITY			
Primigravida			
Para 1			
Para 2			
>Para 3			
EDUCATION LEVEL			
Primary			
Secondary			
College/University			
None			
EMPLOYMENT STATUS			
Employed			

Not employed			
MARITAL STATUS			
Single			
Married			
Separated/divorced			
widowed			
CLINICAL SIGNS			
Present			
None			

PREVALENCE OF ANEMIA BY AETIOLOGIC TYPE

OVERALL PREVALENCE	N=384	% PREVALENCE	P-VALUE
Normochromic normocytic			
Microcytic hypochromic			
Macrocytic hypochromic			
Presence of Malaria parasites			
Presence of Helminthes			
None of the above			

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