

KIBOGORA POLYTECHNIC

FACULTY OF HEALTH SCIENCES

DEPARTMENT OF GENERAL NURSING

ASSESSMENT OF KNOWLEDGE AND PRACTICE TOWARD PREVENTION OF ANEMIA AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE

A case study: Nyagatare District Hospital

Period: November 2021-February 2022

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with honor in General Nursing

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DECLARATION

Declaration by the Candidates

We, UWIMANIMPAYE Jeannette and KWITONDA Cécile hereby declare that this is our own original work and not a duplication of any similar academic work. It has therefore not been submitted to any other institution of higher learning. All materials cited in this paper which are not our own, have been duly acknowledged.

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Declaration by the Supervisor

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ABSTRACT

Anemia among pregnant women continues to be among the public health problems in Rwanda and has long-term consequences to health, social and economic development if not addressed. Its increases portray challenges in existing approaches to alleviate its burden; new approaches, based on scientifically identified risk factors to which interventions should be targeted are needed. This study was conducted to assess knowledge regarding anemia among pregnant women, in order to inform the policy makers, the appropriate interventions to address it in Nyagatare District.

The quantitative research approach used the structured questionnaire to collect data about knowledge regarding to anemia among pregnant women came in hospital in specialized area, gynecological ward, antenatal ward, labor ward and postnatal ward. Questionnaires were prepared and administered to the relevant respondents. Descriptive statistics have been used to give a clear picture of background variables like age, economic status and other variables in well-structured questionnaire.

Study participants with any anemia were described in general with more details about different levels of anemia: mild, moderate and severe anemia as well as the proportions of those who were not anemic. The general prevalence of anemia among pregnant women is 11.3% and most of those who are anemic have mild anemias with a prevalence of 6.3%; 3.8% had a moderate anemia and 1.3% had severe anemia.

Interventions to address anemia problem in Nyagatare should take into account the risk factors by enhancing anemia prevention interventions especially improving nutrition and social economic status of women in general. Special attention and further investigations are needed to assess in deep the risk factors of anemia among pregnant and separated women. In all, evidences from this study guaranty their validity and may serve as base for further researches as well as to better design health interventions addressing anemia among pregnant women in Nyagatare.

Key words: Anemia, Pregnant women, malaria, prevalence, Nyagatare.

DEDICATION

This work is dedicated to:

our lovely parents

our workmates,

classmates,

our relatives

and our special friends

ACKNOWLEDGEMENTS

Firstly, I give all thanks to God for gracing me with all I needed to complete this work.

A special thanks to my supervisor TWAHIRWA Jean Claude for the valuable guidance, input and motivation throughout this process.

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LIST OF TABLES

Table 1: Hemoglobin levels to diagnose anemia at sea level in g/l	9
Table 2: Category of public health significance for anemia.....	10
Table 3: Anemia status by hemoglobin level in pregnant women.....	16
Table 4: Socio demographic characteristics of respondents by anemia levels.	19
Table 5: Anemia status by mothers' health status and reproductive factors.....	22
Table 6: Anemia status by nutrition behaviors factors	24
Table 7: Factors related to the health services uses	27

LIST OF FIGURES

Figure 1: Common iron rich foods.....	10
Figure 2: Common Vitamin C rich foods	18
Figure 3: Common Iron and vitamin C rich foods	18
Figure 4: Conceptual framework	13

LIST OF ABBREVIATIONS, ACRONYMS AND SYMBOLS

%: Percentages

ANC: Ante natal care

BCC: Behavior for Change Communication

BMI: Body Mass Index

CHW: Community Health Workers (CHWs)

FP: Family Planning

GDP: Gross Domestic Product

Hb: Hemoglobin

HIV: Immunodeficiency Virus

IDA: Iron Deficiency Anemia

ITNs: Insecticide Treated Nets

LFTs: Liver Function Tests

MCV: Mean Corpuscular Volume

MOH: Ministry of Health - Rwanda

NISR: National Institute of Statistics of Rwanda

RBC: Red Blood Cells

RDHS: Rwanda Demographic and Health Survey

WBC: White Blood Cells

WHO: World Health Organization

WRA: Women of Reproductive Age

TABLE OF CONTENTS

DECLARATION	i
ABSTRACT	ii
DEDICATION	iii
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF ABBREVIATIONS,ACRONYMS AND SYMBOLS	vii
TABLE OF CONTENTS.....	viii
CHAPTER ONE: GENERAL INTRODUCTION	1
1.0. INTRODUCTION	1
1.1. BACKGROUND.....	1
1.2. PROBLEM STATEMENT	2
1.3 RESEARCH OBJECTIVES	3
1.3.1 General objective.....	3
1.3.2 Specific objectives.....	3
1.4. RESEARCH QUESTIONS.....	3
1.5 JUSTIFICATION AND SIGNIFICANCE OF THE STUDY	4
1.5.1 Personal interest.....	4
1.5.2 Scientific and academic interest.....	4
1.5.3 Socio-economic.....	4
1.6 LIMITATIONS OF THE STUDY	4
1.8. SCOPE OF THE STUDY	4
1.8.1. Concept scope.....	4
1.8.2. Geographical scope.....	5
1.8.3. Time scope.....	5
CHAPTER 2: LITERATURE REVIEW	6
2.0. INTRODUCTION.....	6

2.1. OVERVIEW OF ANEMIA AMONG PREGNANT WOMEN	6
2.1.1. Anemia in pregnant women.....	7
2.1.2. Factors associated with anemia in pregnant women	8
2.1.3. Socio-demographic factors	8
2.1.4. Women health status.....	8
2.1.5. Health conditions and health seeking behaviors.....	8
2.1.6. Knowledge regarding prevention of anemia in pregnant women.....	9
2.2. CONCEPTUAL FRAMEWORK	12
CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY	14
3.0. INTRODUCTION.....	14
3.1. RESEARCH APPROACH AND DESIGN	14
3.1.1 Research approach	14
3.1.2 Research design	14
3.2. TARGET POPULATION	15
3.3. SAMPLING PROCEDURE.....	15
3.4. SAMPLE SIZE.....	15
3.5. RESEARCH INSTRUMENTS FOR DATA COLLECTION	16
3.7 ETHICAL CONSIDERATIONS	17
3.8. DATA ANALYSIS	17
CHAPTER 4: DATA PRESENTATION, ANALYSIS, INTERPRETATION	18
4.0. INTRODUCTION.....	18
4.1. DATA PRESENTATION AND ANALYSIS.....	18
4.1.1. Socio demographic characteristics factors and anemia status	19
4.1.2. Mothers' health status and reproductive factors and anemia status	22
4.1.3 Nutrition behaviors factors	24
4.1.4. Health seeking behaviors factors and anemia status	27
4.2. DISCUSSION OF THE RESULTS	32
4.2.1. Anemia prevalence	32

4.2.2. Risk factors of anemia among pregnant women	33
CONCLUSION AND RECOMMENDATION.....	36
5.0. INTRODUCTION.....	36
5.1. CONCLUSION	36
5.2. RECOMMENDATIONS	36
5.3. STUDY LIMITATIONS AND IMPLICATIONS FOR FUTURE RESEARCH.....	37
REFERENCES	38
APPENDICES	a

CHAPTER ONE: GENERAL INTRODUCTION

1.0. INTRODUCTION

This chapter presents the background, Problem statement, objectives, and research questions, justification and significance of the study and scope of the study

1.1. BACKGROUND

Worldwide, anemia is prevalent in most developing countries and considered of public health significance. The World Health organization (WHO, 2011) has estimated the worldwide prevalence of anemia by regions and population groups. Iron Deficiency Anemia (IDA) is an underlying risk factor for maternal and prenatal mortality and morbidity; it is estimated to be associated with 115,000 of the 510,000 maternal deaths and 591,000 of the 2,464,000 prenatal deaths occurring annually around the world. Women and young children are most vulnerable to anemia (Ezzati, 2012).

A study published in 2016 stated that since anemia is associated with poor health outcomes, the prevalence of anemia is a significant public health indicator. Even though anemia is primarily caused by iron deficiency, low oxygen-carrying capacity may result from other conditions such as chronic diseases, which remain a relevant health concern in the United States (WHO, 2016)

Also, a study of WHO in 2016 showed that the prevalence of anemia among women of reproductive age (% of women ages 15-49) in Canada was 9.50 as of 2016. Its highest value over the past 26 years was 17.20 in 1990, while its lowest value was 8.40 in 2006. Prevalence of anemia among women of reproductive age refers to the combined prevalence of both non-pregnant with hemoglobin levels below 12 g/dL and pregnant women with hemoglobin levels below 11 g/dL (WHO, 2016).

In developing countries most often, anemia co-exists with an underlying disease and rarely occurs on its own. The commonest causes of anemia in developing countries, particularly among the most vulnerable groups (pregnant women and preschool age children) are nutritional disorders and infections. The World Health Organization (WHO, 2011) estimated that 56% of all pregnant women in developing countries are anemic. In Southern Asia, the prevalence of anemia

in pregnancy is about 75% in contrast to what obtains in North America and Europe with about 17% prevalence. Furthermore, 5% of pregnant women suffer from severe anemia in the worst affected parts of the world.

In Africa, the highest prevalence for pregnant women is in Africa (57.1%). Overall, 56.4 million pregnant women are anemic (41.8% prevalence globally). In non-pregnant women, the prevalence of anemia is slightly lower than in pregnant women. Overall, 468.4 million non-pregnant women are anemic (30.2% prevalence globally). The highest prevalence non-pregnant women are found in Africa (47.5%) (WHO M. W., 2017).

The prevalence rate of anemia among pregnant women and women of child-bearing age in Rwanda is 19.5 and 17 percent, respectively, making anemia a mild public health problem among these groups of women. The highest prevalence of anemia (22.8 percent) is in East Province, where it is classified as a moderate public health concern (Fiedler, 2014).

Regarding anemia severity, the majority of cases among pregnant women in country are classified as mild or moderate, while less than one percent of this population is diagnosed as severe. Prevalence is adjusted for altitude and for smoking status, if known, using formulas in CDC, 1998. No pregnant women with a hemoglobin level below 8.0 g/dl and pregnant women with a level below 7.0 g/dl have severe anemia; no pregnant women with a level of 8.0-10.9 g/dl and pregnant women with a level of 7.0-9.9 g/dl have moderate anemia; and no pregnant women with a level of 10.0-11.9 g/dl and pregnant women with a level of 10.0-10.9 g/dl have mild anemia. Thirteen percent of women age 15-49 are anemic. Most of these women are mildly anemic (9%); 4% are moderately anemic, and less than 1% are severely anemic. Pregnant women (25%) and women in the lowest wealth quintile (16%) are more likely to be anemic than other women (NISR M. I., 2020).

1.2. PROBLEM STATEMENT

The World Health Organization (WHO) defines anemia among women of childbearing age as the condition of having a hemoglobin concentration of < 12.0 g/dL at sea level; among pregnant women it is defined as < 11.0 g/dL. The hemoglobin concentration cutoff level that defines anemia varies by age, gender, physiological status, smoking status, and the altitude at which the assessed population lives (Fiedler, 2014).

In addition, anemic pregnant women are at greater risk of giving birth prematurely or have low birth weight babies and this is known to increase risk of neonatal morbidity and mortality (Frass, 2015). Furthermore, anemia can also cause cognitive loss in those who survive it, and because anemic people have general fatigue, the weakness impacts heavily their productivity at work (Fiedler, 2014).

Other reports have argued that anemia is associated with increased healthcare expenditures especially when the condition coexists with several major disorders; patients with anemia have twice the average annualized costs of non-anemic patients with the same condition (Brabin B, 2018).

1.3 RESEARCH OBJECTIVES

1.3.1 General objective

The objective of the study is to assess the knowledge and practice regarding Prevention of anemia among pregnant mothers attending ANC.

1.3.2 Specific objectives

- i. Assess the knowledge regarding the prevention of anemia among mothers attending ANC in Nyagatare District.
- ii. Determine the practices regarding Prevention of anemia among pregnant mothers attending ANC at Nyagatare DH.
- iii. Identify factors associated with anemia among pregnant women in Nyagatare District.

1.4. RESEARCH QUESTIONS

- i. What is the level of knowledge regarding the prevention of anemia among mothers attending ANC in Nyagatare District Hospital?
- ii. What are the practices done for Prevention of anemia among pregnant mothers?
- iii. What are the factors associated with anemia among pregnant women in Nyagatare District?

1.5 JUSTIFICATION AND SIGNIFICANCE OF THE STUDY

1.5.1 Personal interest

The topic has chosen for getting bachelor degree. This research will help to increase knowledge for the researcher to match theory to practice. And the findings of this study will be beneficial to the researchers himself, due to their understanding on how the assessment of knowledge and practice toward prevention of anemia among pregnant women attending antenatal care.

This study will help to improve knowledge about the signs, symptoms, diagnosis, risk factors and preventive measure of anemia.

1.5.2 Scientific and academic interest

This study explains the common signs, symptoms and preventive measure of anemia during pregnancy and this have taught to the population.

1.5.3 Socio-economic

This study has a great importance to both social and economic benefits because it will help the society in acquiring the basic knowledge on anemia and the expenses on medicaments will be decreased among the pregnant women.

1.6 LIMITATIONS OF THE STUDY

This study is limited on our specific area, difficult to generalize; it focuses on the assessment of knowledge regarding anemia among pregnant women. It is used sampled women that represent the total population of the Nyagatare District Hospital but not the whole women of the country. Other limitations include the non-uniqueness of the population as it is a district's hospital-based study; therefore, findings found may differ from others found in other hospitals and lack of other related studies in the country to compare findings and final results.

1.8. SCOPE OF THE STUDY

1.8.1. Concept scope

The current study will assess the knowledge regarding anemia among pregnant women by interviewing the pregnant women in Nyagatare District Hospital, Nyagatare district in Eastern Province of Rwanda during the study period.

1.8.2. Geographical scope

Due to financial flexibility of pregnant women and generalization of findings as study limitations, it was not possible to carry out the study related to the assessment of knowledge regarding anemia among pregnant women of the all hospitals in Rwanda. Therefore, this study has been carried out in Nyagatare District Hospital of Nyagatare Sector, Nyagatare District, and Eastern Province of Rwanda.

1.8.3. Time scope

The research covered the period from November, 2021 to February, 2022 due the availability of data; it has covered the data information of four months.

CHAPTER 2: LITERATURE REVIEW

2.0. INTRODUCTION

This chapter covered different review about overview of anemia among pregnant women, condition and factors for anemia, knowledge for anemia prevention and conceptual framework.

2.1. OVERVIEW OF ANEMIA AMONG PREGNANT WOMEN

Anemia is defined as a low level of hemoglobin in the blood, as evidenced by fewer numbers of functioning red blood cells. Hemoglobin in red blood cells is an oxygen-carrying protein that binds oxygen through its iron component. Hemoglobin transports oxygen to most cells in the body for the generation of energy. When hemoglobin levels are low, less oxygen reaches the cells to support the body's activities; these affect the vital function of organs like the heart and lungs (HAKIZIMANA, 2016). According to the National Institute of statistics, eastern province becomes a third in anemia in pregnant women as shown in below

Table 1: Anemia status by hemoglobin level in pregnant women

Province	Anemia status by hemoglobin level				Number of women
	Any	Mild	Moderate	Severe	
Kigali	14.5	8.7	5.0	0.8	1,050
South	14.5	9.0	5.2	0.4	1,521
West	12.7	9.0	3.6	0.1	1,604
North	11.4	7.8	3.5	0.1	1,091
East	12.6	8.7	3.8	0.1	1,999

Source: (NISR M. I., 2020)

Other causes of anemia include vitamin deficiencies (such as a deficiency of folic acid or vitamin A), genetic disorders, malaria, parasitic infections, HIV, tuberculosis, common infections, and other inflammatory conditions. While iron deficiency anemia (IDA) accounts for about one-half of all anemia cases, it often coexists with these other causes.

2.1.1. Anemia in pregnant women

Anemia in pregnancy is defined by Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO, 2011) as Hb concentration of less than 110 g/L (less than 11 g/dl) in venous blood. Further, it is categorized as mild anemia (10.0-10.9g/dl), moderate anemia (7-9.9g/dl) and severe anemia (<7.9g/dl). Furthermore, moderate and severe forms of anemia can be prevented by treating mild anemia. There are multiple causes of anemia, but the most common cause is the iron deficiency in pregnancy in both the developed and developing world (Silva, 2019; Silva, 2019).

Anemia is a disease condition in which the number of red blood cells or their oxygen-carrying capacity is insufficient to meet physiological needs, which varies by age, sex, altitude, smoking, and pregnancy status (WHO, 2018) of human beings. Iron is a mineral found in the red blood cells and is used to carry oxygen from the lungs to the rest of the body, as well as helps the muscles to store and use oxygen (WHO, 2018). In pregnancy due to the physiological changes of the body, pregnant mothers are significantly more prone to have anemia. The first trimester in pregnancy refers to the first three months of the pregnancy. This is the time period of the pregnant mother which is more vulnerable to having IDA.

Both red cell mass and plasma volume expand progressively from the first trimester of normal pregnancy. The expansion of plasma volume is 30 – 40% while increasing red cell mass in 20 – 25% (American society of Hematology, 2018). Because the expansion in plasma volume is greater than the increase in red blood cell mass, there is a fall in hemoglobin (Hb) concentration, hematocrit, and red blood cell count. Despite this hemodilution, there is usually no change in mean corpuscular volume (MCV) or mean corpuscular hemoglobin concentration (MCHC). This will lead to insufficient transportation of hemoglobin to the mother as well as the fetus (WHO, 2018).

The symptoms of IDA in pregnancy can be seen as fatigue, weakness, pale or yellowish skin, irregular heartbeats, shortness of breath, dizziness or lightheadedness, chest pain and cold hands and feet (WHO, 2018).

2.1.2. Factors associated with anemia in pregnant women

The anemia determinants are multi-factorial ranging from socio-demographic factors including other physiological factors, mother's health status, health conditions, health seeking behaviors.

2.1.3. Socio-demographic factors

Studies conducted in different European and African countries found that area of residence does influence anemia. Women residing in rural areas were more likely to be anemic than women living in urban areas. Education/literacy and an economic status were found to be associated with anemia in many studies where women with any postsecondary education were less frequently anemic than were women with less education (Gebre A, 2015).

Although there are variations of distribution of anemia according to age categories, some studies have found no statistical significance, or have found weak association between age and anemia (Wilunda C, 2013). Moreover, other studies in East African found that poverty (wealth quintile, and pregnancy were among the factors that were associated with anemia (Wilunda C, 2013).

2.1.4. Women health status

Various studies have found that high prevalence of anemia is associated with health status conditions of women and factors including the number of children by mothers, like women having parity 1 and 4, and mother's nutrition status using BMI in kg/m² were found to be associated with anemia (Antelman G, 2018).

Lactating mothers have also been found having higher anemia risks (Yihunie L, 2015). Other studies have linked prevalence and risk factors of anemia to Human Immunodeficiency Virus (HIV). Anemia increased with HIV stage and associated with lower body mass index and other opportunistic infections (Masaisa F., 2011).

2.1.5. Health conditions and health seeking behaviors

Iron deficiency is considered to be the most common of all associated factors of anemia accounting for greater than 60% of all anemia globally (Stevens GA, 2013). In Ethiopia, increased prevalence of anemia among women was due to lack of iron supplementation during pregnancy, and meal frequency of less than two times per day (Gebre A, 2015), but conflicting reports exist especially among pregnant women (Tolentino K, 2017).

Other studies have demonstrated that use of hormonal contraceptive reduced the risk for anemia (Yihunie L, 2015). This is not so for Intra Uterus Devises, which is known to increase the risk of anemia. The use of malaria infection preventions measures like using Long Lasting Insecticide Treated Nets (LLITNs) for malaria prevention, having toilet facilities, and drinking untreated water were found to be associated with anemia prevalence as were deforming and access to health facilities (Ouma P, 2017).

Moreover, access to information has been found also to influencing the use of health services including those related to anemia prevention and control (NISR M. I., 2016). Smoking and altitude do also influence the variations in hemoglobin level and thus anemia level in the population (WHO, 2016). Other risk factors including hemoglobinopathies, chronic kidney diseases, and other gynecological diseases have found to be associated with anemia (Kassebaum NJ, 2016). However, they are not considered in this study because they are not part of the data collection upon which this study draws information (NISR M. I., 2016)

2.1.6. Knowledge regarding prevention of anemia in pregnant women

However, it is difficult to get a clear picture of the knowledge of IDA among pregnant women as very as few studies were conducted in Rwanda. Therefore, it is worthwhile to explore the Knowledge regarding prevention of anemia in pregnant women. It may also be helpful in conducting more awareness programs to prevent the effects of IDA in first semester of pregnant women second and third trimesters as well as in the post-natal period. Hence the current study aims to assess knowledge regarding anemia among pregnant women in Nyagatare District Hospital.

It is estimated that 1.6 billion individuals worldwide have anemia and generally 50% of cases of anemia are due to iron deficiency and about twice as many individuals are estimated to be affected by iron deficiency (Wang, 2019). Worldwide, the prevalence of anemia during pregnancy has been estimated as 41.8%, corresponding to 56.4% of the total female population (WHO, 2011). More than two-thirds (75%) of them belongs to Asia (Wang, 2019). Although more prevalent in less-resourced countries, women from developed countries (18%) are also affected (HAKIZIMANA, 2016). Regarding the Rwandan context, IDA in pregnancy was estimated at around 29% (WHO, 2011). Studies were done in the Western and Northern

Provinces regarding IDA in pregnancy and they were reported IDA in pregnancy 18% and 14% respectively (NISR M. I., 2020).

As precautions, it is instructed to eat a varied diet of iron-rich foods and foods that enhance iron absorption (meats and ascorbic acid-rich fruits) (WHO, 2018). Foods which inhibit absorption of iron (tea, coffee, whole-grain cereals, unleavened whole-grain bread, and dried beans) should be consumed separately from iron-rich foods. Also, the use of iron supplementation during pregnancy is a preventive tool to overcome from IDA (Silva, 2019).

Chickpea <i>Chana Sag</i>		Spinach <i>Palak</i>	
Amaranth <i>Kantewali Chaulai</i>		Onion Stalks <i>Pyaz ki kali</i>	
Mustard Leaves <i>Sarson ka sag</i>		Fenugreek Leaves <i>Methi</i>	
Mint <i>Pudina</i>		Colocasia leaves <i>Arvi Ka Sag</i>	
Lentil <i>Dal</i>		Bengal Gram, Whole <i>Kala chana</i>	
Soyabean		Gingelly Seeds <i>Til</i>	

Figure 1: Common iron rich foods (Source: www.google.com)







Red Gram Dhal <i>Arhar</i>		Plantain Green <i>Kuchcha Kela</i>	
Black Gram, Dhal <i>Urad Dal or Kaskalay</i>		Water Melon <i>Tarbooz</i>	
Pumpkin <i>Seethaphal</i>		Mutton <i>Gosht</i>	

Figure 2: Common Vitamin C rich food (source: www.google.com)

Cabbage <i>Patta Gobhi</i>		Drumstick Leaves <i>Saijan Patta</i>	
Coriander Leaves <i>Dhaniya</i>		Gooseberry <i>Amla</i>	

Figure 3: Common Vitamin c and Iron rich foods (source: www.google.com)

There are some food, drinks and drugs that can impair iron absorption like those below

- ✓ Tea and coffee
- ✓ Calcium, found in dairy products such as milk

- ✓ Antacids (medication to help relieve indigestion)
- ✓ Proton pump inhibitors (PPIs), which affect the production of acid in your stomach
- ✓ Some wholegrain cereals contained phytic acid

Table 2: Category of public health significance for anemia

Prevalence o anemia (%)	Category of public health signifince
< 4.9	No public health
<5.0-19.9	Mild public health problem
<20.0-39.9	Moderate public health problem
>= 40.0	Severe public health problem

Source: primary data

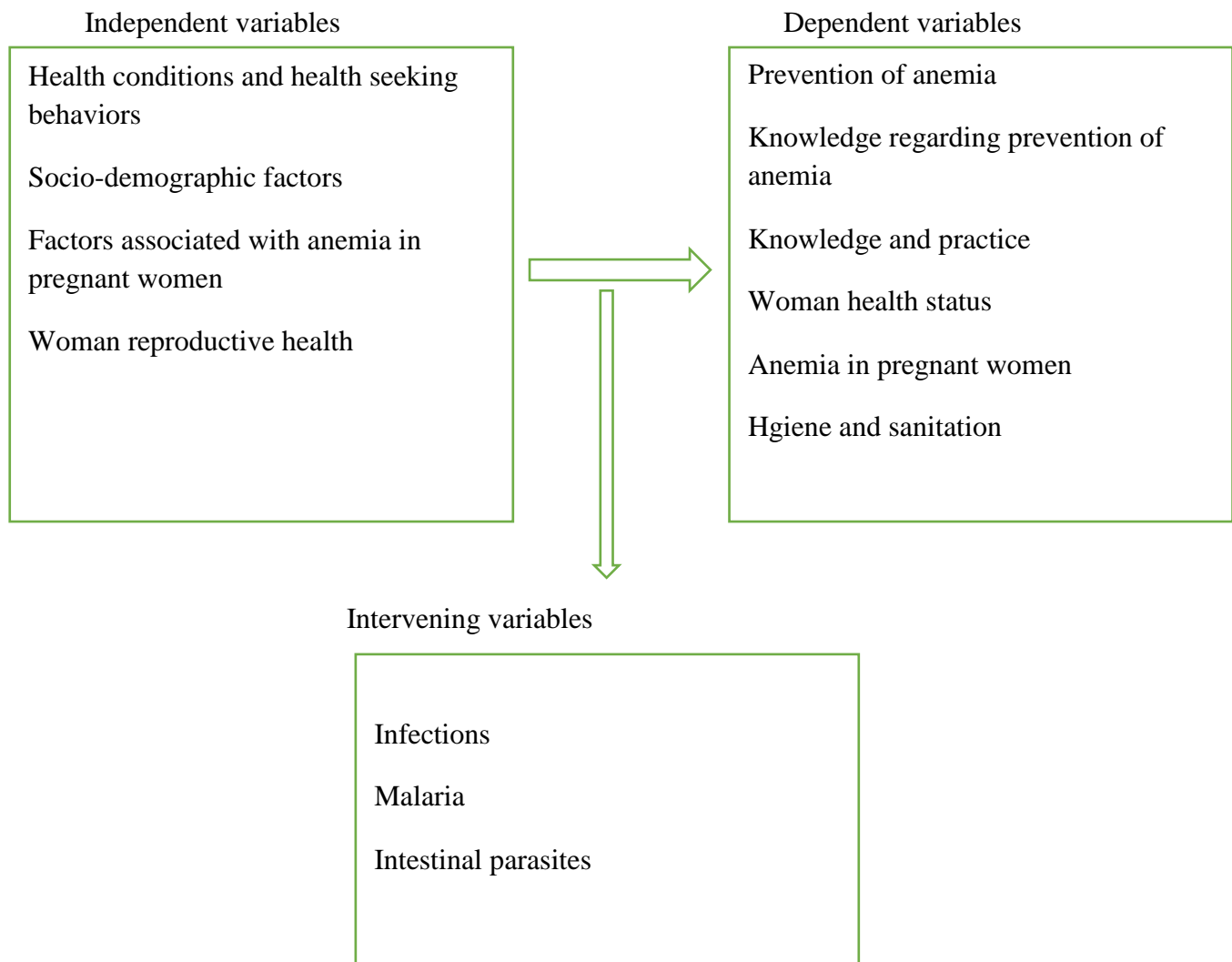
There is some food, drinks and drugs that can impair iron absorption like those below

- ✓ Tea and coffee
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- ✓ Antacids (medication to help relieve indigestion)
- ✓ Proton pump inhibitors (PPIs), which affect the production of acid in your stomach
- ✓ Some wholegrain cereals contained phytic acid

2.2. CONCEPTUAL FRAMEWORK

According to the factors that are considered to be influencing anemia among pregnant women, the following framework was adopted which contains different variables that were included in this study in order to assess the risk factor of anemia among pregnant women in Rwanda.

Figure 4: Conceptual framework



Source: primary data 2021

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.0. INTRODUCTION

This chapter describes the research methodology and includes research design, target population, sample size determination with sampling procedure, data collection and analysis procedures; it includes also the validity and reliability and ethical consideration.

3.1. RESEARCH APPROACH AND DESIGN

3.1.1 Research approach

Research approach is a plan of action that gives direction to conduct research systematically and efficiently. There are two main research approaches as: Alga and Gunderson (2002), quantitative approach and qualitative approach.

Qualitative approaches refers to the name indicates are the approaches that don't involves measurement or statistics, the tools that were applied here by the researcher are the techniques of observation, interview and documentary methods, the researcher analyzed qualitatively.

Quantitative approaches refers to the systematic empirical investigation of social phenomena via tabulation, mathematical or computational techniques, in this research for the purpose of quantitative data analysis, the collected data will be expressed in different tables especially the responses from the representative sample under the study, with regard to this study the researcher analyzed the data collected, basing on the respondents, this was calculated in percentages on which the research based on design to

3.1.2 Research design

Research design refers to all the procedures selected by the researcher for studying a particular set of questions. It is a plan showing how research would be carried out by the researcher in order to obtain relevant data which fulfill the research objectives. In this study, the descriptive cross sectional survey design was employed. Descriptive survey method is often used to study people's feelings, thinking and attitudes about specific aspects hence was relevant for this study as attitudes could not be directly measured or observed but was inferred from certain cues which depicted the implicit nature of student's characteristics.

3.2. TARGET POPULATION

The target population is based on a hundred women (100) came to Nyagatare District Hospital that concerned with specialized area, gynecological ward, antenatal ward, labor ward and postnatal ward. It is from this population the sample has been targeted and on which we were based to conduct the study.

✓ Inclusion criteria

Pregnant women who came in other services, working in hospital or walked around but meet the criteria were included in the study.

✓ Exclusion criteria

Pregnant women who were on leave (maternity, sick, etc.) and those who are in menopause were excluded.

3.3. SAMPLING PROCEDURE

This section deals with the selection of the respondents and the sampling technique used to get an approximate representation of the study population. Includes the sample size and how it was determined considering the target population.

All the women in the hospital meeting the inclusion criteria and willing to participate had equal probability to be recruited for the participation of the study. Non-probability sampling was used to conveniently sample participants for responding.

3.4. SAMPLE SIZE

A sample size is a part of the population chosen for a survey or experiment; women within the hospital were therefore selected purposively. However, the most important purposive criteria for this study were the presence of at least all pregnant women. A simplified formula to calculate sample size (Yamane, 1967)

$$n=N/[1+N(e)^2]$$

Where n= corrected sample size, N = population size, and e = Margin of error (MoE), e = 0.05 based on the research condition.

$$n = \frac{100}{1 + 100(0.05)^2}$$

$$n = \frac{100}{1 + 100(0.0025)}$$

$$n = \frac{100}{1 + 0.25}$$

$$n = \frac{100}{1.25}$$

$$n = 80$$

Thus 80 women were meeting the criteria to be selected as a sample size and they accepted to participate in the study.

3.5. RESEARCH INSTRUMENTS FOR DATA COLLECTION

In this study the data were collected by semi-structured open-ended questionnaire. The questionnaire contains demographic information of the participants (such as age, sex, marital status) and questions related perceptions towards teen pregnancy.

3.6 DATA COLLECTION PROCEDURE

Questionnaires were prepared and administered to the relevant respondents. This method enabled us to get enough information. We used structured questionnaires. The questionnaires were administered to pregnant women. Examples of the probing statements and questions included the following:

- 1) Can you tell me more about your own personal opinions about anemia among pregnant women? 2) Did you sick anemia in your pregnant periods? If yes, elaborate the symptoms you had; and
- 3) Are there certain situations or circumstances in your livelihood these periods? Please explain.

To ensure that the probing questions and statements were applicable and understandable to participants, two pilot interviews were conducted with pregnant women, modifications and

adaptations were implemented as necessary. With the use of questionnaire, the researcher was able to collect different information.

3.7 ETHICAL CONSIDERATIONS

Approval was granted by the deputy principal academics in and permission to conduct the study was obtained from Nyagatare District Hospital Medical Representative to access medical records from different services of Nyagatare District Hospital records.

Collaboration was assigned by the management of the institution to the researcher and scheduled an appropriate date and time to introduce the study to the participants. After a detailed explanation of the study, their rights, risks and benefits, participants who wish to participate was completing the formed consent form and a questionnaire was given to them to complete. Their confidentiality and anonymity were assured and their right to withdraw from the study at any point.

3.8. DATA ANALYSIS

All the data were analyzed using STATA version 18. Variables under study were extracted from the data collected in Nyagatare District Hospital. Descriptive analysis was conducted to describe anemia among WRA according to their social and demographic characteristics, mother's health status, health conditions and behaviors factors as well as living conditions factors as described in the section about study variables above.

The descriptive analysis results were presented in frequency and percentage (n and %) for anemia status with pregnant women with any anemia and those without anemia according to independent variables. In addition to that, variations of anemia levels according to independent variables in study were also analyzed in descriptive analysis step and reported in order to provide details about variations of distribution of anemia levels.

A bivariate analysis using logistic regression was conducted to test association between the anemia among pregnant women and independent variables that were described in conceptual framework. Variables were considered to be statistically significant if the p-value was <0.05 . Co linearity among the significant variables was tested using Spearman's Correlation coefficient and those collinear variables with $r \geq 0.5$ were not retained to be put in multivariate analysis model.

CHAPTER 4: DATA PRESENTATION, ANALYSIS, INTERPRETATION

4.0. INTRODUCTION

This chapter presents the description of variables, data analysis, presentation the results and discussion of funding.

In this study, the outcome variable is the anemia status for pregnant women in Nyagatare District. The anemia status was measured using the standards as described in RDHS 2014/2015, which are not very different with those recommended by WHO (NISR M. I., 2016).

4.1. DATA PRESENTATION AND ANALYSIS

After adjustment for altitude, pregnant women with haemoglobin level above 10.9 g/dl and non-pregnant women with haemoglobin level above 11.9 g/dl were considered as not anemic while those pregnant women with haemoglobin level equal or below to 10.9 g/dl and non-pregnant pregnant women with haemoglobin level equal or below to 11.9 g/dl were considered as anemic.

However, for the purpose of describing in details the variations of different levels of anemia according to different characteristics of pregnant women, three levels of anemia severity were also distinguished in descriptive analysis

- Mild anemia: 10.0-10.9 g/dl for pregnant women and 10.0-11.9 g/dl for non-pregnant women;
- Moderate anemia (7.0-9.9 g/dl);
- Severe anemia (less than 7.0 g/dl)

Different characteristics were used to describe the study participants according to the anemia status. Study participants with any anemia were described in general with more details about different levels of anemia: mild, moderate and severe anemia as well as the proportions of those who were not anemic.

A total of 80 women were included in the analysis (weighted N). As described in table 3, the general prevalence of anemia among pregnant women is 11.3% and most of those who are

anemic have mild Anemia with a prevalence of 6.3%; 3.8% had a moderate anemia and 1.3% had severe anemia.

4.1.1. Socio demographic characteristics factors and anemia status

Table 3: Socio demographic characteristics of respondents by anemia levels

Background	ANEMIC								NOT ANEMIC		TOTAL WEIGHTED	
	Any anemia (<11.0 g/dl)		Mild (10.0-10.9 g/dl)		Moderate (7.0-9.9 g/dl)		Severe (<7.0 g/dl)					
characteristics	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%
1. Social and demographic characteristics of respondents												
Age of the respondents												
15-20 years	0	0	0	0	0	0	0	0	6	7.5	6	7.5
21-25 years	0	0	0	0	0	0	0	0	19	24	19	23.75
26 – 30 years	0	0	0	0	0	0	0	0	26	33	26	32.5
31 -35 years	3	3.75	2	2.5	1	1.25	0	0	14	18	17	21.25
above 36 years	6	7.5	3	3.75	2	2.5	1	1.3	6	7.5	12	15
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Age at the time of marriage

less than 20 years	0	0	0	0	0	0	0	0	6	7.5	6	7.5
20-25years	0	0	0	0	0	0	0	0	19	24	19	23.75

26-30 years	2	2.5	1	1.25	1	1.25	0	0	26	33	28	35
30-35 years	7	8.75	4	5	2	2.5	1	1.3	14	18	21	26.25
Above 35 years	0	0	0	0	0	0	0	0	6	7.5	6	7.5
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Educational level of respondents

Illiterate	1	1.25	1	1.3	0	0	0	0	6	7.5	7	8.75
Primary education	3	3.75	2	2.5	1	1.3	0	0	19	24	22	27.5
0 Level education	3	3.75	1	1.3	1	1.3	1	1.3	26	33	29	36.25
A2 Level education	2	2.5	1	1.3	1	1.3	0	0	14	18	16	20
University education	0	0	0	0	0	0	0	0	6	7.5	6	7.5
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Monthly income of the household Rwf

10,000-50,000	8	10	4	5	3	3.75	1	1.25	56	70	64	80
51,000-100,000	1	1.25	1	1.25	0	0	0	0	12	15	13	16.25
101,000-150,000	0	0	0	0	0	0	0	0	2	2.5	2	2.5
151,000-200,000	0	0	0	0	0	0	0	0	1	1.25	1	1.25
above 200,000	0	0	0	0	0	0	0	0	0	0	0	0

Total	9	11.25	5	6.25	3	3.75	1	1.25	71	88.8	80	100
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Source: primary data 2021

Marriage status

house wife	2	2.5	1	1.3	1	1.3	0	0	46	58	48	60
Doing job (like manpower and salary worker)	7	8.75	4	5	2	2.5	1	1.3	25	31	32	40
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

As shown in table 3, 26 (32.5%) of the study participants were aged 26-30 years old; 28 (35%) their ages at the time of marriage were between also 26-30 years old. Moreover, around 36.25% did complete ordinary education level and only 7.5% had university education level.

Furthermore, 64 (80%) their monthly income was between 10,000 and 50,000 Rwandan francs and only one has the monthly income were between 101,000 and 150,000 Rwandan francs, and regarding the marriage status, 48 (60%) and 32 (40%) were house wife and workers (like manpower and salary worker) respectively (table 3).

The anemia prevalence is higher among old pregnant women where it is 7.5%, 3.75% in pregnant women aged above 35 years and 31-35 years old respectively. The proportions of mild, moderate and severe anemia according to age categories follow those trends of variations between age groups.

Moreover, there was a variation of anemia with the age at the time of marriage. High anemia prevalence (8.75%) was observed in pregnant women married in ages between 30-35 years.

In addition to that, the table 3 also shows a huge variation of anemia prevalence among pregnant women according to the monthly income where the prevalence is higher in less monthly income at 10% where both mild, moderate and severe anemia are presented compared to the higher monthly income rate.

Furthermore, anemia prevalence is low among pregnant women with non-education and those of university education with a prevalence of 1.25% and 0% respectively. However, a higher prevalence is also observed among pregnant women with primary and ordinary education where the prevalence is 3.75%.

4.1.2. Mothers' health status and reproductive factors and anemia status

Table 4: Anemia status by mothers' health status and reproductive factors

Background	ANEMIC								NOT ANEMIC		TOTAL WEIGHTED	
	Any anemia (<11.0 g/dl)		Mild (10.0-10.9 g/dl)		Moderate (7.0-9.9 g/dl)		Severe (<7.0 g/dl)					
characteristics	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%
	2. Mothers' health status and reproductive factors											
Type of pregnancy												
Single	8	10	4	5	3	3.8	1	1.3	70	87.5	78	97.5
Twin	1	1.25	1	1.3	0	0	0	0	1	1.25	2	2.5
Triple	0	0	0	0	0	0	0	0	0	0	0	0
quarter let	0	0	0	0	0	0	0	0	0	0	0	0
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	88.8	80	100

Source: primary data 2021

Hb% of respondent

3-4 g/dl	0	0	0	0	0	0	0	0	0	0	0	0
5-6 g/dl	1	1.25	0	0	0	0	1	0	0	0	1	1.25

7-10 g/dl	3	3.75	0	0	3	3.8	0	0	0	0	3	3.75
Above 10 g/dl	5	6.25	5	6.3	0	0	0	0	71	88.8	76	95
Total	9	11.3	5	6.3	3	3.8	1	0	71	88.8	80	100

Source: primary data 2021

Liver function tests of respondent

less normal	0	0	0	0	0	0	0	0	1	1.25	1	1.25
normal	9	11.3	5	6.3	3	3.8	1	1.3	70	87.5	79	98.75
more than normal	0	0	0	0	0	0	0	0	0	0	0	0
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	88.8	80	100

Source: primary data 2021

Body Mass Index (BMI)

Underweight: <18.5	0	0	0	0	0	0	0	0	0	0	0	0
Normal: 18.50 - 24.99	8	10	4	5	3	3.8	1	1.3	66	82.5	74	92.5
overweight: 24.99 - <30	1	1.25	1	1.3	0	0	0	0	5	6.25	6	7.5
Obese: ≥ 30.00 (45)	0	0	0	0	0	0	0	0	0	0	0	0
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	88.8	80	100

Source: primary data 2021

The table 4 indicates that 11 (13.75%) of the study participants were pregnant but without another child, 31 (38.75%) had 1-2 children, 21 (26.75%) had 2-4 children, 17 (21.75%) had 5-6 children while no participant has had 7 and more children. Moreover, 41 (51.25%) had their last

birth in 2-3 years, and 78 (97.5%) were pregnant with only single fetus. Additionally, 76(95%) of pregnant women in the study hemoglobin cells above 10 grams per deciliter, 79 (98.75%) had normal liver function test status and 30 (37.5%) had between 4-6 months of gestation while 74 (92.5%) were 18.50-24.99BMI which is normal weight.

Besides that, the table 4 also demonstrates that anemia is more prevalent among pregnant women with their first pregnancy with 5% as compared to 3.75% among those who are pregnant and have 2-3 years after last birth. However, mild and moderate anemia is more prevalent among those who were single pregnant or who had one fetus with a prevalence of 5% for mild anemia and 3.8% for moderate anemia. Moreover, anemia is almost the higher regarding the number of children ever born per pregnant women, varying from 5% among those with 1-2 children to 3.75% among those with no child. Same trends of variations are observed in different anemia levels except for severe anemia where there was no anemia among those who had 5-6 children and more.

Moreover, anemia is more prevalent among women who had their gestation month between 4-6 month and 7-9 month with a prevalence of 6.25%. Anemia among those pregnant women who were normal for their liver function test is higher with 11.3%. In addition to that, pregnant women who are normal weight have a high anemia prevalence of 10% compared to 1.25% among those with overweight, 0% among underweight and 0% among obese. However, although the same trends of variations are observed according to level of anemia, mild anemia make an exception where it's more prevalence among normal weight (5%) compared to 1.3% among overweight. The table 4 below provides details about anemia status by mothers' health status and reproductive factors.

4.1.3 Nutrition behaviors factors

Table 5: Anemia status by nutrition behaviors factors

Background characteristics	ANEMIC				NOT ANEMIC	TOTAL WEIGHTED
	Any anemia (<11.0 g/dl)	Mild (10.0-10.9 g/dl)	Moderate (7.0-9.9 g/dl)	Severe (<7.0 g/dl)		

	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%
2. Mothers' health status and reproductive factors												
Period of the last birth												
no last birth	4	5	2	2.5	1	1.3	1	1.3	8	10	12	15
less or equal to one year	0	0	0	0	0	0	0	0	1	1.3	1	1.25
2-3 years	3	3.75	2	2.5	1	1.3	0	0	38	48	41	51.25
4-5 years	2	2.5	1	1.3	1	1.3	0	0	22	28	24	30
more than 5 years	0	0	0	0	0	0	0	0	2	2.5	2	2.5
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Type of pregnancy

Single	8	10	4	5	3	3.8	1	1.3	70	88	78	97.5
Twin	1	1.25	1	1.3	0	0	0	0	1	1.3	2	2.5
Triple	0	0	0	0	0	0	0	0	0	0	0	0
quarter let	0	0	0	0	0	0	0	0	0	0	0	0
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Hb% of respondent

3-4 g/dl	0	0	0	0	0	0	0	0	0	0	0	0
5-6 g/dl	1	1.25	0	0	0	0	1	0	0	0	1	1.25

7-10 g/dl	3	3.75	0	0	3	3.8	0	0	0	0	3	3.75
Above 10 g/dl	5	6.25	5	6.3	0	0	0	0	71	89	76	95
Total	9	11.3	5	6.3	3	3.8	1	0	71	89	80	100

Source: primary data 2021

Liver function tests of respondent

less normal	0	0	0	0	0	0	0	0	1	1.3	1	1.25
Normal	9	11.3	5	6.3	3	3.8	1	1.3	70	88	79	98.75
more than normal	0	0	0	0	0	0	0	0	0	0	0	0
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100
Gestational month												
1-3month	2	2.5	1	1.3	1	1.3	0	0	22	28	24	30
4-6month	5	6.25	2	2.5	2	2.5	1	1.3	25	31	30	37.5
7-9month	2	2.5	2	2.5	0	0	0	0	24	30	26	32.5
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Body Mass Index (BMI)

Underweight: <18.5	0	0	0	0	0	0	0	0	0	0	0	0
Normal:18.50 - 24.99	8	10	4	5	3	3.8	1	1.3	66	83	74	92.5
overweight: 24.99 - <30	1	1.25	1	1.3	0	0	0	0	5	6.3	6	7.5
Obese: ≥ 30.00 (45)	0	0	0	0	0	0	0	0	0	0	0	0
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

The table 5 indicates that 40 (50%) take a tea once a day and 39 (48.75%) take the food thrice a day before the survey. Moreover, 32 (40%) of pregnant women eat fresh fruits, vegetables and milk week while 26 (32.5%) suffered from frequent nausea and vomiting compared to 54 (67.5%) do not suffer from frequent nausea and vomiting. And also 35 (43.75%) of respondents their daily eating habits were like previous compared to 29 (36.25%) of respondents their daily eating habits were less than previous and 16 (20%) of respondents their daily eating habits were double then previous. In addition, 43 (53.75%) of respondents they take an average of 7-8 hours of rest per a day compared to 37 (46.25%) of respondents they take above 8 hours of rest per a day.

Regarding anemia status, anemia is more prevalent among those who use to take a tea once a day as it is 5% and 5% among those who take food once a day but also those take food twice a day as shown in table 5.

Regarding the eating fresh fruits, vegetables and milk, anemia was more prevalent among those who eat fresh fruits, vegetables and milk weekly very rare (7.5%) as compared to those who do it daily (0%), and it's also higher among those who suffer from frequent nausea and vomiting (8.75%) as compared to those do not suffer from this problem (2.5%), and those have less than previous daily eating habits have higher an anemia prevalence of 5%, compared to those have their daily eating habits like previous (3.75%) and double then previous (2.5%). Regarding the average hours of rest per a day, anemia was more prevalent among those take rest between 7-8 hours per a day (7.5%) as compared to those who rest above 8 hours (3.75%). The table 5 below provides details about anemia status by health seeking behaviors factors.

4.1.4. Health seeking behaviors factors and anemia status

Table 6: Factors related to the health services uses

Background	ANEMIC								NOT ANEMIC		TOTAL WEIGHTED	
	Any anemia (<11.0 g/dl)		Mild (10.0-10.9 g/dl)		Moderate (7.0-9.9 g/dl)		Severe (<7.0 g/dl)					
characteristics	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%

			(n)				(n)					
4. Health seeking behaviors factors												
Respondent have mosquito bed net for sleeping												
Yes	4	5	3	3.8	1	1.3	0	0	67	84	71	88.75
No	5	6.25	2	2.5	2	2.5	1	1.3	4	5	9	11.25
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Respondent slept under mosquito bed net

Yes	3	3.75	2	2.5	1	1.3	0	0	56	70	59	73.75
No	6	7.5	3	3.8	2	2.5	1	1.3	15	19	21	26.25
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Use of ante natal care (ANC) on the pregnancy

No ANC	0	0	0	0	0	0	0	0	0	0	0	0
1- 3 ANC	8	10	4	5	3	3.8	1	1.3	34	43	42	52.5
4 or more ANC	1	1.25	1	1.3	0	0	0	0	37	46	38	47.5
no pregnancy or had their last pregnancy in more than last 5 years	0	0	0	0	0	0	0	0	0	0	0	0
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Use of iron supplement

Yes	2	2.5	1	1.3	1	1.3	0	0	36	45	38	47.5
No	7	8.75	4	5	2	2.5	1	1.3	35	44	42	52.5
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100
Malaria history during the last pregnancy												
no malaria drug during last pregnancy	1	1.25	1	1.3	0	0	0	0	10	13	11	13.75
took malaria drug during last pregnancy	3	3.75	1	1.3	2	2.5	0	0	35	44	38	47.5
took malaria drug but no birth or who had birth in more than 5 years	5	6.25	3	3.8	1	1.3	1	1.3	26	33	31	38.75
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Intestinal parasites history during the last pregnancy

no intestinal parasites drug during last pregnancy	1	1.25	1	1.3	0	0	0	0	11	14	12	15
took any intestinal parasites drug during last pregnancy	6	7.5	3	3.8	2	2.5	1	1.3	29	36	35	43.75

no birth or who had birth in more than 5 years	2	2.5	1	1.3	1	1.3	0	0	31	39	33	41.25
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Nature of work y done daily

light and normal	3	3.75	2	2.5	1	1.3	0	0	39	49	42	52.5
exhaustive	6	7.5	3	3.8	2	2.5	1	1.3	32	40	38	47.5
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Knowledge about double diet needs

Yes	0	0	0	0	0	0	0	0	35	44	35	43.75
No	9	11.3	5	6.3	3	3.8	1	1.3	36	45	45	56.25
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Knowledge about cheap alternatives of health diet

Yes	1	1.25	0	0	1	1.3	0	0	37	46	38	47.5
No	8	10	5	6.3	2	2.5	1	1.3	34	43	42	52.5
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Suffering from any sort of haemorrhagic disease (APH)

Yes	7	8.75	4	5	2	2.5	1	1.3	34	43	41	51.25
No	2	2.5	1	1.3	1	1.3	0	0	37	46	39	48.75
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

Source: primary data 2021

Suffering from any sort of stress or worry

Yes	8	10	5	6.3	2	2.5	1	1.3	51	64	59	73.75
No	1	1.25	0	0	1	1.3	0	0	20	25	21	26.25
Total	9	11.3	5	6.3	3	3.8	1	1.3	71	89	80	100

SOURCE: Primary data 2021

The table 6 indicates that 71 (88.75%) have at least one mosquito net in their household and 59(73.75%) reported having slept under mosquito nets the last night before the survey. Moreover, 49 (61.25%) of pregnant women do not listen to radio at all while 37 (46.25%) do not watching television at all and 79 (98.75%) do not read any new paper or magazine. In addition, 42 (52.5%) of pregnant women use ante natal care (ANC) on their pregnancy between 1-3 ANC. Also, 42 (52.5%) they did not use iron supplement and 38 (47.5%) of them they used malaria drug during last pregnancy.

Moreover 35 (43.75%) of them used intestinal parasites drugs during last pregnancy. Therefore, 42 (52.5%) of pregnant women have nature of working light and normal whereas 45 (56.25%) and 42 (52.5%) they don't have knowledge about double diet they need and about cheap alternatives of health diet respectively. 41 (51.25%) and 59 (73.75%) of respondents suffered from any sort of hemorrhagic disease (APH) and from any sort of stress or worry respectively.

Regarding anemia status, anemia is more prevalent among those who do not have mosquito net in household as it is 6.25% and 7.5% among those who did not sleep under mosquito net the last night before the survey as compared to 3.75% among those who slept under mosquito net last night before the survey (table 6).

Regarding the access to information, anemia was more prevalent among those who do listen to the radio (10%) as compared to 1% those who listen to it, and it's also higher among those who do not read newspaper or magazine (11.3%) as compared to those who read them, and those who do not watch television have an anemia prevalence of 7.5%, higher compared to those who watch it.

Moreover, anemia prevalent among those who use 1 to 3 ANC is higher with 10% compared to 1.25 for 4 times and more. Also, anemia prevalent is higher for who took malaria drug but no birth or who had birth in more than 5 years with 5% and also higher to those took any intestinal parasites drug during last pregnancy the same as those they work exhaustively with 7.5%.

Regarding to suffering from any sort of hemorrhagic disease, stress or worry anemia prevalent is higher for those who suffered with 8.75% and 10% respectively. Lastly, anemia prevalent is totally remarked to the respondents without knowledge about double diet needs and about cheap alternatives of health diet with 11.3% and 10% respectively. The table 6 below provides details about anemia status by health seeking behaviors factors.

4.2. DISCUSSION OF THE RESULTS

The quantitative exploratory descriptive research conducted from different pregnant women about knowledge regarding to anemia and uses standardised and tested questionnaires which improves its validity.

The study included all pregnant women who participated in the study and who had the haemoglobin results with anemia levels results and the risks factors that have been identified to be influencing anemia in pregnant women in other settings were compared are compared to those found in this study.

4.2.1. Anemia prevalence

The study findings showed that anemia in pregnant women is decreased over time in Nyagatare compared to the previous studies. Province of residence had a significant effect on anemia status. Moreover, anemia was more prevalent among old women.

Besides that, the anemia prevalence was higher and also almost the same among pregnant women with primary education and those who did not complete ordinary level. However, that difference has not been statistically significant and thus education level has not been found to be a risk factor of anemia among pregnant women in this study. Such findings are different to the other studies which found that education level was associated to the anemia. An explanation of such differences is being the fact that there's a relation between education and wealth status and thus, those with primary education may have an improved economic status and thus reduce the risk of anemia.

In addition to that, although the use of antenatal care was considered to be among the factors influencing anemia in pregnant women as well as having given or bought iron in other studies, our study did find them as risk factors of anemia in Nyagatare; this may be explained by the fact that although 10% of Nyagatare founded to be anemic after 1-3 ANC during pregnancy. Studies

have demonstrated that daily iron intervention provides more protection against a decline in the storage iron pool in pregnant women than does an intermittent schedule.

On the other hand, as it is well known that pregnant women have a high risk of anemia and iron is provided to pregnant women who attend antenatal care. Thus, having taken iron may offer a protective effect to anemia and thus reduce that increased risk with effect of not being found as risk factor.

Furthermore, prevalence of anemia was found among pregnant women who use water from wells as drinking water as well as those who do have pit latrine toilet, Although, those factors were not statistically significant. Such high prevalence in those sub groups may be explained by the fact that such population has also low social economic status in most of the cases. Moreover, in order studies, type of the toilet has been found to be associated with the anemia risks including the in a study conducted in Nyagatare.

In our study, intestinal parasites were also a risk factor of anemia because the information was based on real time thus could influence much the situation during the survey.

4.2.2. Risk factors of anemia among pregnant women

The study found that factors of economic status, lack of knowledge about double diet needs and cheap alternatives of health diet, suffering from any sort of hemorrhagic disease, stress or worry, suffering from frequent nausea and vomiting, nutrition status of the women, having malaria history as well as sleeping under mosquito net were associated with anemia among pregnant women in Nyagatare.

Wealth index in pregnant women was found to be a significant factor associated to anemia among pregnant women in Nyagatare where the risks are reduced the more the economic status is increased. Such findings are not different from those found in other settings. Anemia is a multifactor problem, and wealth index status also is associated with different factors that may impact anemia directly or indirectly.

Evidences shows that improved economic status is associated with improved hygiene and low infection morbidity rate, improved access to information, education and to health services as well as to the fact of having the facilities likes good toilet, treated water.

All those factors have been found to be associated with anemia in other studies unless they were not associated with anemia in pregnant women in our study. Thus, pregnant women with improved economic status have lower risks of anemia as they are able to use available preventive measures compared to those who are poor.

As malaria is known to be among the risk factors of anemia, this also increases their risks of having anemia. Apart from that, our study found that women doing job have a greater risk of anemia compared to those who are housewives. Those findings are similar to those of the study conducted in some settings but those studies about significant difference of anemia risk among those doing job compared to housewives recommended also further investigations.

Furthermore, nutritional status of pregnant women was found to be a risk factor of anemia and those findings are similar with other different studies conducted in other settings. This may be due to the fact that anemia itself is one form of malnutrition and the most common cause is the iron deficiency which in most of the cases associated with other types of malnutrition. Thus, women who are underweight have a greater risk of iron deficiency, infections which have been found to be increasing anemia risks.

Thus, those with normal nutrition status have risks of having anemia as it's for the overweight pregnant women as their nutrition status is improved and thus have lower risks of having nutrition deficiencies including iron deficiency unless obesity is associated with health conditions like non-communicable diseases where studies have found that anemia risk is increased.

However, our study found that there is no respondent represented in obese pregnant women and underweight. This still needs further investigations. In this study, most of pregnant women took malaria drug during last pregnancy but with high risks of anemia compared to with no malaria during last pregnancy. The study found that women who took malaria drug during the last pregnancy had a greater risk of having anemia compared to those who did not take any malaria drug. This is explained by the fact that malaria has been found to be causing anemia in a population and thus taking malaria drug shows that they had malaria and thus at risk of anemia. This may suggest the explanations of the increase of anemia among pregnant women as malaria morbidity has increased in past years in Nyagatare and evidences demonstrated that women are at greater risk of malaria especially when pregnant.

Thus, with the increase of number of people with malaria, pregnant women with malaria also increased which may explain the increase of the anemia prevalence among pregnant women in Nyagatare over the last years. In connection to that, our study also demonstrated that use of mosquito nets reduces the risk of anemia. Such findings are in line with those found in Nyagatare where the use of mosquito net has been found to be lowering the risk of anemia.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.0. INTRODUCTION

This chapter presents the conclusion of the study about assessment of knowledge regarding anemia among pregnant women, recommendations and further study limitations and implications for future research.

5.1. CONCLUSION

Referring to the research questions, the decreasing of anemia status with social and demographic characteristics of pregnant women in Nyagatare, even it remains risky in women above 36 years. However, the variation between their knowledge about double diet needs and cheap alternatives of health diet is statistically significant. Moreover, our study confirmed the hypothesis that the anemia among pregnant women in Nyagatare is associated with economic status, the nutrition status of the pregnant women and source of drinking water. However, our study found that there's no association between anemia among pregnant women in Nyagatare and education level, use of antenatal case, iron supplementation, hygiene: type of toilet, and access to information as well as the access to health services.

The wealth index level is among the risk factors of anemia in pregnant women in Rwanda and as the more the economic status improves, the more the risk of anemia reduces.

Besides that, nutrition status of pregnant women is an important risk factor, pregnant women with normal BMI and obese have a reduced risk of anemia compared to the underweight. Moreover, malaria has been found to be associated with anemia where women who suffered malaria have a high risk of anemia and those who use mosquito net reduces the risk of anemia.

5.2. RECOMMENDATIONS

Interventions to address anemia problem in Nyagatare should take into account the risk factors by enhancing malaria and anemia prevention interventions especially improving nutrition and social economic status of women in general.

Pregnant women are provided with iron supplementations during ante natal care visits, Information, Education and Communication (IEC) activities are conducted to improve the knowledge and good practice about malaria prevention using indoor residue spraying (IRS) and

nutrition in general as well as distribution of Long-Lasting Insecticides Treated Nets (LLITNs) to ensure coverage.

Their review and improvement will be important including the review and change of existing malaria preventions guidelines related to LLITNs distribution in the population to improve their access. Those imply a multi-stakeholder's collaboration at national, province and district level as well as involvement of the Schools of Health Sciences in Rwanda including Kibogora polytechnic.

5.3. STUDY LIMITATIONS AND IMPLICATIONS FOR FUTURE RESEARCH

Anemia among pregnant women is a multifactor health condition. Risk factors associated with anemia have been identified and recommendations have been proposed to address it. However, as any other study, this study doesn't make an exception of having limitations.

Other factors especially qualitative information could provide more insights about the risk factors of anemia in community including those related to variations of diet and food quality in community and their influence to anemia.

Further research about the anemia in Nyagatare population is necessary to continue provide information to which interventions should base on to reduce the anemia burden. There still need to assess the prevalence of iron deficiency with a national representative study in order to know the area that needs special attentions in terms of iron supplementation. Furthermore, the risk factors of anemia among widow stills need further investigations to understand the rationale behind in order to design selected interventions towards them.

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APPENDICES

Appendis I : Questionnaire

1. Age of the respondents

15-20 years 21-25 years 26 – 30 years 31 -35 years above 36 years

2. Age at the time of marriage

Less than 20 years 20-25years 26-30 years 30-35 years above 35 years

3. Educational level of respondents

Illiterate Primary education 0 Level education A2 Level education

University education

4. Monthly income of the household

10,000-50,000 Rwf 51,000-100,000 Rwf 101,000-150,000 Rwf

151,000-200,000 Rwf Above 200,000 Rwf

5. Marriage status

House wife doing job

6. Type of pregnancy

Single Twin Triple quarter let

7. Hb% of respondent

3-4 g/dl 5-6 g/dl 7-10 g/dl Above 10 g/dl

8. Liver function tests of respondent

Less normal/normal more than normal

9. Body Mass Index (BMI)

Underweight: <18.5 Normal: 18.50 - 24.99 overweight: 24.99 - <30

Obese: ≥ 30.00 (45)

10. Daily tea intake of the respondent

5-6 hours

7-8hours

above 8

A week at least

once a week

16. Respondent have mosquito bed net for sleeping

Yes

No

17. Respondent slept under mosquito bed net

Yes

No

18. Use of ante natal care (ANC) on the pregnancy

No ANC 1- 3

ANC 4

or more ANC

no pregnancy or had their last pregnancy in more than last 5 years

19. Use of iron supplement

Yes

No

20. Malaria history during the last pregnancy

e

no malaria drug during last pregnancy took malaria drug during last pregnancy above

Took malaria drug but no birth or who had birth in more than 5 years

21. Intestinal parasites history during the last pregnancy

no intestinal parasites drug during last pregnancy

Took any intestinal parasites drug during last pregnancy

no birth or who had birth in more than 5 years

22. Nature of work y done daily

Light and normal exhaustive

23. Do you know that pregnant woman needs double diet?

Yes No

24. Do you know about cheap alternatives of health diet?

Yes No

25. Are you suffering from any sort of hemorrhagic disease (APH)?

Yes

No

26. Suffering from any sort of stress or worry

Yes

No

27. Toilet type use in household

No toilet

bush or field

pit latrine

Slab/ open pit

Pit latrine with slab

Ventilated improved pit latrine (VIP) and other types of latrines

28. Source of drinking water

Protected spring

unprotected spring

public tap/ standpipe

Uses piped to yard/plot

river/dam/lake/ponds/stream/canal/irrigation

Protected well unprotected well other water sources

29. Access to health facility

Difficulty Not difficult

Thank you for your participation in this research!!!!

Appendix II: Introduction to conduct research



KIBOGORA POLYTECHNIC



Granted Accreditation and Legal Personality by The Ministerial Order N°7/2015 Official Gazette N° 03 of 19/01/2015
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RESEARCH LETTER

June 4th, 2022

To whom it may concern:

We write this letter to humbly request you to allow **Ms./Mr. UWIMANIMPAYE JEANNETTE REG N°: 2000442** and **KWITONDA CECILE REG N°: 2000478** to conduct research in your organization /institution, territory entity. The above mentioned are both students of Kibogora Polytechnic pursuing bachelor's degree in General Nursing Department These students are currently conducting a research topic :**"ASSESSMENT OF KNOWLEDGE AND PRACTICE TOWARDS PREVENTION OF ANEMIA AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE AT NYAGATARE DISTRICT"**

"We are convinced that your organization /institution, territorial entity will constitute a valuable source of information pertaining to their research, the purpose of this letter is to humbly request you to avail them the with pertinent information they may need. we pledge to ensure that all provided information will be confidential and used in the strict academic purpose.

Any assistance rendered to the candidates will be highly appreciated.

Yours,

Dr NDABARORA Eleazar,
Dean of Health Sciences Faculty

Kibogora Polytechnic

