SCHOOL OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF PUBLIC HEALTH

UTILIZATION OF MICRONUTRIENT SUPPLEMENTS IN MOTHERS AND CHILDREN TO REDUCE STUNTING IN PERI URBAN LUSAKA.

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DECLARATION

I **Mubukwanu Mulongwe** declare that the findings in this dissertation are totally attributed to me under the supervision and guidance of Dr. Chitundu Kasase PhD a lecturer at University of Lusaka. I further declare that this dissertation has not been used anywhere as a fulfillment for being awarded a Degree, or Diploma, or Certificate or other similar title of recognition.

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DEDICATION

This thesis is dedicated my mother (Mrs G.S. Mulongwe) who has been extremely supportive during my entire academic journey at the university of Lusaka and throughout the process of carrying out this thesis, I am very grateful for the support, encouragement and understanding given to me without you this would have not been possible.

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Contents

LIST OF ACRONYMS

DHS	Demographic and Health Survey
GMP	Growth monitoring programmes
HIV	human immune deficiency virus
MMM	multiple micronutrient
MND	Micronutrient deficiency
LMICS	Low and middle income countries
LNS	Lipid based nutrient supplementation
WHO	World Health Organisation

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Abstract

Background; According to UNICEF, Zambia has a high rate of stunting, which means that many children are not getting the best start in life. Stunting is now prevalent in 35 percent of Zambians (DHS 2018), down from 40 percent in 2014. This indicates that prior development was less than normal, which could be due to maternal nutrition. This study looked into how micronutrients can be used to reduce child underweight and the prevalence of stunting in children and mothers living in perilous areas of Lusaka.

Objectives: The association of iron and vitamin A supplementation and underweight in children less than 5 years in peri-urban Lusaka,

Methods: The study employed cross-sectional descriptive research, the sample size of the study was 50 respondents, and this consisted of mothers and children under five years old of peri urban Lusaka. The research was a quantitative and the researcher used structured questionnaires to collect data from the respondents

Results: with 50 samples the study indicates that 37(74%) mothers had iron supplements whole pregnant while 26% did have iron supplements;

The result for the level of vitamin A supplements in children under five out of the 50 children 42(84%) had been receiving vitamin A supplements and only 8(16%) of the children had not received vitamin A supplements.

While on the association of iron supplementation in pregnant mothers and underweight in children, there was significant evidence that there was an association with a p-value of 0.001.and the association of vitamin A and underweight had a value of 0.131 which meant there was no significant evidence to claim there was an association between vitamin A supplements in children under five and underweight in children.

Conclusion: In conclusion the study showed that 74% of the mothers in peri-urban Lusaka had iron supplementation intake which is the majority of the pregnant mothers had iron supplementation while pregnant which can help reduce stunting and underweight in children

In the infants and children below five years 84% had vitamin A supplementation which is very good because it shows that most children are less likely to suffer from vitamin A deficiency or underweight as a result of micronutrient deficiency.

However the study showed that there was an association between maternal iron supplementation and infant nutritional status, hence the utilization of iron supplements can help reduce underweight and stunting in children. While the study, did not show any association between vitamin A supplementation and infant nutritional status this could have been because only Bauleni clinic was selected as the study site and not the whole peri-urban Lusaka hence further research is recommended.

However, this study would rather be considered exploratory, which suggests a follow up study with sufficient sample size.

CHAPTER ONE

1.1 Introduction

Micronutrient supplements have been shown to help prevent deficiency diseases. Supplements contain a mix of micronutrients that have been shown to be more effective in preventing stunting and are easier to take and distribute. Zinc, for example, is required for adequate growth, and multiple micronutrients, as well as energy and macronutrients are required to prevent stunting; however, micronutrient deficiencies remain common among children under the age of five in low and middle-income countries.“Malnutrition can have a number of immediate and long-term consequences, such as stunted growth, an increased risk of infection, and poor development outcomes, all of which can lead to a child not reaching his or her full potential (Bhuta 2012)”.

Multiple micronutrients can be delivered as medicinal supplements or combined with food, such as in milk drinks, fortified dried cereals, and so on. It is also possible to improve the diets of infants and young children, and increasing animal food intake can help with growth (Tam 2020). Pregnancy and the first two years of a child's life are critical periods, with zinc, iron, calcium, and vitamin A deficiency being particularly common and often occurring together, necessitating the use of micronutrient supplements in pregnant mothers and children (Shekar 2004).

The goal of this study was to look into how micronutrients can be used to help reduce child underweight and stunting in children and mothers in peri-urban Lusaka.

1.2 Statement of the problem

In Zambia, there has been an increase in stunting among children and pregnant mothers due to a lack of knowledge about a proper balanced diet. Under nutrition is linked to 45 percent of children under the age of five. The majority of these occur in low- and middle-income countries. Stunting is now prevalent in 35% of children (DHS 2018), down from 40% in 2014. Stunting in children begins when the mother is pregnant; poor nutrition and a lack of proper healthcare for children and their mothers are some of the leading causes of stunting. Food fortification, bio fortification, and food diversification are some of the strategies used in Zambia to reduce stunting. This, however, has not proven to be very effective in peri-urban Lusaka that is why this

research aimed to raise awareness and implement policies to provide micronutrient provision for mothers and children in peri-urban Lusaka to reduce micronutrient malnutrition whose long term consequences is child stunting.

1.3 Justification of study

The use of micronutrient supplements in children and mothers will help to reduce stunting. Mothers' adoption of micronutrient supplements will reduce the number of underweight newborns and deficiency diseases in children, which are all causes of stunting. UNICEF focuses on a number of strategic areas to address child nutrition and stunting, wasting and micronutrient deficiencies, and suboptimal infant and young child feeding practices. UNICEF is assisting parents, caregivers, and communities in Zambia to improve their nutrition, with healthy sustainable diets, good care, and hygiene practices, in order to reduce stunting by supporting public and policy advocacy for increased investment in the nutrition sector. in Zambia it is also assisting parents, caregivers and communities to improve their nutrition, with healthy sustainable diets, good care and hygiene practices with a focus 0n the first 1000 days of life

As a result, this study on the use of micronutrient supplements in mothers and children to reduce stunting in peri-urban Lusaka would benefit Lusaka's rural communities by raising awareness and increasing knowledge about the importance of micronutrients in reducing underweight in children, which is one of the factors leading to stunting. Because of this the prevalence of stunting will decrease, more children in peril-urban Lusaka will not be underweight, prone to deficiency diseases, and stunting will be reduced as a result of the findings of this study.

1.4 General research objective

To determine the association between iron and vitamin A supplementation and underweight in children less than 5 years in peri-urban Lusaka.

1.5 Specific research objective

i. To determine the level of iron supplementation in mothers attending prenatal care in peri-urban Lusaka.
ii. To determine the level of vitamin A supplementation in children less than five years old attending GMP sessions in peri-urban Lusaka.
iii. To determine the association between iron supplementation in mothers attending prenatal and underweight in children less than five years old attending GMP sessions in Peri-Urban Lusaka.
iv. To determine the association between vitamin A supplementation and underweight in children less than five years old attending GMP sessions in Peri-Urban Lusaka.

1.6 Research questions

i. What is the level of iron supplementation in mothers attending prenatal care in peri-urban Lusaka?
ii. What is the level of vitamin A supplements in children less than five years old attending GMP sessions in peri-urban Lusaka?
iii. What is the association between iron supplements in mothers attending prenatal care and underweight in children less than five years attending GMP sessions in peri-urban Lusaka?
iv. What is the association between vitamin A supplementation and underweight in children less than five years old attending GMP sessions in peril urban Lusaka?

CHAPTER TWO

2.0 Literature review

There is a large and compelling body of scientific evidence that suggests that micronutrient supplementation in mothers and children can reduce micronutrient diseases and underweight in children. (Micronutrient deficiency)MND affects up to 2 billion people worldwide, or nearly 30% of the world's population, resulting in increased morbidity and mortality, irreversible impairment to children's physical and cognitive development and significant losses in national and national productivity (WHO, 2014).

IRON SUPLLMENTATION IN MOTHERS

According to a study by (tam et al 2020) two public health programs aimed at reducing the prevalence of iron deficiency (ID) and iron deficiency anaemia (IDA) in 4–24-month-old infants are direct supplementation and food fortification with iron. The recommended daily intake levels of iron from supplements and/or consumption of fortified food products in most high-income countries where IDA prevalence is less than 15% are at odds with WHO guidelines, which recommend shorter-term (3months/year) supplementation only in populations with IDA prevalence greater than 40%. Concerns regarding the long-term brain repercussions of early-life iron overexposure have prompted debates about whether current recommendations in high-income nations are excessive. This systematic review will compile data from supplementation/fortification trials, evaluating health outcomes in studies in which iron-depleted children received or did not receive supplemental dietary iron; Deficiencies in micronutrients iron deficiencies, in particular, are major public health issues worldwide, with low-income African countries bearing the brunt of the disease burden (Wedner and Ross, 2008).

Deficiencies in micronutrients iron deficiencies, in particular, are major public health concerns.A systematic review of the available evidence on strategies to prevent micronutrient malnutrition among children under the age of five in low and middle income countries (LMICS) was

conducted. These strategies included single and multiple micronutrient (MMN) supplementation, lipid-based nutrient supplementation, and large-scale fortification (Tam et al 2020).

The intervention's efficacy and effectiveness, as well as specific outcomes such as anaemia, were investigated. Iron alone or iron plus folic acid reduced the risk of anaemia. Stunting, on the other hand, was only improved in children who were given LNS. The importance of reducing the burden of micronutrient malnutrition in nutrition is supported by this evidence.

In 2015, UNICEF et al (2015) reported that over 159 million children under the age of five were stunted, revealing a massive global health and development failure (Shekar et al 2015). The world's governments recognized the need for a set of nutrition goals, including a 40 percent reduction in stunted children under the age of five by 2025. This goal was then added to the second Sustainable Development Goal. By 2030, all forms of malnutrition will be eradicated, as well as the nutritional needs of adolescent girls, pregnant and lactating women, and the elderly (United Nations et al, 2015).Anaemia affected 41.7 percent of children under the age of five worldwide in 2016. This rate was 57.3 percent (Brown 2014) in India, while the prevalence of anaemia among children aged 6 to 59 months was 58.5 percent, indicating a serious public health issue. Children under the age of five have a disproportionately greater rate of anaemia than other age groups . Anaemia in children is thought to be caused by an iron shortage. Anaemia caused by iron deficiency is linked to a variety of other health issues in children, including behavioural issues, cognitive impairment, stunted growth, and psychomotor development. Different sets of determinants for iron deficiency anaemia have been discovered in studies from throughout the world, implying possible differences in risk factors among countries (Shekar et al 2017)

VITAMIN SUPLEMENTATION AND CHILDREN LESS THAN 5 YRS

When VAD is a public health problem, vitamin A supplementation lowers child morbidity and mortality and is advised for infants and children aged 6 to 59 months. When given at the prescribed age-specific vitamin A dose, vitamin A supplements for children have no major negative effects. Adverse effects of vitamin A supplementation in babies and children aged 6–59 months have been reported in studies (irritability, headache, fever, diarrhoea, nausea and vomiting). High-dose vitamin A supplements, on the other hand, have a significantly greater impact on averting blindness and mortality than these infrequent and brief side effects(yan 2021).

Ending stunting is critical for development, the investment of nutrition might be strong but the efforts to reach the sustainable development goals are however constrained by a number of factors, these include insufficient funding, gaps of knowledge regarding costs and financing needs required to scale up nutrition interventions (Horton et al 2010).however they did not estimate the cost reaching global nutrition targets,

Furthermore they did not focus on stunting but rather the cost of a number of evidence based interventions affecting a number of different aspects of child under nutrition. No prior study has presented a comprehensive global estimate of donor and government investment in nutrition stunting prevention

IRON SUPPLEMENTATION AND UNDERNUTRITION

In malnourished children and pregnant women, iron should not be supplied in isolation. It is a well-known fact that iron supplementation lowers blood pressure. Anaemia. However, malnourished children, particularly those who are extremely malnourished, malnourished children (deficiencies in protein, energy, and vitamins), iron deficiency alone would result in oxidative stress, aggravating an already-difficult situation. This has been demonstrated in a rat model (Aukett et al 2013) as well as in placental tissue during pregnancy. the tissue (Burger et al 2019). Proteins, we believe, should be given in small doses. So that iron is bound and slowly synthesized in very malnourished youngsters accessible for haematopoiesis and anaemia correction Clinical investigations (Bhad et al 2009) have revealed that iron deficiency is a serious problem. Malaria and other illnesses in children are made worse by iron supplements.

Iron supplementation is effective, but at the cost of variable gastrointestinal side effects which can lead to poor compliance, and there is controversy over whether iron supplements result in increased growth (javaid 2011), decreased growth or has no effect on growth , in young children. Similarly, there is debate about the possibility that iron supplements or iron-fortified foods may increase the incidence of certain types of infections, particularly gastrointestinal infections (sachdev 2016). The World Health Organization (WHO) recommends intermittent iron supplementation as a public health intervention in preschool and school-age children to improve the iron status and reduce the risk of anaemia (WHO 2011). Various trials have been conducted

to evaluate the effectiveness of iron supplementation and its impact on a range of outcomes from improving serum levels of iron, and reducing anaemia to its impact on anthropometric indices, morbidity, mortality and neurodevelopment outcomes. A review concluded that iron supplementation does not have any significant effect on anthropometric outcomes in children (Sachev 2018). A Cochrane review (Opprenhelmer 2011) found that intermittent iron supplementation reduces the risk of anaemia by 49% and iron deficiency by 76% and significantly improves haemoglobin and serum ferritin concentration. The findings further suggest that intermittent iron supplementation may be a viable public health intervention in settings where daily supplementation has failed or has not been implemented. A review (Ahmed and Jackson 2020) of iron supplementation in children and its impact on mental and motor development indicates that iron supplementation improves mental development score modestly, with effects apparent for intelligence tests above 7 years of age and in initially iron-deficient children. There is no convincing evidence that iron treatment has an effect on mental development in children below 27 months of age or on motor development. Another systematic review (Stoltzfus et al 2014) indicates that iron supplementation increases haemoglobin levels in children significantly and this increase is greater in children who were anaemic at baseline and lower in malarial endemic areas and in those consuming iron-fortified food. This clearly projects the need for additional area-specific interventions, particularly in malaria-prone regions. The dilemma that still holds ground is the consensus on the strategy to move forward that not only prevents iron deficiency and its consequences in young children, but also minimizes the risks to malaria endemic populations. While new research findings continue to increase our understanding, there are ways which can, in the interim, move us forward with the existing knowledge. Two complementary strategies proposed by Stoltzfus et al are to shift interventions from supplements to lower-dose, food-based interventions and to coordinate iron interventions with malaria control efforts (Stoltzfus et al 2014). Iron supplementation could be given in combination with key malaria interventions, including indoor residual spraying, insecticide treated bed nets, prophylactic treatment, or education and community awareness about malaria prevention and treatment. Food fortification is also a feasible option as it has the potential to reach larger sections of the society, are cost effective and compliance is not dependent at the individual level (Tapiero 2019). While fortification could be a viable strategy, good-quality field trials are required to unequivocally demonstrate and quantify the actual impacts of food

fortification a to determine any untoward effects associated with this strategy. Despite gaps in the existing knowledge on the risks and benefits of iron supplementation in children especially in malaria-endemic areas, various research communities and relevant stakeholders together with policy makers should work together with the single and foremost goal of reaching a consensus on the best possible approach. It is understandable that this won't be easy and would take time to conform to the existing realities of the scientific and research gaps, but at the same time we should not underestimate the loss that is occurring in this interim period, and should propose a strategy which is effective, widely agreed upon and is functional until the real picture unfolds

VITAMIN A SUPPLEMENTATION AND UNDERNUTRITION

In Zambia, a study was done to see if locally produced spirulina platensis supplements may help increase newborn physical growth, reduce morbidity, and improve motor development (Morley et al 2009). After being assigned to the control group, which got soya maize based porridge, and the spirulina group, which received the same diet plus spirulina, the anthropometric status of 501 Zambian newborns was examined. The two groups had similar baseline characteristics, but the infants' physical growth, as measured by height for age z-scores and weight for cores, was similar at the 12-month intervention.

Infants in the spirulina group were more likely to walk at 15 months than infants in the control groups. Home fortification of complementary foods using spirulina had positive effects on upper respiratory infection morbidity prevention and motor milestones acquisition among Zambian infants.

This study had its limitations in relation to reducing stunting it only emphasized on the use of micronutrient supplementation using spirulina but not ways in which stunting can be reduced in rural areas.

According to a randomised double blind trial controlled trial that was carried out in chilenge Lusaka by Kissinger (2010) two locally made infant foods that is porridge made of flour composed of maize, beans and groundnuts. And the other contained a basal and other rich level

micronutrient fortification. It was noted that among children of HIV infected mothers who breastfed < 6 months, the richly fortified porridge increased length for age and reduced stunting.

In the study population the rich micronutrient fortification did not reduce stunting or hospital referral but did improve iron status, and in infant of mothers, who stopped breast feeding before 6 months, the rich fortification improved linear growth, hence provision of such fortified foods may benefit health of those high risk infants(Ross 2011).

Vitamin A is a vitamin that is necessary for the immune system to function properly. Its deficiency is one of the leading causes of preventable childhood blindness, as well as a substantial contributor to infection-related morbidity and mortality. Vitamin A deficiency has been related to a higher risk of malnutrition in studies. As a result, the purpose of this study was to determine the amount of Vitamin A consumed by pre-school children and its relationship to their nutritional condition.

A cross-sectional study was undertaken in Lucknow, Uttar Pradesh, India, in both urban and rural areas. Mothers were interviewed after giving informed consent on a pretested predesigned questionnaire on socio-demographic and dietary intake. Children (n=400) aged 12 to 59 months were randomly selected and mothers were interviewed after giving informed consent on a pretested predesigned questionnaire on socio-demographic and dietary intake. Standard anthropometry protocols were used. the results of this study showed that the mean age of children was 31.9 months and mean intake of Vitamin A was 344.8 µg. Underweight, stunting and wasting was seen in 43.7%, 51.3 % and 21.8% of children respectively. Stunting was associated significantly with mean Vitamin A intake ($p<0.005$). 54% children had been administered(Rahman et al 2019).

However, while stunting affects all moms and children with poor nutrition, this study focused solely on mothers and their children, not all mothers.

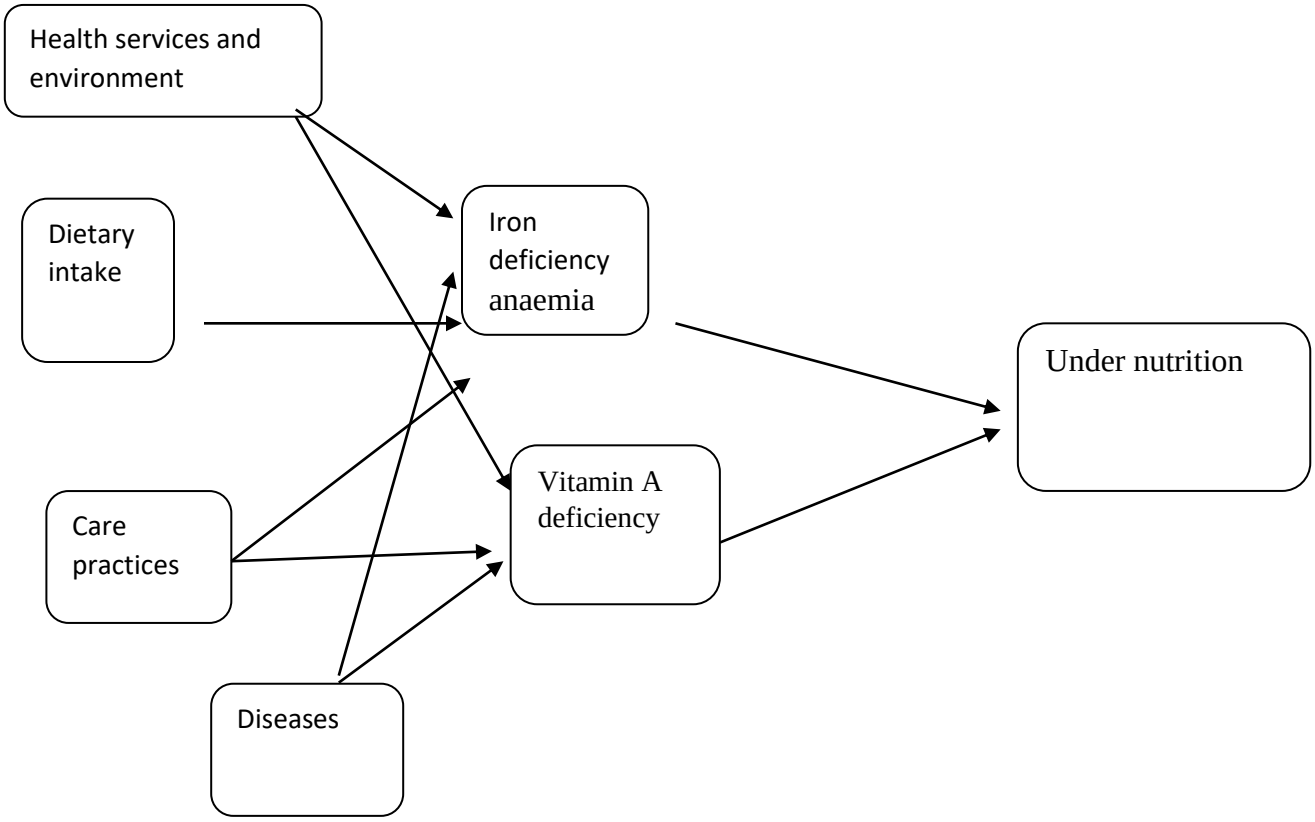
Based on the existing literature on the use of micronutrients to reduce child underweight, which leads to stunting, it can be seen that much of the focus is on using micronutrients on children, but not on mothers, and since stunting is mostly caused by mothers, micronutrients should be prioritized in pregnant mothers if we are to achieve our goal of reducing stunting in peril urban Lusaka.

2.1 Theoretical framework

The educational theory is the most effective in ensuring that moms and children get enough micronutrients to avoid stunting. The educational theory is a health promotion theory that is founded on a set of assumptions about the links between knowledge and behaviour, namely that increased information will lead to a change in attitudes, which in turn will lead to a change in behaviour. This theory's key goal is for the client to be able to make an informed decision. The rationale for adopting this theory is that it will assist moms in rural Lusaka with poor educational levels in making informed nutrition decisions, hence reducing the number of underweight children and micronutrient insufficiency. The better educated the mothers, the better.

2.2 **Conceptual framework**

A conceptual framework on the factors leading to under nutrition in children



Source: by author 2022

Figure 1. Conceptual framework on the factors leading to under nutrition in children

The conceptual framework above shows the factors that lead to under nutrition in infants and children under five years old.

The various factors leading to under nutrition are:

Diseases: diseases such as anaemia can lead to iron deficiency in mothers while pregnant which leads to under nutrition. Diseases can also lead to vitamin A deficiency which inturn leads to under nutrition in children

Care practices: care practices such as mothers not regularly taking their children to under five clinics to get vitamin A supplementation can lead to under nutrition

On part of the mother not visiting prenatal care while pregnant is a factor leading to iron deficiency which in turn results into under nutrition in the newborn

Dietary intake: children and mothers not having balanced diets with all the required nutrients can lead vitamin A and iron deficiencies which end up causing under nutrition in children

Health services and environment: the ability of the health services to provide the micronutrient supplements is a factor. if they are not able to offer vitamin A and iron supplementation, this may lead to under nutrition in children

CHAPTRER THREE

3.0Methodology

This chapter consists of the methodology of this research which describes the physical steps of gathering data. Description of participants and procedures of administering the research and the instruments used to the collect the data. The research methodology includes the study approach, study design, study population, sample size, data collection, data analysis and ethical considerations.

3.1 Study Approach

This study used quantitative research; the goal of the quantitative research was to classify features, count them, and then build statistical models to try to explain what was observed in the study. Before the data is collected, all aspects of the study are carefully designed in this method. The information and statistics that were used in this research approach were numbers and statistics. The quantitative approach has the advantage of being more efficient, allowing the researcher to test a hypothesis while remaining objectively separated from the subject matter. The quantitative approach is more deductive, beginning with a hypothesis and focusing on causality.

3.2 Study design

This study made use of a cross-sectional study design type. A cross sectional quantitative study helps to understand reasons behind certain behaviours, it can also be relatively easy, quick and inexpensive when it comes to collecting data and most importantly it's beneficial because it involves and allows researchers to do a lot of different variables at one time.

Study site

Peri-urban Lusaka was chosen for this study, specifically Bauleni Clinic, to explore and collect data on how micronutrient supplementation could be utilized to prevent underweight, which could lead to stunting in peri-urban Lusaka.

3.3 Study population /Target population

The research was conducted in Lusaka province's peri-urban areas, with a particular focus on Bauleni clinic. The rationale for this choice stems from the fact that these are the areas where most mothers with low literacy levels reside, and who may be unaware of child health and the importance of micronutrients in their children's diets, such as vitamin A and iron. As a result, all necessary and relevant data can be obtained from the Bauleni clinic. Data was gathered from pregnant women and children under the age of five.

Inclusion criteria

- Pregnant mothers
- Mothers with children under 5 years
- Children under five years

Exclusion criteria

- Mothers and children outside the catchment area

3.4 Sample size/sampling procedures

Before the investigation begins, the sample size should be calculated. The larger the sample, the more representative it is of the population. The mathematical estimation of the number of people to be included in the sample is known as sample size determination. It is necessary to establish the population of interest before determining the sample size (N).

With a 95% confidence level, the confidence interval or margin error is 5%.

The sample size for this study is 103.

$$n = \frac{N \times Z^2 \times 0.05}{\_\_\_\_\_}$$

Where, n = sample size required

N= total population

d = precision level (p- value) usually 0.05 or 0.10

Z = number of standard deviation units of the sampling distribution corresponding to the confidence level.

Since the population of mothers of Bauleni clinic is 140 people, in order to get the 95% confidence level and positive precision level which is the p- value. d = 0.05, Z = 1.96) then the sample size will be as follows.

Where,

$$n = \frac{(140 \times 1.96^2 \times 0.05)}{(0.05^2 \times (140-1)) + (1.96^2 \times 0.05)}$$

= 103 subjects

Sampling procedures

The researcher utilized a purposeful sampling approach, in which he or she utilizes his or her own judgment about which respondents to use and selects only those who match the study's objectives. A researcher must reject all individuals who do not meet the study's inclusion criteria while using purposive sampling (Tongco, 2007).

The following are the variables were considered in this study in order to access a particular subset of people.

- Pregnant mothers attending postnatal health services
- Mothers with children under five years attending postnatal health services

3.5 Data collection method

In this research, questionnaires, children under five cards and in depth interviews were used as a way of collecting data.

Questionnaires

This study used researcher-administered questionnaires to obtain data. There were open ended, semi-closed, and closed ended questions on the questionnaires. Questionnaires can be used for specific groups and managed in a variety of ways, such as by selecting the questions to be asked as well as the format (open and closed ended). They are also a means to get data on any subject. Questionnaires will be used to collect quantitative data that will be utilized to reveal relationships that the researchers may not have seen yet.

In depth interviews

For data collection, in depth interviews were employed. In depth interviews are personal and unstructured discussions with the goal of identifying participants' thoughts on a certain research topic. Personal interviews have the advantage of involving direct and personal contact between the interviewer and the participants (Fisher 2005, wilson, 2003) While unstructured interviews

allow for greater freedom in the interview's flow, they also allow for the generalization of conclusions that were not intended to be drawn from the study subject (Gill and johnson, 2002).

A semi structured questionnaire was used as an interview guide for the researcher during the data gathering process for this study. Some questions were prepared in order to direct the interview in the right direction. Some questions were prepared so as to guide the interview towards the satisfaction of the research objective but additional questions were to be encountered in the interview.

Children's under five card

This is a detailed under five card that is maintained for each child. The card has details about the child s weight, health history, the micronutrient supplementation (vitamin A and iron tablets), the birth weight and the current weight of the child. The growth monitoring program was also assessed.

3.6 Data analysis

The research was descriptive in nature, and the quantitative method used to analyze the data in this study was chi-square in Stata 14.2.

The appropriate computer software to analyze this data was stata 14.2. Chi-square (p-value 0.05) in spss was used to examine the association between iron and underweight in children and the association between vitamin A supplementation and underweight in peri-urban children. The final outcome was to show the true picture of whether there is an association of vitamin A and iron supplementation between pregnant mothers and children under 5years who are underweight.

3.7 Ethical considerations

This research was subject to certain ethical issues. All participants were required to report a written acceptance regarding their participation in the research, through a signed consent.

Participants were asked to sign a withdraw letter. The aim was to ensure the participation of participants was voluntary and they were free to withdraw if at all they felt they were uncomfortable or other reasons with the research,

The participants were fully informed regarding the objectives of the study and they were re assured that there answers and contribution would be confidential and would only be used for academic purposes. The participants were reassured that they will remain anonymous.

A comfortable environment was created to ensure the participants were not harmed or abused both physically and psychologically during the conduction of the research.

Beneficence was observed while data was been collected, this is an act of not harming anyone who provides data to the researcher, hence there was no harm subjected to the participants.

The researcher ensured that the participants' identities remained anonymous and therefore would not record their real names in the research.

CHAPTER FOUR

4.0 Results

Introduction

The purpose of this chapter is to present information on how research data was obtained and analysed. A total of 50 questionnaires were distributed. This study was a quantitative study and stata 14.2 and excel were the statistical packages that were used in this research for data analysis and the following were established. Descriptive statistics were done; hence percentages, basic frequencies, frequencies and percentages indicate how often a certain variable is appearing and the percentage of the total occupancy of that variable. Chi-square was used determine the association between variables.

4.1 Demographic characteristics

Demographic data include mother's age, educational background and the number of children they had.

A total of 50 mothers ages were ranging from under 20years to 40 years.15 (30%) were under 20 years while 19(38%) were between 20-30 years and 16(32%) were between 31-40 year.

The educational level of the respondents were 14(14%) had no educational background,18(36%) had primary education,19(88%) had secondary education while only 6(12%) had tertiary education.

And among the 50 respondents only 3(6%) had no children but were pregnant,20(40%) had between 1-4 children,21(42%) had between 4-5 children and only 6(12%) had more than 6 children.

Table 4.1: demographics characteristics of care givers

Variables		Frequency(n)	percentage
Age	Under 20 years	15	30%
	20-30yrs	19	38%
	31-40yrs	16	32%
	41 and above	0	0%
Educational level	None	14	14%
	Primary	18	36%
	Secondary	19	88%
	Tertiary	6	12%
No of children	0	3	6%
	1-4	20	40%
	4-5	21	42%
	6 and above	6	12%

4.2 Maternal iron supplementation

The level of iron supplementation among the mothers was 37(74%) had iron supplements when pregnant while only 13(26%) did not take iron supplements.

Table 4.2: maternal iron supplementation

Variable		Freq(n)	Percent
Iron supplementation	Yes	37	74%
	No	13	26%

4.3 Infant and child status

The infant nutritional status at birth was found that 15(30%) were found to be underweight at birth while 35(70%) were normal weight when born. the child's current nutritional status was 14(28%) of the children were under weight while 36(72%) were normal weight.

Table 4.3 infant and child status

Variables		Frequency(n)	percent
Under weight birth weight			
	yes	15	30%
	no	35	70%
Child current under weight			
	yes	14	28%
	no	36	72%

4.4 Infant and child vitamin A supplementation

The level of vitamin A supplementation among the infants and children showed that majority had vitamin A supplements which 42(84%) while only 8(16%) did not take vitamin A supplements.

Table 4.4: infant and child vitamin A supplementation

Variable		Freq(n)	Percent
Vitamin A supplementation	Yes	42	84%
	No	8	16%

4.5 Association between maternal iron supplementation and infant nutritional status

The p-value of 0.000 which can be expressed as P<0.001 is less than 0.005 meaning there is significant evidence that there is an association between iron supplements in pregnant mothers and underweight in children under five attending GMP session in peri urban Lusaka.

Table 4.5: Association between maternal iron supplementation and infant nutritional status

Variables		**Chi-square value**	**p-value**
Iron supplementation	Infant nutritional status	16.0952	*0.000

*denotes that there is an association

4.6 Association between vitamin A supplementation and underweight in children less than five years

The p value=0.131 which is greater than p-value 0.05 meaning that that there is no evidence or the findings are not significant, hence there is no association between vitamin A supplements

and underweight in children less than five years old attending GMP sessions in peri urban Lusaka.

Table 4.6: association between infant vitamin A supplementation and infant child nutritional status

Variables		Chi-Square Value	P-Value
Vitamin A supplementation	Infant nutritional Status	2.2865	0.131

*denotes that there is an association

CHAPTER FIVE

5.0 Discussion

This chapter discusses the findings on the utilization of micronutrient supplements in mothers and children .the findings of this study were based on a sample of 50 respondents from Bauleni clinic. The results are discussed below.

Demographic characteristics

The demographic characteristics that were relevant for this research were mothers age education level of the mothers and the number of children .

Mother's age

The results of this research showed that the ages of the mothers was evenly distributed the with the highest been 38% of the mothers been between 20 to 30 years. Most of the mothers in this research were adults which reduced the risk of the children been underweight. According to a study by (Nguyen 2020) adolescent mothers are more likely to have children who are stunted or underweight as compared to adult mothers.

Education level

The results of the research showed that out of the 50 mothers at Bauleni clinic most of the women's educational level was below tertiary education with 36% with primary level education and 38%secondary level education while 12%had completely no educational background, this showed that there is an association between education of the mother and underweight in the child. a study by Goma(2013) also showed similar results that the prevalence of underweight was associated with social-demographic factors such as education background of the mothers. This may be attributed to that most of the mothers had no educational bacground or primary level of education. This is due to the negative attitude towards education among women and girls in those areas.

Number of children

The results show that 40% of the mothers had between 1 and 4 children and 42% had 5 0r children while only 12 % had above 6 children. infant or children born from mothers with more children are more likely to be underweight because of inadequate care and insufficient nutrition from the mother might be lacking due to the large family.

Infant and child nutritional status

The results of this study showed that 30% of the infants were born under weight while 70% of the infants were born of normal weight. Most infants who were born underweight were from the mothers who had not taken iron supplements when pregnant similar to a study by (Tango 2019) which also said that iron supplementation was connected to low birth weight in newborns. While the current nutritional status showed that 28% of the children were underweight while 72% were of normal weight.

Maternal iron supplementation

The result of this research showed that majority of the mothers had taken iron supplementation while pregnant. Out of the 50 mothers' understudy 74% of the mothers of the had iron supplementation, the high number of mothers with iron supplementation in this study could be as a result that this study was focused at Bauleni clinic and most of the mothers interviewed were attending prenatal care. However, 26% of the mothers did not have iron supplements while pregnant and this was as a result of this mothers not attending prenatal care while pregnant and not having knowledge o the importance of prenatal care. A similar study by (Mira Triharini, 2018) revealed that pregnant mothers that did not attend prenatal care were more likely not to taken iron supplementation and some felt bored taking iron supplements daily, and most uneducated mothers thought iron supplementation was not a necessity during pregnancy.

Infant and child vitamin A supplementation

The result of the level of vitamin A supplementation in children under five years was that the majority of the children under five had received vitamin A supplements of the 50 children in the study 84% had been receiving vitamin A supplements and only 16% of the children had not

received vitamin A supplements and this was as a result of irregular visits to the under five clinic, the study identified that most mothers with no educational background did not find it necessary to take the child to the under five clinic especially if the child is was above 2 years. This led to some children missing the vitamin A study conducted by (AC, 2013) showed that with mothers with little or no educational background are more likely to have children with nutrient deficiencies such as vitamin A.

Association between maternal iron supplementation in mothers and infant nutritional status

At Bauleni clinic there was a significant association between mothers taking iron supplementation and underweight in children. The chi square test had a p-value of 0.001 which was less than the p-value 0.005 which meant that there was significant evidence that there was an association between mothers not taking iron supplements and underweight in children. Mothers who had not taken iron supplementation when pregnant had children with low birth weight while mothers that had taken iron supplementation when pregnant their babies had normal birth weight. Similar to a study by (Yan, 2021) it also proved that indeed there was association between iron supplementation (independent variable) and underweight (dependant variable) in children.

Association between vitamin A supplementation and infant nutritional status

From the results of this study there was no association between vitamin A supplementation and underweight in children. vitamin A was the independent variable and children underweight was the dependant variable which meant that there was no significant evidence to prove that there the chi2 test presented a p-value of 0.131 which is greater the p-value 0.05 was an association between vitamin A supplementation in children and underweight in children. However according to (Djibril M, 2021) the study also proved that there was association observed of vitamin A and wasting, underweight or severe underweight hence there is need for further research on the association between vitamin A and underweight, this research was limited in terms of sample size hence we cannot generalise the results.

5.2 Limitations of the study

- The results of this study may not be generalised to all areas of peri urban Lusaka
- The sample size of this study was limited to fifty (50) due to inadequate time as a result.
- The other limitation was that the research was narrow as it only included Bauleni clinic and did not include other areas in peri urban Lusaka.
- Time was a limiting factor for the researcher

CHAPTER SIX

6.0 Conclusion

In conclusion the study showed that 74% of the mothers in peri-urban Lusaka had iron supplementation intake which is the majority of the pregnant mothers had iron supplementation while pregnant which can help reduce stunting and underweight in children

In the infants and children below five years 84% had vitamin A supplementation which is very good because it shows that most children are less likely to suffer from vitamin A deficiency or underweight as a result of micronutrient deficiency.

However the study showed that there was an association between maternal iron supplementation and infant nutritional status, hence the utilization of iron supplements can help reduce underweight and stunting in children. While the study, did not show any association between vitamin A supplementation and infant nutritional status this could have been because only Bauleni clinic was selected as the study site and not the whole peri-urban Lusaka hence further research is recommended.

However, this study would rather be considered exploratory, which suggests a follow up study with sufficient sample size.

6.1 Recommendations

- The ministry of health should conduct community awareness to the mothers in Bauleni and organising community workers who will educate or create awareness on the importance of prenatal and antenatal care
- There is need to involve all the influential people in the community such as political leaders, church leaders, schools, traditional leaders and health workers in the fight against under nutrition.

- There is need for ministry to come up with programs on educating women on the managing under nutrition
- This study should be done on a large sample size so that the results can be generalized

- Mothers should be educated on on the importance of growth monitoring and micronutrient supplements.

APPENDIX

I Informed consent sheet

UNIVERSITY OF LUSAKA

LUSAKA, ZAMBIA

CONSENT TO PARTICIPATE IN RESEACH PROBLEM

RESEARCH TITLE: UTILIZATION OF MICRONUTRIENTS SUPPLEMENTS IN MOTHERS AND CHILDREN O REDUCE STUNTING IN PERI URBAN LUSAKA PROVINCE

RESEARCHER: Mubukwanu Mulongwe

I confirm that the researcher has explained the elements of informed consent to the participant.

The subject knows that their participation is voluntary, and that they are asked to answer all questions. The purpose of the research as well as the risks and benefits has been explained. The procedures as well as the time commitment have been outlined. The participant understands issues of confidentiality.

Witness name_____

Witness signature _____

Participant name_____

Participant signature_____

II.CONSENT FORM

(Translated into vernacular if necessary)

TITLE OF RESEARCH: **utilization of micronutrient supplements in mothers and children to reduce stunting in peri-urban Lusaka.**

REFERENCE TO PARTICIPANT INFORMATION SHEET:

1. Make sure that you read the Information Sheet carefully, or that it has been explained to you to your satisfaction.

2. Your permission is required if tape or audio recording is being used.

3. Your participation in this research is entirely voluntary, i.e. you do not have to participate if you do not wish to.

4. Refusal to take part will involve no penalty or loss of services to which you are otherwise entitled.

5. If you decide to take part, you are still free to withdraw at any time without penalty or loss of services and without giving a reason for your withdrawal.

6. You may choose not to answer particular questions that are asked in the study. If there is anything that you would prefer not to discuss, please feel free to say so.

7. The information collected in this interview will be kept strictly confidential.

8. If you choose to participate in this research study, your signed consent is required below before I proceed with the interview with you. ----------

----------VOLUNTARY CONSENT

I have read (or have had explained to me) the information about this research as contained in the Participant Information Sheet. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction.

I now consent voluntarily to be a participant in this project and understand that I have the right to end the interview at any time and to choose not to answer particular questions that are asked in the study.

My signature below says that I am willing to participate in this research:

Participant's name (Printed): …….
…….....……

Participant's signature: ……

Researcher Conducting Informed Consent (Printed)
……

Signature of Researcher: …… Date: .....

Signature of parent/guardian: …… Date: ……...

IV.DATA COLLECTION TOOL

SAMPLE OF THE QUESTIONAIRE

Utilization of micronutrients supplements in mothers and children to reduce stunting in peril urban Lusaka.

Date of the interview…….

SECTION A – MARTERNAL DATA

1. Gender of the respondent (Mark with X)

   Male or Female

2. What is your weight (kg)? tick

   Below 50kg

   50kg-60kg

   70kg-80kg

   90kg-100kg

   Above 100kg

3. What is your height (m)? tick

   Below 1.50m

   1.50m-1.60m

1.60m-1.70m

1.70m-1.80m

1.80m and above

4. What is your age group

   Less than 20 years old Tick

   20-24 years old

   25-29 years old

   30-34 years old

   35-39 years old

   40-44 years old

   45-49 years old

   50-55 years old

   56-60 years old

   Above 60 years old

5. What is your educational level? Tick

   Early childhood education (level 0)

   Primary education (level 1)

   Lower secondary education (level 2)

   Upper secondary education (level 3)

   Postsecondary non tertiary education (level 4)

   Short-cycle tertiary education (level 5)

6. How many children do you have? Tick

0

1-4

4-5

6 and above

7. Did you receive and take any Iron (Ferrous Sulphate) tablets when you where pregnant?

YES

NO Tick

Section B – INFANT/CHILD DATA (From the Growth Chart for the child)

8. Age: .....

9. Gender Male: Female:

10. Birth Weight (kg).....

11. Last Month Weight (kg).....

12. Vitamin A supplement received: Yes: No

13. Vitamin A dose received:

V. REQUIRED PERMISSION LETTER

SCHOOL OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF PUBLIC HEALTH

Research Questionnaire

Dear Respondent,

I am a student from the University of Lusaka in Zambia carrying out research with the aim of determining ways in which micronutrient supplements are going to be utilized to reduce stunting in peril-urban Lusaka province.

You have been randomly selected as one of the respondents to take part in this research. Please feel free to answer the questions that follow as objectively as possible.

Be assured that your responses will be treated with the highest confidentiality. No information that will be given in this study will be passed on to third parties and no information which identifies you as an individual or family will be included in the reports.

Yours

Researcher

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