PERCEPTION OF MOTHERS OF UNDER –FIVE CHILDREN ABOUT INTESTINAL WORMS AND PRACTICE OF REGULAR DEWORMING AT MONIYA, AKINYELE LOCAL GOVERNMENT AREA, OYO STATE.

BY

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DEDICATION

This project is dedicated to those closest to me, my family. To my husband, 'Dele, for loving me and supporting my academic pursuit. And to my children, Oluhukunmi, Olubusayo, and Olubusola Isreal, I am so proud of you all.

To the memory of my late father, Alhaji Ademola Saliu Balogun even though I did not know him, he nevertheless left me a good heritage and my mother, the Alimis, Olawuyis, Olorunniyis and Bose who stuck closely to me and gave me countless assistance all through the way. Thanks to you all for loving me, accepting me as I am, believing in me, and making life so precious and sweet.

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The fellowship of my classmates is hereby acknowledged for the numerous support especially for the wealth of intellectual assistance, physical support and academic materials especially when I was pregnant: Toyin Aniagwu, Tayo Ogunwole, Ogun Millicent, AdelekeSiddik, Popoola Bukky, Apena Temitayo, Folake Makinde, Mercy Ukeni and others too numerous to mention. The encouragement and support of my helpers - Bisi Olupitan, Tina Eke, Rebecca Oboh, Doyin Ogunbowale, Taiwo Johnson and Dolapo Ayeyemi, is hereby acknowledged. I will thank God eternally for bringing pastor Sola Kolade of Vine Branch Church into my life at a time I almost let go.

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Olufemi, O.A

ABSTRACT

Intestinal worms are prevalent in the developing world and they constitute a major cause of malnutrition and other health problems including retardation of mental and physical development in children. Little is known on cultural beliefs that promote the prevalence of intestinal worms and factors influencing deworming practices in the population. This study therefore assess the perception of mothers of under-five children on intestinal worms infestation and practice of regular deworming in Moniya, Akinyele Local Government Area (LGA), Oyo state, Nigeria.

This study was descriptive and cross-sectional in design. A three-stage cluster sampling technique was used to select 500 respondents from eleven out of twenty-two communities in Moniya. A validated semi-structured interviewer administered questionnaire was used for data collection. The questionnaire included a 10-point perception scale, questions relating to practice of regular deworming and factors influencing it. Perception scores of 0-4 and 5-10 were classified as negative and positive perception respectively. Descriptive statistics and Chi-square test were used to analyse the data at 0.05 level of significance.

The respondents mean age was 29.2 ± 7.6 years, 65.0% were married and 70.6% were in monogamous relationship. Majority (89.6%) were Yoruba and 55.5% had post-primary education. Majority (73.0%) of the respondents had a negative perception relating to intestinal worms while seventy per cent were of the opinion that worms are present in the human intestine from birth. About 70% perceived that certain quantities of intestinal worms are needed in the body to stay healthy. Age, marital status, religion, educational status, occupation and parity of the respondents did not influence their perception about intestinal worms. A higher proportion (68.5%) of the respondents with post primary education and many in monogamous family (78.3%) regularly dewormed their children. More than half (58.2%) of the respondents had ever dewormed their children: of which, 3.8% did so every month, close to a quarter (24.2%) every three months while only 0.8% did so biannually as recommended. Age, marital status, religion, occupation and parity of the respondents did not influence their perception about intestinal worms and practice of regular deworming. Perception of respondents was not significantly related with practice of regular deworming. Majority (77.2%) claimed they had dewormed themselves in the past but only 43.6% did so in the last 5 years preceding the study. The cost of worm expellers was perceived by 82.6% not to be a barrier for regular

deworming of under-five children. However, 32.0% of the respondents could not afford the cost of worming medicines. Majority (74.0%) believed worm expellers had to be taken with sugar and 70.0% stated that it should be taken before breakfast to be effective.

Although majority of the respondents had ever deworm their wards, their perceptions about intestinal worm infestation and practice of regular worming have serious health implications. Health education strategies such as public enlightenment through mass media, training, deworming outreaches, and facility-based health talk are needed to address their perception about intestinal worms and improve their worming practices.

Key words: Intestinal worms infestation, Deworming, Under-five children

Word count: 490

CERTIFICATION

This is to certify that this study was carried out by Oluwatoyin Adewumi OLUFEMI in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria under my supervision.

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ABBREVIATIONS USED IN THE TEXT

STH	Soil Transmitted Helminths
IPI	Intestinal Parasitic Infections
NTD	Neglected Tropical Disease
PPC	Partners for Parasite Control
FRESH	Focusing Resources on Effective School Health
MDG	Millennium Development Goals
WHO	World Health Organization
U-5	Under-Five Children
LMIC	Low- And Middle Income Countries
CDC	Centers For Disease Control And Prevention
DCPP	Disease Control And Priority Project
PC	Preventive Chemotherapy
DALY	Disability-Adjusted Life Year
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
HBM	Health Belief Model
OSMHERC	Oyo State Ministry of Health Ethical Review Committee
SSHE	School Sanitation and Hygiene Education
WES	Water, Environment and Sanitation programme
IMCI	Integrated Management of Childhood Illnesses strategy
CGI	Clinton Global Initiative
UNICEF	United Nations International Children's Emergency Fund
RA	Research Assistants
ALG	Akinyele Local Government Area
DLC	Distance Learning Centre
NCE	National Certificate of Education

Operational Definition of terms

Under five year Children between ages 12 months and up to 59 months

Practice Having dewormed at least once in a life time

Perceptions Opinion, understanding of the respondent on intestinal worms and deworming

Deworming The act of using worm expellers either as prevention or for the treatment of intestinal worms in human beings used. It is also known as worming, but for the purpose of this study, deworming is used.

Regular Deworming The use of worm expellers for the prevention and treatment of intestinal worms at least two times in a year.

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CHAPTER ONE

INTRODUCTION

1.0. Background to the study

Hundreds of millions of people do not enjoy a healthy, productive life because they are debilitated and unable to achieve their full potential due to intestinal parasitic infections (IPI) (World Health Organization (WHO); 2004). Gabrielli (2008) noted that intestinal worms infection is the most widespread disease worldwide since greater than 2 billion people are infected with roundworm, whipworm, and hookworm infections.

Intestinal parasitic worms are common with mankind and affecting people of all tribe, country and continent, cutting across all age groups. Intestinal parasitic infections deprive the poorest of the poor of health, contributes to economic instability and social marginalization. This is because the poor people of under developed nations experience a cycle where under nutrition and repeated infections lead to excess morbidity that can continue from generation to generation (Michraj, Hatcher, Akhtar, Rafique, and Beg, 2008). The poor socioeconomic conditions that support the prevalence of IPI correlate with poverty and underdevelopment, so that intestinal parasites can be labelled "diseases of poverty" (Anh, Diep, and Tree, 2007). And this is more true of developing countries. Global health has focused on reducing the burden of neglected diseases such as helminth parasites, however infection rates remain high among indigenous groups in resource-poor settings (Tarnera, Choqued, Huancad, Leonarde, McDadee, Reyes-Garciae; 2011).

Age is an important risk factor for IPIs and the pre-school and school going children have been reported to be at highest risk for IPIs (Michraj et al, 2008). Focusing Resources on Effective

School Health (FRESH) , 2004). The WHO (2007) pointed out that there is ample evidence to demonstrate why school-age children and the under 5-year-olds should be regularly dewormed. Even at low intensities of infection, worms compromise healthy growth and development by aggravating malnutrition, anaemia and stunting levels and impacting a childs' ability to attend and perform well in school and in severe infections, it can result into death (FRESH, 2004). Moreover, if mothers are infected, worms contribute to their already precarious iron status and to children born with low birth weights (WHO, 2007, FRESH 2004, Global Forum, 2008).

Estimates of the quantitative costs of worm infections to cognition and education shows that the total lost years of schooling due to worm associated absenteeism amounts to over 200 million years and the average Intelligent Quotient (IQ) loss per worm infection is 3.75 points, amounting to a total IQ loss of 633 million points for the world's low-income countries, almost all these loss occurs in low- and middle-income countries (LMIC) (WHO, 2005). This is worrisome as it invariably translates into reduction in the intellectual capability of the future of these LMIC, Nigeria inclusive. Therefore, if worm infection in children is continuously neglected in national disease control, the future efficiency and productivity of the future labour force, especially in endemic countries is threatened. From an education perspective, and in light of an increasingly competitive skill-based socioeconomic environment, intestinal worms may very well be the primary driver for perpetuating the vicious intergenerational cycle of poverty (Worm count, 2010).

Treating health and nutrition problems in pre-school children (less than five years old) is important for two reasons. First, these children accounted for more than 50% of the global gap in mortality between the poorest and richest countries of the world's population and secondly, they bear 30% of the total burden of disease in poor countries. Therefore, keeping them healthy gives them a better survival rate in childhood and adulthood among other benefits. since school readiness depends on cognitive, motor and socio-emotional development which can be affected by, among other things, under nutrition (closely related to intestinal worms infestation), iron deficiency anemia and malaria (Jukes, 2006). Researchers have shown that regular deworming can substantially increase school attendance and significantly improve a child's ability to learn in school (UNICEF, 2001; WHO, 2006).

Regular deworming of children is a cost-effective strategy for promoting the health of children and assisting in meeting many of the Millennium Development Goals (MDG). In 2001, the World Health Assembly Resolution 54.19 urged all member states endemic for soil transmitted helminths (STH) to attain a minimum target of regular administration of chemotherapy to at least 75% and up to 100% of all school-age children at risk of morbidity by 2010 (Bath, Ench, Bakken, Knox, Schiedt, and Compbell, (2010); Partner for parasite Control (PPC) ;2010). Many deworming programmes focus on mass deworming of school age children because of the ample evidence to support the fact that they have the largest worm burden and the intervention is cost effective. However, this sporadic effort often marginalised the under-fives (U-5s) / pre-school and the out - of - school children. In addition, the older population segments that might also have a significant worm burden are often missed out and these often lack knowledge about how to prevent and control parasitic worm infections.

Realizing the burden of the problems associated with IPI, some state governments, pharmaceutical companies and non-governmental organizations in Nigeria had severally taken steps at embarking on mass deworming of children in the community at different times and locations but mostly this is done as ad hoc programmes at schools, neither is it integrated into other health interventions nor into school health package hence, this is usually not sustained.

An important factor that could help in the effort at controlling IPI and uptake of deworming interventions is exploring the perceptions and beliefs of spectrum of population about IPI and practice of deworming in addition to continous environmental control and health education. People's behavior and judgment is based on their perception. Perceptions will affect behavior, practice, health seeking behavior and uptake of preventive health services. Perceptions are also linked to and shaped by culturally determined practices concerning health, hygiene, and disease. In addition to these, belief, cultural values and orientation, educational status, previous experience, economic ability and the influence of social networks among others also influences perception and practice. Perceptual distortions and inaccuracies of people about intestinal worms and deworming will definitely influence their practice of deworming their children.

Studies done to explore the perceptions of people about intestinal worms and their practice of deworming of children are scanty. This study will therefore attempt to seek for the perceptions of mothers and caregivers of under-five (U-5) children in the study area about intestinal worms and their practice of regular deworming of their children in relation to preventive health practice and explore the factors that influence their practice of this important health behavior.

1.1 Statement of the problem

Intestinal worm infection is common in Nigeria as revealed by prevalence studies conducted separately by Agugua (1996), Okeniyi, Ogunlesi, Oyelami and Oyedeji (2005), Ekpo, Odoemene, Mafiana, and Sam-Wobo (2008), Acka, Raso, N'Goran, Tschannen, Bogoch, Seraphin, Tanner, Obrist, and Utzinger (2010) and Adekunle (2009). The WHO (1999) postulated that over 20 million Nigerians harbor intestinal worms and that between 80-85% of our children are infested.

Majority of these studies focus on prevalence of intestinal worms in hospital based patients, school children in urban and rural populations. Other studies in other countries on deworming had focused mostly on evaluation of deworming interventions on school age children and its effect on growth, nutrition, mental capacity and survey of health behaviours that promotes the prevalence of IPI among others (Mustafa Ulukanligil (2006), Worm count, (2010), Curtale, Pezzotti, Sharbini, al Mazdzi, Ingrosso, Saad, and Babille (1998), Kanoa, Al-Hindi, Michraj et al (2008), Acka et al (2010).

In Nigeria, studies to find out and address the ecological and socio-cultural factors that promote the prevalence of intestinal worms and influence deworming practices in populations is scarce. Also, knowledge and perceptions of people about intestinal worms and its influence on their practice of worming children had not been fully explored and documented. Similarly, though the nation is with a high prevalence of intestinal worms and living conditions that favour the transmission of intestinal worms, especially in rural areas, integration of deworming interventions into other programmes is not given the full attention it deserves unlike immunization and vitamin A supplementation for children. Lastly, although the country has an integrated Neglected Tropical Disease (NTD) control policy and plan, a school health policy and

school feeding guidelines that all includes school-based deworming; school-based deworming intervention is not consistently done.

Similarly, published research and studies on the practices of deworming of people had not been fully explored and documented. Since perception of people about intestinal worms and awareness of the enormous havoc it causes is not well publicized in Nigeria, this study is therefore designed to document the perception of mothers and caregivers of U-5 children about intestinal worms and explore their practice of regular deworming at Moniya Ibadan.

1.2. Justification

Behavior is what people do or fail to do and this is often influenced by perceptions, beliefs, cultural orientation and values and this invariably influences practice. Mothers and women are customarily saddled with the responsibility of providing care for their children and family and by extension the larger society. Perception of mothers towards intestinal worms and the need for regular deworming of their children will influence the uptake of any intervention in this direction. For health education and promotion activities to be effective, target audiences must be identified so that a clear message can be delivered, hence local knowledge and perceptions must be taken into account. Recent studies support that both individual and community perceptions and attitudes of parasitic worm infections and their prevention and treatment are important factors (Acka et al 2010). There is a need to better understand communities' and mothers' perception about intestinal worms and practices of deworming of children in order to improve public health prevention and control efforts and this study address this concern.

The result from this study is therefore beneficial in designing interventions that will address erroneous beliefs about intestinal worms and deworming of children, at the same time, it will encourage the development of interventions to promote positive attitudes on these issues in Nigeria and other developing countries. This study therefore provides a basis or evidence for advocating for local and national policies targeted at this often marginalized population (U-5 and out of school children) in community deworming intervention programmes apart from the popular school-based intervention programmes.

Lastly, experiences gained from this study is useful for the design and implementation of an integrated control program against intestinal parasitic infection and the lessons learned could stimulated stimulate thinking and actions on other health promotion and education initiative in the community beyond deworming for a more wholistic health promotion result.

1.3. Research Questions

1. What are the perceptions of mothers of under-five (U-5) children at Moniya about intestinal worms?
2. what is the level of awareness of mothers of U-5s children at Moniya on the need to deworm their children?
3. What is the practice of mothers of U-5s children at Moniya about regular deworming of their children?
4. What is the influence of the perceptions of mothers of U-5 children at Moniya about intestinal worms on their practice of regular deworming?
5. What factors influence the practice of mothers of U-5 children at Moniya about regular deworming of their children?

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5. What factors influence the practice of mothers of U-5 children at Moniya about regular deworming of their children?

1.4. Objective of the study

The broad objective of the study was to explore the perception of mothers and care givers of under five (U-5) children at Moniya in Akinyele Local Government Area of Oyo state about intestinal worms and assess their practice of regular deworming of their children.

1.5 Specific objectives

The specific objectives were to;

1. Assess the level of the perception of mothers of under-five children at Moniya about intestinal worms
2. Assess the awareness of the mothers of under-five children at Moniya about intestinal worms and deworming.
3. Determine the practice of regular deworming of U-5 children among mothers at Moniya.
4. Describe the influence of the perception of mothers of U-5 children at Moniya about intestinal worms on the practice of regular deworming of their U-5 children.
5. Identify the factors that influence the practice of deworming of children among mothers of U-5 children at Moniya.

1.6. Hypotheses

The following hypotheses were tested by the study:

1. There is no significant relationship between the socio-demographic characteristics (ages group, parity, type of family and educational attainment of mothers of U-5 children at Moniya and their perception about intestinal worms.

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2. There is no significant relationship between the socio-demographic characteristics (age groups, marital status, type of family and educational qualification) of mothers of U-5 children at Moniya and their practice of regular deworming of their children.

3. There is no significant relationship between the mean perception of the mothers of U-5 children at Moniya about intestinal worms and their practice of regular deworming.

4. There is no significant relationship between mothers self deworming practice and the practice of deworming their children.

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3. There is no significant relationship between the mean perception of the mothers of U-5 children at Moniya about intestinal worms and their practice of regular deworming.

4. There is no significant relationship between mothers self deworming practice and the practice of deworming their children.

CHAPTER TWO

LITERATURE REVIEW

This chapter is organized into various subsections. These are definition, life cycles, prevalence, predisposition, symptoms, effects and treatment of intestinal worms. It also discusses the age for the initiation of worming, Procurements, benefits, and usefulness of deworming in meeting the Millennium Development Goals (MDGs). It highlights the Global and National responses to the control of STH and other control measures for IPI. It ended with the use of a conceptual framework to describe the concept of likelihood of taking the preventive health action through the application of HBM to perception, knowledge and Practices relating to intestinal worms and deworming of children.

2.0. Definition and Description of Intestinal parasite/worms

A parasite is any organism which obtains food and shelters from another organism. They live within a host organism (human or animal) for the purpose of obtaining food. This relationship causes harm to the host, and, if the infection is severe, it can lead to a fatal outcome. Helminthes or worm infestations refer to worms that live as parasites in the human body and are a fundamental cause of disease associated with health and nutrition problems beyond gastrointestinal tract disturbances (Luong, 2003).

There are about 20 species of helminthes but there are two main types of intestinal parasites: helminthes and protozoa (Anh, Dicp,and Trec, 2007). Protozoa have only one cell, and can multiply inside the human body, which contributes to their survival and enables serious infections to develop. Helminthes are worms with many cells, and are generally visible to the

naked eye in their adult stages. Tapeworms, pinworms, and roundworms are among the most common helminthes. In their adult form, helminthes cannot multiply in the human body.

2.1. Life cycle of intestinal worms

2.1.1 Ascariasis lumbricoides (Roundworm)

The name Ascariasis lumbricoides reflects the resemblance of this intestinal roundworm to the common earthworm known as Lumbricus. It is one of the commonest and most widespread of human infections with an estimated 1,300 million cases worldwide in both temperate and tropical areas. In areas of poor sanitation, everyone may be harboring the parasite. Amazingly, one person can be infected by up to a hundred worms (Anh, Diep,and Tree, 2007).

Eggs from adult female worms living in the intestine are passed out with faeces. These eggs will then contaminate the soil, and in warm moist conditions they will develop to the stage where they can become infective. These eggs are then swallowed – e.g. on fruits or vegetables that have been watered with water containing contaminated soil. Once they are in the intestine (the duodenum) the eggs hatch into larvae, which penetrate the wall of the intestine and enter the blood or lymph vessels and end up in the lungs. There, they continue to grow and develop, before moving to the throat, to be swallowed back down to the intestine. Here the worms grow and develop to maturity and start producing eggs (FRESH, 2004).

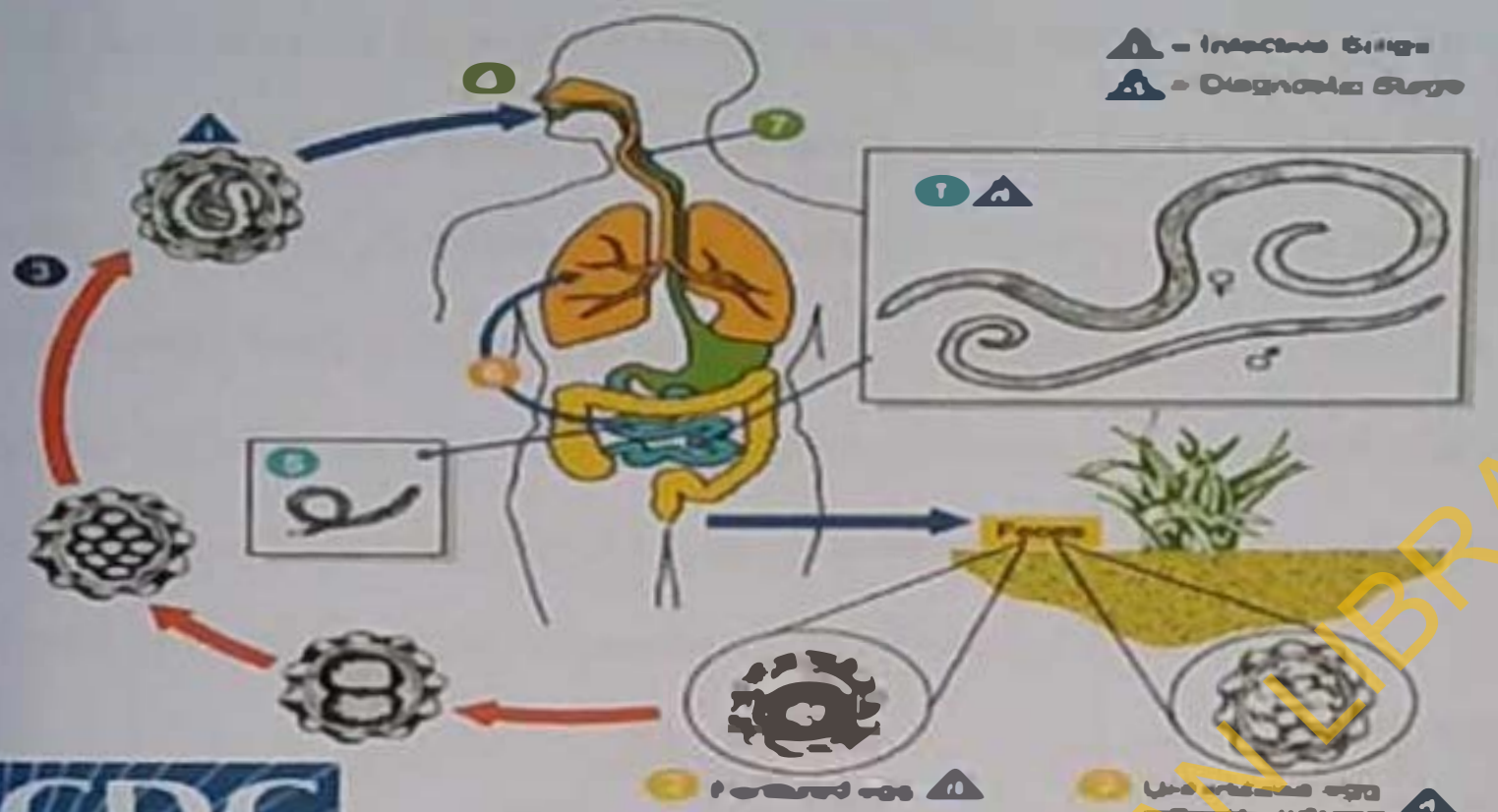

Figure 2. 1 Life cycle of Ascariasis

Source : Centre for Disease Control and prevention

2.1.2 Ancylostomiasis (Hookworm)

Hookworm is a parasitic nematode that lives in the small intestine of its host, which may be a mammal such as a dog, cat, or human. Two species of hookworms commonly infect humans, *Ancylostoma duodenale* and *Necator americanus*. Eggs are passed in the stool, and under favorable conditions (moisture, warmth, shade), larvae hatch in 1 to 2 days. The released rhabditiform larvae grow in the feces and/or the soil, and after 5 to 10 days they become filariform (third-stage) larvae that are infective. These infective larvae can survive 3 to 4 weeks in favorable environmental conditions. On contact with the human host, the larvae penetrate the skin and are carried through the blood vessels to the heart and then to the lungs. They penetrate into the pulmonary alveoli, ascend the bronchial tree to the pharynx, and are swallowed. The

larvae reach the small intestine, where they reside and mature into adults. Adult worms live in the lumen of the small intestine, where they attach to the intestinal wall with resultant blood loss by the host. Most adult worms are eliminated in 1 to 2 years, but the longevity may reach several years. Some *A. duodenale* larvae, following penetration of the host skin, can become dormant (in the intestine or muscle). In addition, infection by *A. duodenale* may probably also occur by the oral and transmammary route. *N. americanus*, however, requires a transpulmonary migration phase (Centers for Disease Control and Prevention (CDC) factsheet.

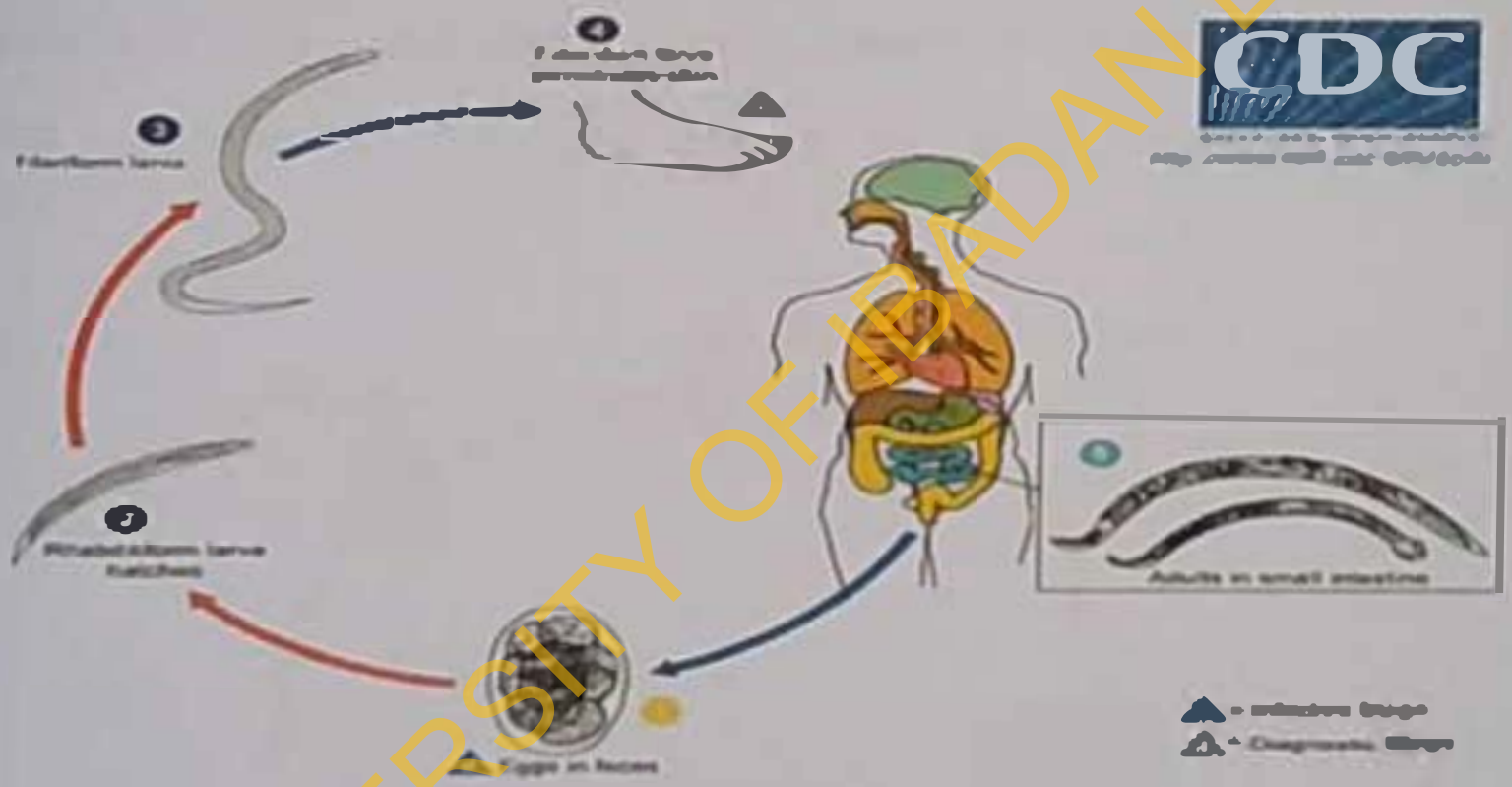

Figure 2.2 Life Cycle of intestinal hookworm

Source : Centre for Disease Control and prevention

2.1.3 Trichuriasis (Whipworm)

Worldwide, infections are more frequent in areas with tropical weather and poor sanitation practices, and among children. It is estimated that 800 million people are infected worldwide (CDC). Although the incidence of whipworm infection is high, its intensity is usually

light (FRESH 2004). The name whipworm comes from the parasite's long, very thin, whip like shape. The unembryonated eggs are passed with the stool. In the soil, the eggs develop into a 2-cell stage, an advanced cleavage stage, and then they embryonate; eggs become infective in 15 to 30 days. After ingestion (soil-contaminated hands or food), the eggs hatch in the small intestine, and release larvae that mature and establish themselves as adults in the colon. The adult worms (approximately 4 cm in length) live in the cecum and ascending colon. The adult worms are fixed in that location, with the anterior portions threaded into the mucosa. The females begin to oviposit 60 to 70 days after infection. Female worms in the cecum shed between 3,000 and 20,000 eggs per day. The life span of the adults is about 1 year (CDC)

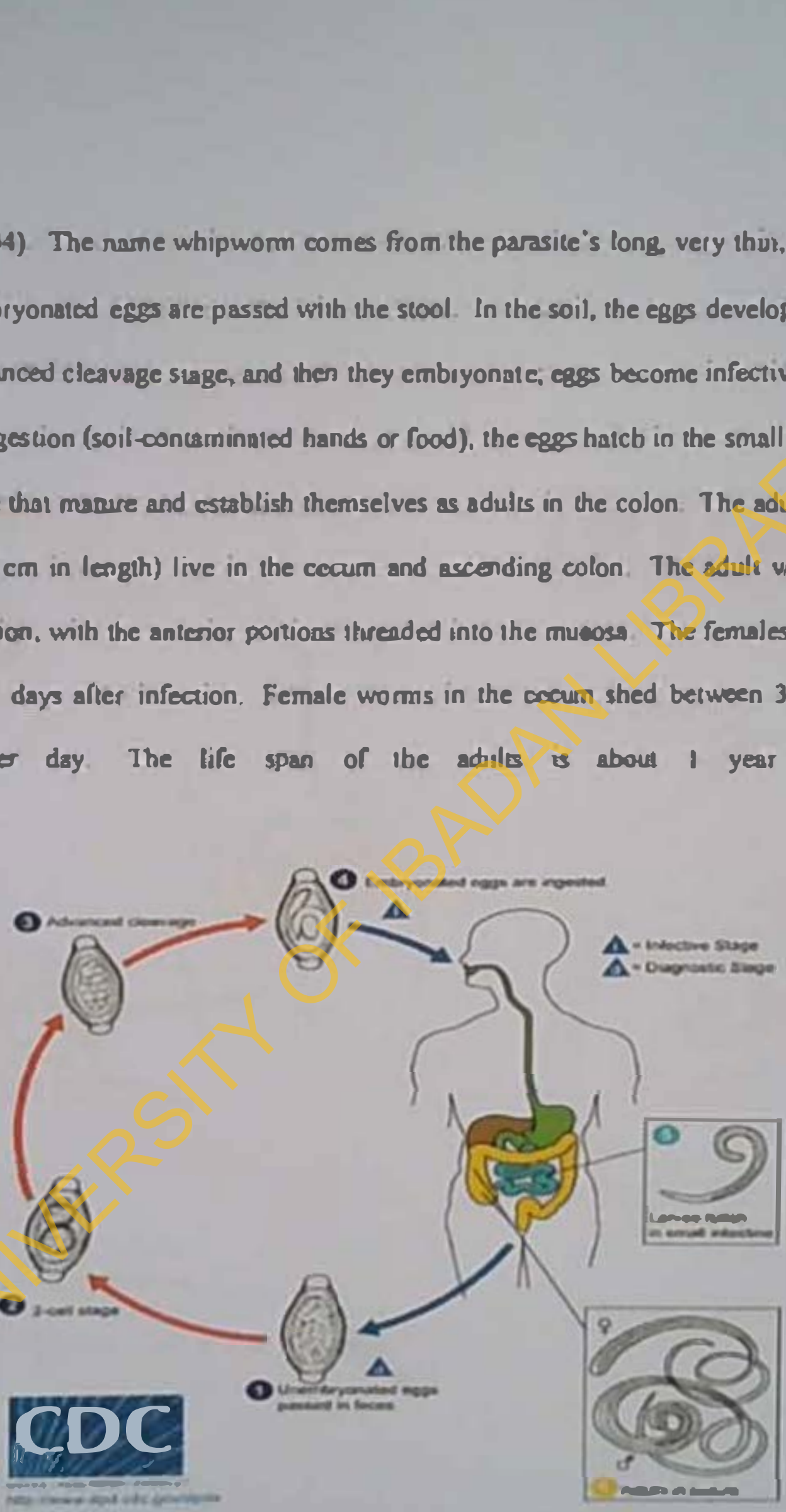

Figure 2.3 Life cycle of whipworm

Source : Centre for Disease Control and prevention

contaminated area (the area around the anus where the female worm deposits her eggs) and then transfers the eggs to the fingertips and from there to the mouth. The eggs may be scattered into the air from bed linen and clothing, and can cling to doorknobs, furniture, tubs and faucets, and even food.

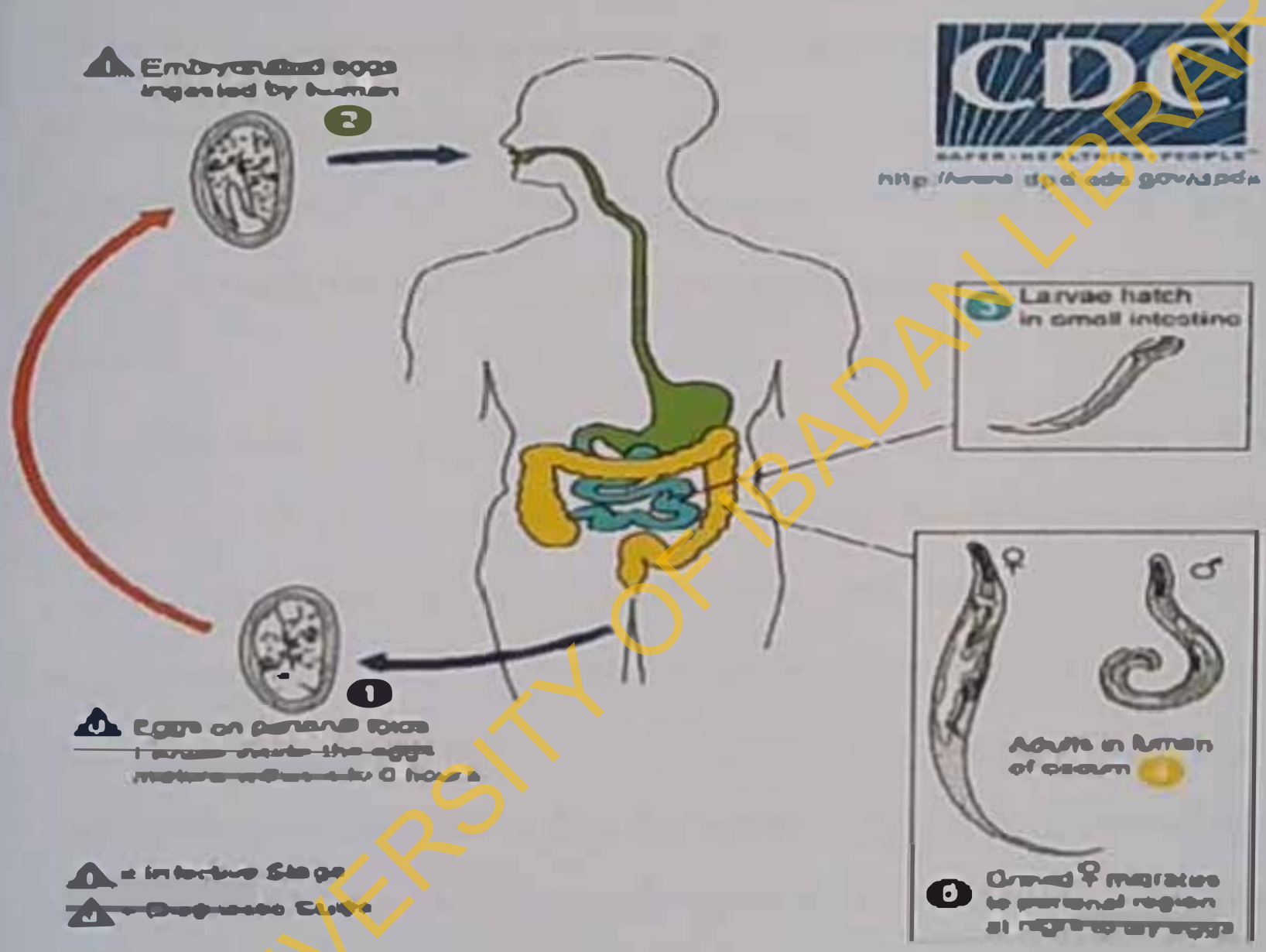

Figure 2.4 Life cycle of pinworms

Source : Centre for Disease Control and prevention

2.1.5 Tapeworms (Taenia)

Taeniasis is the infection of humans with the adult tapeworm of *Taenia saginata*, *T. solium* or *T. asiatica*. Humans are the only definitive hosts for these three species. Eggs or

contaminated area (the area around the anus where the female worm deposits her eggs) and then transfers the eggs to the fingertips and from there to the mouth. The eggs may be scattered into the air from bed linen and clothing, and can cling to doorknobs, furniture, tubs and faucets, and even food

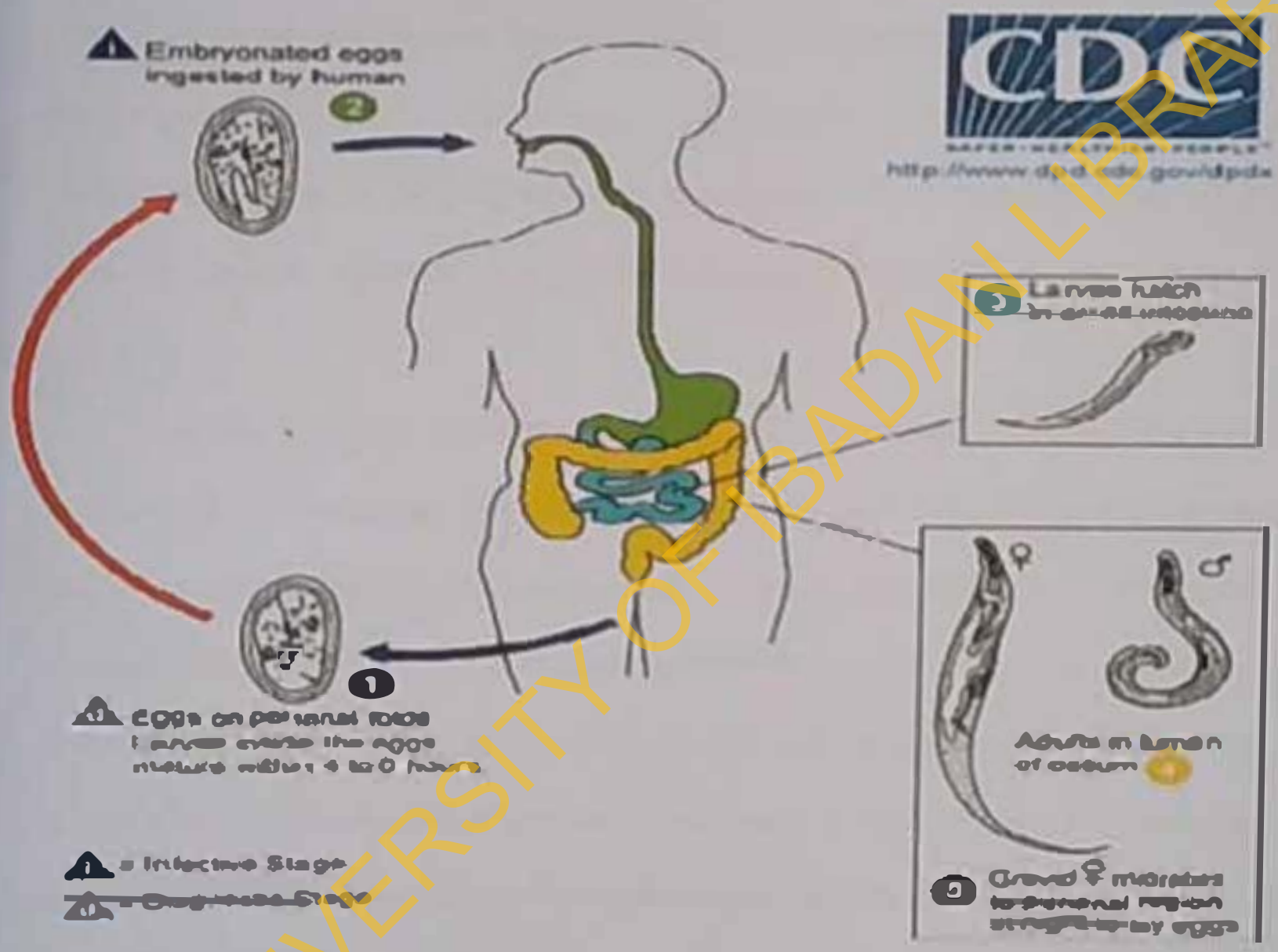

Figure 2.4 Life cycle of pinworms

Source : Centre for Disease Control and prevention

2.1.5 Tapeworms (Taenia)

Taeniasis is the infection of humans with the adult tapeworm of *Taenia saginata*, *T. solium* or *T. asiatica*. Humans are the only definitive hosts for these three species. Eggs or

2.1.4 Enterobiasis (Pinworm)

Pinworms are small, threadlike roundworms found primarily in the colon and rectum. A Pinworm is the most common roundworm parasite in temperate climates even in areas with high levels of sanitation. Because pinworm infection is spread mainly by children, it is found most often in family groups, day-care centers, schools, and camps (FRESH 2004). Hence, worldwide, the infections are more frequent in school- or preschool-children and in crowded conditions. Enterobiasis appears to be more common in temperate than tropical countries. It is the most common helminthic infection in the United States (an estimated 40 million persons are infected CDC).

Eggs are deposited on perianal folds. Self-infection occurs by transferring infective eggs to the mouth with hands that have scratched the perianal area. Person-to-person transmission can also occur through handling of contaminated clothes or bed linens. Enterobiasis may also be acquired through surfaces in the environment that are contaminated with pinworm eggs (e.g., curtains, carpeting). Some small number of eggs may become airborne and inhaled. These would be swallowed and follow the same development as ingested eggs. Following ingestion of infective eggs, the larvae hatch in the small intestine and the adults establish themselves in the colon. The time interval from ingestion of infective eggs to oviposition by the adult females is about one month. The life span of the adults is about two months. Gravid females migrate nocturnally outside the anus and oviposit while crawling on the skin of the perianal area. The larvae contained inside the eggs develop (the eggs become infective) in 4 to 6 hours under optimal conditions (CDC). Retroinfection, or the migration of newly hatched larvae from the anal skin back into the rectum, may occur but the frequency with which this happens is unknown. Exposure to infective eggs may occur when the person who is infected scratches the

gravid proglottids are passed with feces ; the eggs can survive for days to months in the environment. Cattle (*T. saginata*) and pigs (*T. solium* and *T. asiatica*) become infected by ingesting vegetation contaminated with eggs or gravid proglottids. In the animal's intestine, the oncospheres hatch, invade the intestinal wall, and migrate to the striated muscles, where they develop into cysticerci. A cysticercus can survive for several years in the animal. Humans become infected by ingesting raw or undercooked infected meat. In the human intestine, the cysticercus develops over 2 months into an adult tapeworm, which can survive for years. The adult tapeworms attach to the small intestine by their scolex and reside in the small intestine. Length of adult worms is usually 5 m or less for *T. saginata* (however it may reach up to 25 m) and 2 to 7 m for *T. solium*. The adults produce proglottids which mature, become gravid, detach from the tapeworm, and migrate to the anus or are passed in the stool (approximately 6 per day). *T. saginata* adults usually have 1,000 to 2,000 proglottids, while *T. solium* adults have an average of 1,000 proglottids. The eggs contained in the gravid proglottids are released after the proglottids are passed with the feces. *T. saginata* may produce up to 100,000 and *T. solium* may produce 50,000 eggs per proglottid respectively (CDC).

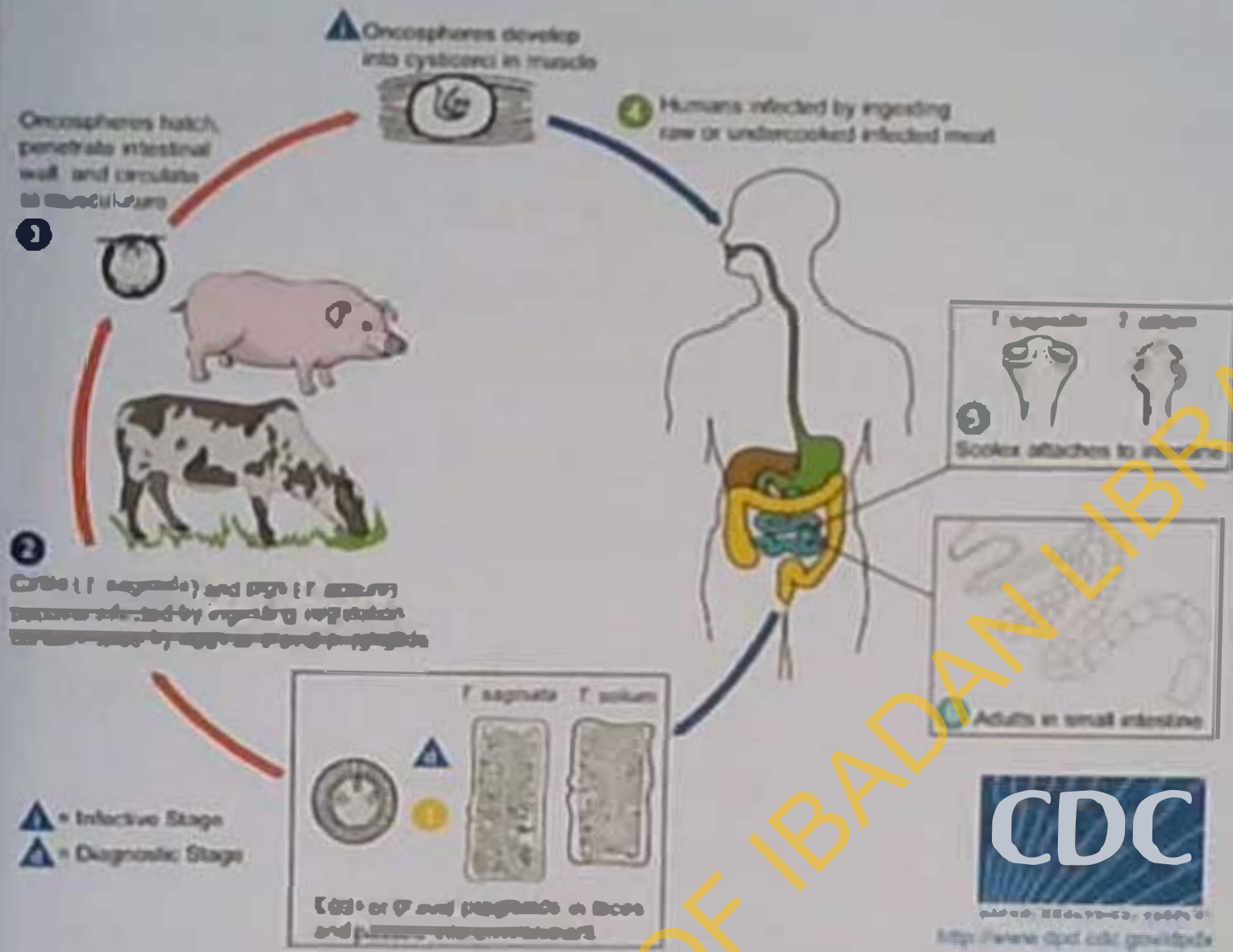

Figure 2.5 Life cycles of tapeworms

Source : Centre for Disease Control and prevention

2.2. Global prevalence of intestinal worms

Mehraj et al (2008) pointed out that intestinal parasitic infections are endemic worldwide and have been described as constituting the greatest single worldwide cause of illness and disease. Presently, there is no international surveillance mechanism currently in place to determine prevalence and global distribution. Many of the numbers regarding the prevalence of intestinal worms infection are estimates and varied widely. It has been estimated that 1.22 billion people in low, lower-middle and upper-middle income economies, or 26% of their population,

are infected with roundworms, 0.80 billion (17%) with whipworms and 0.74 billion (15%) with hookworms (de Silva *et al*., 2003). From this data it can be estimated that some 2.3 billion people, or about 48% of people living in the world's poorest countries are likely to be infected with at least one of these types of worms and that nearly 10% are infected with two or more types (Hill and Horton, 2009). Some prevalent rates have been measured through survey data in endemic regions around the world. The following are some of the available findings on prevalence rates in regions endemic with intestinal worms.

Africa

A study of worm infection in children aged 2–10 years living in ten areas described as 'slums' in Durban, South Africa was completed in 2001. The prevalence of *Ascaris* and *Trichuris* (whipworm) was 89.2% and 71.6% respectively, this indicates that most of the children were infected with both worms (Fincham and Dhansay, 2005).

Jukes (2006) pointed out that Brooker et al., (1999) conducted a study at Kenya, and results showed that 28% of 460 preschool children (0.5 – 5 years) harbored hookworm infection. 76% were anemic and that anemia was more severe in those children with hookworm. At Southern Sudan, Magambo, Zeyhl, Wachira (1998) conducted a study to determine the prevalence of intestinal parasites among school children. A total of 275 stool samples which were examined using formol-ether concentration techniques yielded 15 different species of parasites. Hook worm with a prevalence of 13.1% was the predominant nematode followed by Strongyloides stercoralis (3.3%), Trichostrongylus (2.5%), Schistosoma mansoni (2.2%) and Trichuris trichiura (1.8%). Ascaris lumbricoides and cestodes were not detected in this

population. It was observed that children in the age group 6-10 years old were the most affected followed by the 11-15 year-old age group.

Kamar and Rahim (1995), conducted a community based prospective study among randomly selected 300 children aged less than five years selected from three camps of the police force in Khartoum from 534 households representing a total population of 4962 individuals. From the 300 children, 298 stools specimens were examined; 116 were positive for a single parasite, while samples from 15 children showed ova and cysts for two types of parasites giving a prevalence rate of 44%. The commonest infestations were Giardiasis (21.1%), Taeniasis (10.4%) and Enterobiasis (7.1%). Non pathogenic E. coli, E. histolytica and Taenia saginata were detected in 2.7%, 0.7% and 1.7% of stools specimen respectively.

Mahfouz, el-Morshedy, Farghaly, and Khalil (1997) surveyed the ecological determinants of intestinal parasitic infections among pre-school children in an urban squatter settlement of Egypt. Stool samples were collected from 658 pre-school children below 5 years of age and examined for intestinal parasites. Overall, the prevalence rates of infections with the intestinal Helminths and Protozoa were 17.3 and 31.5 %, respectively, which were very high compared to previously reported figures for this age group in Egypt.

Asia

In Eastern Province of Saudi Arabia, Abaliussain (2005) conducted a retrospective cross-sectional study among expatriate workers in Al-Khobar using 1,019 medical files. The results showed that the prevalence of parasitic infection is 31.4%. Out of these, 22.3% are single infection and 9.1% multiple infections (double and triple and quadruple). Hookworm, Trichuris

trichiura, and Ascaris lumbricoides were the most common infections in all nationalities observed. Parasites were found to be more prevalent among Indians followed by Indonesians. Filipinos and then Sri Lankans.

Luong (2003) asserted that globally, over 3.5 billion people are infected with intestinal worms, of which 1.47 billion are with roundworm, 1.3 billion with hookworm and 1.05 billion with whipworm. He pointed out that about 400 million school-age children are infected with roundworm, whipworm and hookworm worldwide, a large proportion of whom are found in the East Asia region (Cambodia, China, Lao PDR, Thailand and Vietnam).

At Ghosia Colony, Gulshan Town Karachi, Pakistan which is an urban slum, during a cross-sectional survey of 350 children aged 1-5 years, the prevalence of intestinal parasitic infections was estimated to be 52.8%. About 43% children were infected with single parasite and 10% with multiple parasites. The proportions of wasted, stunted and underweight children were 10.4%, 58.9% and 32.7% respectively. Similarly, Ullah, Sarwar, Aziz, and Khan (2009) examined 200 primary school children aged 5-10 years in a rural Peshawar in Pakistan and found that 132 (66%) were found positive with six different types of intestinal helminths infestation.

Europe

Okyay, Ertug, Gultekin, Oncn and Beser (2004) examined the prevalence of intestinal parasite and related factors in a western city of Aydin, Turkey among 7-14 years old school children. A total of 456 stool specimens were collected and 145 students (31.8%) were infected with one or more intestinal parasites. 29 (6.4%) of the students were infected more than one

parasite, 26 (5.7%) with two parasites and 3 (0.7%) with three parasites.

Lindo, Validum, Ager, Campa, Cuadrado, Cummings, and Palmer (2002) investigated the prevalence of intestinal parasites among young children in a town located in the interior of Guyana. Eighty-five children under the age of 12 years were studied prospectively for intestinal parasites in Mahdia, Guyana. At least one intestinal parasite was detected in 43.5% (37/85) of the children studied and multiple parasitic infections were recorded in 21.2% (18/85). The most common intestinal helminth parasite was hookworm (28.2%; 24/85), followed by Ascaris lumbricoides (18.8%; 16/85) and then Trichuris trichuria (14.1%; 12/85).

Subramoniam, Mohan, and Kavitha (2005) observed that in part of Kanyakumari district which is an endemic area of worm infestation, mainly Ascariasis, the prevalence of intestinal Helminths was 60% in children and 20% in adult population. High incidence of Ascariasis was seen in age group 1-2 years.

2.3. Prevalence of intestinal worms in Nigeria

The WHO in 1999 postulated that over 20 million Nigerians harbor intestinal worms and that between 80-85% of our children are infested. Anosike et al (2009) examined the prevalence of intestinal helminth among residents of Naraguta rural community in Central Nigeria Out of 700 stool specimens examined, 261 (37.3%) were positive for helminthic infections. In another study by Aguam (1996), it was observed that a total of One hundred and fifty (150) children, aged between 1–12 years, with established intestinal ascariasis, were seen at the University of Nigeria Teaching Hospital (UNTH), Enugu within a four-year period. The highest incidence (7.1%) occurred in children aged between 3–7 years. The infestation was rare in the 1–2 year age

group (4%). While studying the prevalence of intestinal parasitic infection in Edo state of Nigeria, Mordi and Okaka (2008) found 11.3% prevalence of persons with intestinal parasites in the state.

Ogbolu, Alli, Ogunleye, Olusoga-Ogbolu and Olaosun, (2009) examined the presence of intestinal parasites in selected vegetables from open markets in south western Nigeria, and discovered that out of the 120 samples taken, 82 (68.3%) of the vegetables were positive for intestinal parasites. They pointed out that samples of vegetables from Ibadan, Ilorin and Lagos had high parasitic contamination – 70%, 70% and 65% respectively.

At Ikenne, in Ogun state of Nigeria, Ekpo et al (2008) did a study on the prevalence of helminthes infection among 232 school children and noted that the prevalence of helminthes infection was 54.9%, 63.5%, and 28.4% in the urban government, rural government, and private owned schools respectively. Okeniyi, Ogunlesi, Oyelami and Oyedeji (2005) in a cross-sectional study of 175 healthy children aged 6 months to 15 years at the Wesley Guild hospital, Ilesa, Nigeria with the microscopic examination of their fresh stool samples for intestinal parasites, discovered that 58 (33.1%) had various parasites while 4.0% had poly-parasitism.

Adekunle (2009) also carried out a study on the prevalence of intestinal parasites among three major sectors of Ibadan urban metropolis. She observed that 55.8% of the children had no intestinal parasites while 44.2% of the children were found to have one form of intestinal parasites or the other. 92.8% of the infected children were in 1-4 years age group, 69% were in ages 5-9 years and 34.6% in 10-15 years age groups. In a study conducted at Akinyele local government of Oyo state by Morenikeji, Azubike and Ige (2009), it was observed that out of the 123 people examined for intestinal parasite, 52% (64) were infected with intestinal parasites.

Those in the 10-19 years had 60% of prevalence of helmithes infection. Those in 0-9 years category had 57.1% more infections than the other age groups.

2.4. Predisposition to Intestinal worms

General predisposition- Intestinal parasitosis transcend countries, tribes or continent as all people of the world are affected. Mehraj et al. (2008) asserted that people of all ages are affected by intestinal parasitic infections. Other predisposition to IPIs includes;

2.4.1 Age

Children are particularly susceptible and typically have the largest number of worms (FRESH, 2004). Adekunle (2009) observed that in a study to determine the prevalence of intestinal parasites among three major sectors of Ibadan Urban metropolis. 92.8% of the infected children were in ages 1-4 years. Ehrlich (2008) also opined that children and the elderly are more likely to get infected with IPIs. This view is also supported by Mehraj et al (2008) who asserted that age is an important risk factor for IPIs and the pre-school and school going children were at highest risk for IPIs. In a study, they identified an increasing dose-response association between age and IPIs within the age group of 12 to 60 months attributing this to the possibility that as children grows older, exposure to many of the risk factors for IPIs increases. Mahfouz , el-Morshedy , Farghaly, and Khalil (1997) observed that among the pre-school children, those above 2 years of age were much more likely to develop IPIs.

Magambo, Zeyhl , Wachira (1998) also observed that at Southern Sudan, where there is evidence of prevalent IPI, children in the age group 6-10 years old were the most affected

followed by the 11-15 year-old age group. Similarly, Anosike et al (2009) observed that, infection rates were high among persons below ten years of age and in toddlers, among others. And lastly, Morenikeji, Azubike and Ige (2009) found out that at Akinyele local government of Oyo state, Nigeria, *E. vermicularis* occured only in age group 0- 19 years and that the mode of transmission of the parasite, which is mainly through infected fingers after scratching the peri-anal region, is a habit found mostly in young people

Kamar and Rahim (1995) also observed that children aged 3 years and above were the most affected group in a study. Mehraj et al (2008) however cautioned that the linear association of age within the mentioned age range needs further exploration through prospective studies. Lastly, children generally whether school-age, pre-school or out-of-school are often with the greatest number of intestinal worms and they are assumed to be at greatest risk and are expected to benefit most from deworming. Preschool children, whose worm burdens are housed in smaller bodies, are just as much at risk of the disease and they are more at risk of death (WHO 2004).

2.4.2 Poor socio-economic status and living condition

Mehraj et al (2008) asserted that certain socio economic conditions like poverty, illiteracy, poor hygiene, lack of access to potable water are among the factors associated with IPIs. According to them, IPIs deprive the poorest of the poor of health, contributing to economic instability and social marginalization. The poor people of under developed nations experience a cycle where under nutrition and repeated infections lead to excess morbidity that can continue from generation to generation.

Mahfouz et al (1997) also pointed out that from a study; certain groups of pre-school children were much more likely to develop IPIs. They included children whose families had pools of sewage around houses and shared toilets with another family. In addition, children whose families lacked tap water inside their dwelling and disposed human excreta in septic tank very close to the dwelling. This living condition describe what is likely to be found in the lower socio- economic status (SES) of a community.

Similarly, Adekunle (2009) conducted a study in Ibadan, and discovered that 33.4 % of the children infected with IPIs were from low socio-economic group, while 86% of the children in the upper class had no intestinal parasite. It was also revealed from the same study that all the 7 (12.1%) children who had multiple intestinal parasites belonged to the lower socio-economic class.

At Akinyele local government of Oyo state, Nigeria with high prevalence of intestinal parasitosis, the factors associated with predisposion to IPIs in the area includes prevalent poor sanitary conditions, inadequate water supply, unhealthy cultural practices, lack of toilet facilities, defecating in nearby bushes and ignorance. In addition, children playing in dirty or filthy environment, playing and swimming in natural water bodies, geophagus habit of children and involvement of women in subsistence agriculture are habits that were found to facilitate the transmission of the parasites (Morenikeji, Azubike and Ige, 2009).

Mehraj et al (2008) opined that IPIs are linked to lower income, unemployment of mothers, lack of sanitation, lack of access to safe water and improper hygiene, therefore they occur wherever there is poverty. Ehrlich (2008) also supported the idea that poor sanitation (for both food and water) and poor hygiene puts people at higher risk of IPIs. In the same vein,

Anosike et al (2009) observed that in a study, infection rates were high among persons defecating in the bush as they harbored more worms (56.7%) than pit latrine users (43.3%). The fact that poor socio economic status (SES), poor sanitation, poor personal hygiene, and perhaps particular behaviours that increase the risk of infection, such as using fresh human faeces as a fertilizer or not wearing shoes to protect from infection with hookworm is associated with IPIs is also supported by Subramoniam, Mohan, Kavitha (2005) and Hall and Hoston (2009). Fincham and Dhansay (2005) noted that disadvantaged children carry most of the load of IPI, especially those who live in densely populated and under-serviced urban informal settlements, as well as in some rural areas.

All the afore-mentioned perspective shows that children from poor socio-economic background are at greater risk of harboring intestinal parasite probably because they are likely to live in less desirable living conditions with poor hygiene practices that favour the spread of IPIs. Caution needs to be employed in adjudging SES as a predisposition to IPI as pointed out by Mehraj et al (2008) who in a study used rented houses as a proxy measure of SES which is also positively associated with IPIs. It was pointed out that the effect of SES on risk of infectious diseases in general, and parasitic infections in particular, is complex in nature and could be attributed to several other factors such as lack of access to clean water, poor hygienic environment, lack of access to education due to financial constraints and overcrowded conditions.

2.4.3 Educational status of the mothers or parents

The relationship between a child's health and mother's educational status is well known. In rural communities and among those in low SES, children were traditionally taught to wash

anal area with water by hand after defeacating. Toilet paper usage was not common and might be due to low income or just a behavioral habit. In a study on IPI, Karrar and Rahim (1995), found that infection rate was highest among the illiterate, overcrowded and large sized families. This view was also supported by Mehraj et al (2008) that identified low educational level of the mothers as a significant factor associated with IPIs. Similarly, Okyay, Ertug, Gultekin, Onen and Beser (2004) also observed that intestinal parasite prevalence was higher in rural area, in children with less than primary school educated mother, in children who use hands for washing anal area after defecation, and in children who use toilet paper sometimes or never.

2.4.4 Environmental condition

Okenlyi et al (2005) pointed out that childhood intestinal parasosis is global though endemic in the tropics and subtropics for reasons attributable mainly to environmental conditions and poor hygiene. Therefore, living in the tropical and sub tropical countries is a predisposition to IPIs. The countries of sub-Saharan Africa, South and Southeast Asia and parts of Latin America are worst-affected, which reflects environmental conditions that suit the survival of infectious stages, poor sanitation, poor personal hygiene and perhaps particular behaviours that increase the risk of infection, such as using fresh human faeces as a fertilizer or not wearing shoes to protect from infection with hookworm (Hall and Hoston, 2009).

Mehraj et al (2008) also noted that hot and humid tropical climate are factors associated with intestinal parasitic infections. Subramoniam, Mohan, and Kavitha (2005) identified such precipitating ecological factors as heavy rainfall, tree cover, poor exposure to sunlight, poor sanitation, and unsafe water supply. Morenikeji, Azubike and Ige (2009) found five species of intestinal parasites in Akinyele local government area of Oyo state, Nigeria noting that the area is

a temperate zone, and the presence of five different species of intestinal parasites in this area suggests that the prevailing environmental conditions support the transmission of a wide range of parasites.

Other predispositions to IPIs as mentioned by Ehrlich (2008) includes

- Living in or visiting an area known to have parasites
- International travel
- Exposure to child and institutional care centers
- Immune-compromised
- HIV or AIDS

2.5. Symptoms of intestinal parasitic infection

FRESH (2004) opined that different kinds of worms can cause different symptoms, and children with only a few worms probably won't notice any symptoms. However, with heavier infections, common symptoms in children with one or more kind of worm may include loss of appetite, distended abdomen, painful abdomen, coughing, listlessness and generally feeling unwell, fever, diarrhoea and vomiting. The fact that diarrhoea and vomiting are symptoms of IPI was also supported by Subramonian, Mohan, and Kavitha (2005) who affirmed that diarrhea and vomiting are the main presenting features of IPI. Heavy infection may cause partial or complete blockage of the intestine resulting in severe abdominal pain, vomiting, restlessness, and disturbed sleep. The heavier or greater the worm infection, the more severe the symptoms are likely to be.

Occasionally, the first sign of infection may be the presence of a worm in vomit or in the stool. In addition, hookworm may result into ground-itch, which is an allergic reaction at the site of parasitic penetration and entry, vague abdominal pain, intestinal cramps, colic, and nausea, anaemia because of blood loss from the worms attaching themselves to the intestine and sucking the blood and tissue juices, and/or vitamin B_{12} deficiency, and protein malnutrition. Others includes capricious appetite, pica (or dirt-eating), obstinate constipation followed by diarrhea, palpitations, thready pulse, coldness of the skin, pallor of the mucous membranes, fatigue and weakness, shortness of breath and in cases running a fatal course, dysentery, hemorrhages and edema. A large number of larvae invading the lungs at one time may cause pneumonia. Other identified symptoms includes growth retardation, pneumonia, and bloody, mucus stools may be seen.

Pinworm infections in some persons may not produce any symptoms over a long period, but episodes of infection may return repeatedly. However, movement of egg-laden female worms from the anus will often produce irritation and itchy skin surrounding the anal opening. This itching of the anus or vagina, in some cases, may become very intense especially at night and may even interfere with sleep. Mild infection with flukes may cause no symptoms, but heavy infections can cause diarrhea, abdominal pain, and profuse stools containing undigested food (Ehrlich, 2008, Hipgrave, 2002, Global forumn (2008), Hipgrave, 2002)

Lastly, Mehraj et al (2008) found the history of excessive crying to be positively associated with IPIs noting that like many other diseases, since diarrhea causes irritation, the suffering children are expected to cry excessively. They however advised that further exploration

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is required to link excessive crying to hunger, either due to poverty (and therefore not an independent risk factor) or due to intestinal worm burden reducing nutrition.

2.6. Effects of worms on the body

The burden of disease caused by infection with STH remains enormous. About 2 billion people are affected worldwide, of whom 300 million suffer associated severe morbidity. Morbidity due to IPI is directly related to the worm burden (WHO, 2004). Bundy (2011) observed that only rarely does infection have acute consequences for children. Instead, the effect is long-term and chronic, and can negatively affect all aspects of a child's development: health, nutrition, cognitive development, learning and educational access and achievement. Severe infections can result into death.

STHs is one of the most common, long-term infections of children in low-income countries. For girls and boys aged 5 to 14 years in low-income countries, intestinal worms accounted for an estimated 11 and 12 percent, respectively, of the total disease burden, and represent the single largest contributor to the disease burden of this group. An estimated 20 percent of disability adjusted life years (DALY) lost because of communicable disease among school children is a direct result of intestinal worms (Bundy, 2011). Similarly, he pointed out that research has shown that there is a clinical link between worm infection and reduced vitamin A levels. Where vitamin A-rich foods are already marginal in the diet, roundworm infections can tip the balance towards vitamin A deficiency (Bundy, 2003).

IPIs makes a significant contribution to the development of nutritional deficiencies in children (Adekunle, 2009). As numbers of worms build up over time, they can cause

malnutrition, as they rob the body of food through loss of appetite so that children eat less, or through stopping the food from being absorbed properly once it had been eaten. Children with chronic worm infections and large numbers of worms may be stunted and underweight. Heavy infections with roundworm can also cause bowel obstruction (FRESH; 2004). It is important to note that the stunting of children's growth due to worm infections is not readily recognised, because it occurs almost imperceptibly over time. Thus, the full impact of helminth infections is often greatly under-reported or overlooked (Stephenson, Latham and Ottesen, 2000; Loung, 2003).

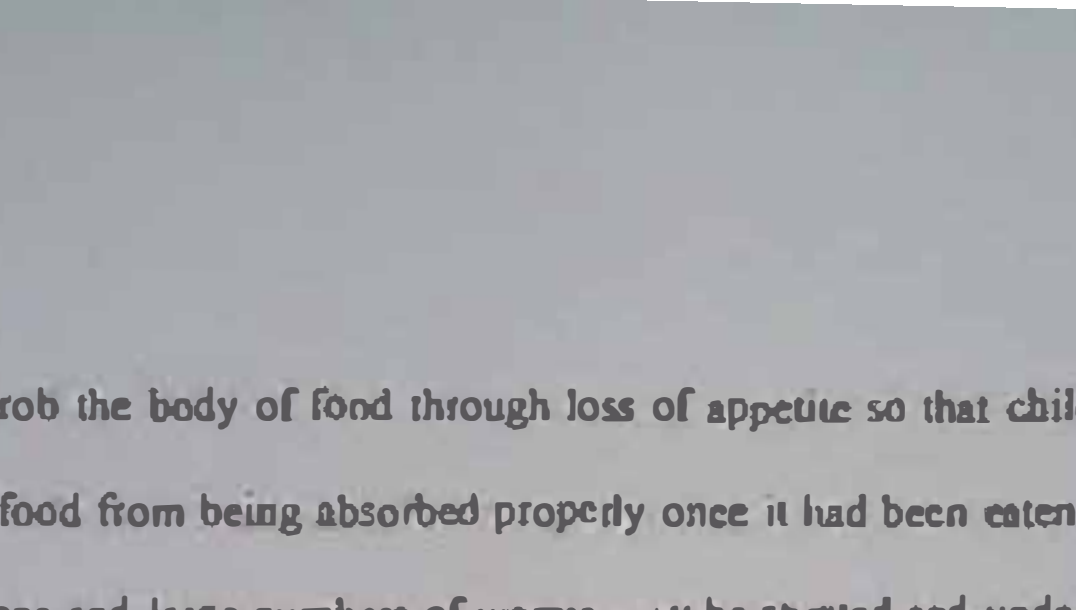

Figure 2.6- Piece of intestine blocked by worms

Source: Dr John Fincham and Dr Ali Dhansay

Intestinal worms can also contribute to anaemia, especially hookworm, which causes bleeding in the intestines and loss of blood. A study in Kenya showed that 28% of 460 pre-school children (0.5 – 5 years) harbored hookworm infection, 76% were anemic and that anemia

was more severe in those children with hookworm (Brooker et al., (1999) in Jukes (2006). The larger the number of worms, the more likely they are to make children ill, which can also lead to children missing school, and doing less well when they are at school. Chronic infections can lead to long term retardation of mental and physical development since children are most at risk at an age when they are both growing and learning, geohelminth infection potentially threatens a child's overall physical and psychological development (FRESH, 2004, FRESH, 2010).

All these consequences of infection can lead to an impairment of learning and slower cognitive development, leading to poor school performance. Fincham and Dhansay (2005) pointed out that tests were carried out to detect the presence of tapeworm cysts in 10% of 400 volunteers from the Oliver Tambo and Alfred Nzo districts in the Eastern Cape of South Africa. It was discovered that the cysts are often in the brain and are a major cause of epileptic fits and this impairs a child's ability to learn at school and to function normally at home in addition to other serious complications. Evidence of the cognitive impact of worm infections comes mainly from the school-age years as school children in South America, Africa and South-East Asia who are infected with worms perform poorly in tests of cognitive function noting that for the pre-school children, it is likely that worm infections have a similar impact since infections are also prevalent in this age group although worm loads typically do not reach peak intensity until the school-age years (Watkins and Pollitt, 1997 in Jukes, 2006).

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Figure 2.7 The portion of a human brain containing numerous cysts of the pork tapeworm *Taenia solium*

Source: Dr John Fincham and Dr Ali Dhansay

Hookworm is a leading cause of maternal and child morbidity in the developing countries of the tropics and subtropics. In children, it results in intellectual, cognitive and growth retardation, intrauterine growth retardation, prematurity, and low birth weight among newborns born to infected mothers. In developed countries, hookworm infection is rarely fatal, but anemia can be significant in a heavily infected individual. An interesting consequence of this in the case of *Ancylostoma duodenale* infection is translactational transmission of infection: the skin-invasive larvae of this species do not all immediately pass through the lungs and on into the gut, but spread around the body via the circulation, to become dormant inside muscle fibers. In a pregnant woman, after childbirth, some or all of these larvae are stimulated to re-enter the circulation (presumably by sudden hormonal changes), then to pass into the mammary glands, so that the newborn baby can receive a large dose of infective larvae through its mother's milk. This accounts for otherwise inexplicable cases of very heavy, even fatal, hookworm infections in

children a month or so of age, in places such as China, India and northern Australia (Jukes; 2006).

Loung (2003) pointed out that women and adolescent girls bear a particular burden of losing blood due to hookworm infections resulting in iron deficiency anaemia. As heavy infection of hookworm causes anaemia among women which is believed to be one of the factors contributing to maternal morbidity and mortality. IPIs rarely cause death but because of the size of the problem, the global number of related deaths is substantial (Mehraj et al: 2008) however, heavy or long-term intestinal worm infections frequently result in death if treatment is not given in time. About 39 million disability adjusted life years (DALYs) are attributed to IPIs and these infections represent a substantial economic burden. The total DALYs lost annually due to worm infection may range from 4.7 million to 39 million. The higher figure would place helminths close to major diseases such as tuberculosis, malaria, and measles (FRESH, 2010).

In summary, the health consequences of helminth infections according to the Disease control and priority project (DCPP, 2008) are far-reaching and they includes:

- All infected individuals suffer some degree of chronic disability, including anemia, chronic pain, diarrhea, inability to exercise, and undernutrition.
- Pregnant women with severe anemia are more likely to have premature births, babies with low birth weight, and impaired lactation.
- Pre-school and school-age children experience less physical growth, decreased physical fitness, and lower cognitive skills.

Consequences extend well beyond the health effects, because children with impaired cognitive skills have lower school enrollment, attendance, and graduation rates. Additionally, because educational attainment affects the jobs that children acquire later in life, the long-term effects of helminth infections include lower work productivity and lower family income. Limitations in physical growth can also affect economic well-being. Studies have shown that height affects participation in the labor force and the wage earning capacity of both women and men (Jukes; 2006).

2.7. Treatment of intestinal worms

2.7.1 Deworming

Deworming is the delivery of safety-tested, single dose, oral anthelminthic drugs for the reduction of both the subtle and the overt morbidity that accompanies worm infections (WHO 2005). Deworming is also referred to as drenching or worming, a medical practice of giving anthelmintic drugs to animals to assist them get rid of various intestinal parasites. The goals of pharmacotherapy in the treatment of IPIs are to eradicate infection, to prevent complications, and to reduce morbidity. Treatment can be through o doctor or health worker, or by teachers who have been trained to treat children at school (Erlich, 2008). Mass deworming means treating large numbers of people with parasite-killing drugs: praziquantel kills schistosomiasis, while albendazole kills soil transmitted helminthes

Preventive Chemotherapy (PC) is the large-scale distribution of anthelminthic drugs, at regular intervals, to population groups at risk targeting diseases like lymphatic filariasis, onchocerciasis, schistosomiasis, soil-transmitted helminthiasis and it is the mainstay of the WHO-recommended strategy to control (and eliminate) helminth infections, the goal of which is

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the prevention of morbidity (+ reduction of transmission) (Gabrielli: 2008). As reinfection with intestinal worms can occur immediately after treatment, the aim of deworming is first, to reduce initial worm loads by >80% and thereby eliminate disease, and then to repeat treatment often enough to prevent moderate to heavy loads from being reaccumulated (Hall and Horton, 2009). PC in high-risk groups can ensure that the levels of infections are kept below those associated with ill health. Deworming often results in immediate improvements in child health and development, and because it is also inexpensive, it is the recommended course of action in areas where infections are intensely transmitted and health resources are limited (Bath et al. 2010; DCPP; 2008).

However, treatment programme should be justified on the basis of epidemiological evidence of the situation because in some cases, it appears that deworming has been added to large-scale programmes simply because the opportunity to treat millions of pre-school children has arisen, not because there is a demonstrated need for treatment (WHO, 2006). Therefore, the WHO recommended a rapid survey approach, which is inexpensive and allows for fast decision-making.

Intestinal worms infection is often treated in several ways by people. In urban populations, it is common for people to use worm expellers but others still use local medicines and other remedies for the treatment of intestinal worms. Worming is frequently associated with signs and symptoms of infection although the use of anthelmintic is not usually the first choice of action when IPI is suspected. Other temporary, "prompt management" is often first tried like finding ways to relieve associated pain or nausea first then later, use of antihelminthics. The

common option is often to take something of bitter taste, which makes worms crawl down or go away; and the second option is feeding worms with their favorite foods of sweet taste (sugared water, candy, bananas), as this is believed "to make them no longer pester" (Anh, Diep, and Trees, 2007). On the contrary, Bath et al (2010) find out that a good number of residents in Bangladesh thought that worms were spread from eating sweet foods.

2.7.2 Local treatment of Intestinal parasitic infection

Many people's concepts about health problems are associated with the use of traditional medicines and a combination of both traditional and orthdox medicines. At Vietnam, people use a combination of the traditional anthelmintic medicines and "western" anthelmintic drugs. The traditional anthelmintic bolus is easily found in the market. Very few people used traditional vermifuges (in pills, not herb) to treat IP infections, usually for children as it is believed to be safer and less toxic for children although some adults use it too even though it is considered to be less effective than "western" anthelmintic because of fewer amounts of worms that was expelled (Anh, Diep, and Trees, 2007).

Acka et al (2010) observed that people used both modern and traditional medicine to treat worm infections; the majority of them considered modern medicine to be inaccessible, and used traditional medicine or drugs sold on local markets, consistent with findings from a study in Egypt, where it was found that traditional medications were frequently used, since modern treatments were either unavailable due to high costs or lack of supply.

2.7.3 Use of Orthodox medicines to treat Intestinal parasititic infection

The use of antihelminthics in human populations had been in existence since a long time. This is often a second choice of action after home remedies used for the treatment of IPI failed or the symptoms persist. Anh, Diep, and Trees (2007) also observed that a survey, anthelmintics were used by the villagers to treat the worm infections, and the majority of people purchased pharmaceutical drugs. Many people have used an anthelmintic in their childhood. Being aware of the negative impact that worms have on a persons health, they consider worming as a most effective tool to treat this infection. Almost all members of the interviewed households in Vietnam have had course to buy antihelminthics for their children and for themselves. Deworming pills are heat-stable and require no cold chain for delivery. With a shelf life of up to four years, they can be purchased in bulk to reduce costs and to ensure uninterrupted supply Bundy (2011).

In Uganda, a school health programme targeted children above five only for de-worming, oral hygiene and girls of child-bearing age for vaccination against tetanus. Information provided by the school nurse showed that the commonest medicines for de-worming included ketrax, albendazole and zentel (Akello, Reis, Ovuga, Rwabukwali, Kaboneka, and Richters, 2007).

The WHO recommended four drugs for STH treatment: albendazole, mebendazole, levamisole, and pyrantel (Albonico, Allen, Chitsulo, Engels, Gabrielli, Savioli; 2008). Benzimidazoles (Albendazole and Mebendazole) are more appropriate for use in large-scale campaigns because there is no need to weigh the children. Levamisole and Pyrantel Pamoate are also recommended by WHO for treatment of soil transmitted helminths. However the correct

dose is calculated on the child's weight (Levamisole 2.5 mg/kg and Pyrantel pamoate 10 mg/kg), making it logistically difficult to use in large-scale campaigns. It was recommended that for treatment of all children under 5 years of age, chewable tablets must be used and since findings have shown that these drugs are extremely well tolerated by infected and non-infected individuals and whole communities at risk of STH infections. The WHO recommended that it is safe for paramedical and trained non-medical personnel to administer the drugs (Albonico, 2008).

Table 2.1 WHO recommended drug and dosage for treatment of Intestinal Parasititic Infection

Drugs	Dose by age		Comment
	1-2 years	2 years and above	
Albendazole 400mg tablet	½ tablet	1 tablet	These two drugs are easy to administer because there is no need to weigh the children.
Mebendazole 500mg tablet	1 Tablet		

Albonico (2008) noted that at single doses, all four anthelminthics are very effective against *A. lumbricoides*, with cure rates (CRs) and egg reduction rates (ERRs) between 90% and 100% Albendazole is effective against the hookworms (CR 57%–95% and ERR 79%–99%) and has been shown to be more active than other anthelminthics against *N. americanus*. Ascariasis commonly coexists with whipworm infection, which appears to be more susceptible to albendazole than to mebendazole (Erlich, 2008)

Mebendazole is less effective in curing hookworms than albendazole, but nevertheless reduces the worm burden by >80%. Levamisole and pyrantel are active against hookworm infections, although benzimidazoles are the drug of choice in large scale deworming campaigns. Drugs such as mebendazole and pyrantel pamoate are the most useful in treating pinworm infections which some doctors believe does not require treatment since it has no symptoms. This is because children usually outgrow the infection. Because of the strong probability that small children will get infected again outside the home, strenuous efforts to eliminate the eggs from the household are of little help. If the doctor does prescribe medicine, all members of the household should take it, regardless of whether they have symptoms or not (Global forumn, 2008, Erlich, 2008).

Levamisole is less effective in curing infections, and both drugs have been shown to be more effective against *A. duodenale* (ERR ~80%) than against *N. americanus*, where repeated doses are needed, especially in heavy infections. Both benzimidazoles (albendazole and ~~mebendazole~~) have similarly poor efficacy in curing *T. trichiura* infections (CR between 10% and 77%), but significantly reduce the worm burden (ERR 60%-80%). Levamisole and pyrantel have little effect on *T. trichiura* (Albonico, 2008).

Bath et al (2010) noted that the effectiveness of the single -dose drugs are questionable (low cure rate) pointing out that Keiser and Utzinger conducted a systematic review and meta-analysis of available data concerning treatment with these antihelminthic drugs and concluded that new treatments are needed as the results obtained from single oral dose treatment against *T. trichiura* were found to be unsatisfactory, 72% for albendazole, 15% for mebendazole, and 31% for pyrantel pamoate. Continual re-administration of drugs is therefore necessary. Subramoniam,

Mohan. Kavitha (2005) however noted that Pyrantel pahmoate was found to be more useful than Albendazole and treatment for 2 days was more effective than single dose

Worm expellers are safe for administration and have been demonstrated to be with little or no side effects. At the dosages recommended for STH treatment, the incidence of side effects following treatment reported in literatures is very low and these includes migration of *A lumbricoides* through the mouth, occasional gastrointestinal symptoms (epigastric pain, diarrhoea, nausea, vomiting), central nervous system symptoms (headache, dizziness), and rare allergic phenomena (oedema, rashes, urticaria). All these reactions are minor and transient, usually spontaneously disappearing within 48 hours from onset without need for hospitalization (Albonico et al; 2008)

2.7.4 Age for the commencement of deworming and practice of worming

In most health centre and hospital, during routine health talks, it is customary to hear health workers advice patients and clients on routine deworming of children every three months. The extent to which this health information is correct or adequate is questionable and this may affect the level of compliance with it. Anh. Diep. and Trees (2007) observed that quite a number of people know they should be wormed at six month-intervals, or we should repeat worming process regularly but at intervals more than six months, even at one year to three year- intervals. Others opined that worming is only necessary when "there is a lot of worms", and some others opined that worming is harmful to health. Repeated and simultaneous worming for all individuals in families at Vietnam is rare, especially for adults who often will not repeat worming when the symptoms is less or disappear until the symptoms reoccur or they have had a terrible experience with IPI. Worming for adults is usually neglected. Many adults have been

wormed but the last worming recorded was dated more than three years ago. The reason for this is an absence of subjective symptoms. People look after children more than adults. Many adults especially men think they are not infected because of "having no pain", "feeling well", or "don't see worms out" (Anh, Diep, and Trees, 2007).

Literatures about deworming schedules are ironically scanty. The frequency of deworming should be based on the prevalence of intestinal parasite in the area. Where IPI is heavily endemic, deworming programs can improve iron status and prevent moderate and severe anemia, but deworming may be needed at least mice yearly (Stoltzfus, Albonico, Chwaya, Tielsch, Schulze, and Savioli, 1998). The Minister of Health in South Africa (2006) asserted that, it is especially important for children who are not growing well, but every child whether they are sick or well to receive the treatment every six months. In addition, children of school going age should receive deworming medicine on a regular basis, which is once to three times a year. Bath et al (2008) noted that because re-infection typically occurs, deworming needs to be repeated about once per year, or two to three times per year in highly infected areas. Periodic deworming at intervals of two-three months to prevent worm reinvasion or reinfection was recommended by Subramoniam, Mohan, and Kavitha (2005). Because reinfection typically occurs, deworming needs to be repeated about once per year, or two to three times per year in highly infected areas (DCPP, 2008). In 2006, the World Health Organization (WHO) revised its guidelines regarding act thresholds for deworming and now recommends treatment once n year where infection rates with any intestinal worm exceed 20% and twice a year where they exceed 50% or up to three times a year if resources permit (Hall and Horton 2009).

logically dunking, deworming of children should start after six months especially in endemic areas. This is because at this age, children would have started sitting down on the floor

and later crawl, hence they can pick up dirts infected with the eggs of IP. Also, these age group is the time for introduction to adult diets which can be infected with IP. However, Anh, Dicp, and Trees (2007) found out that some people opined that worming should start from the age of one year, while some others advocated for initiation of deworming in children from age of four years. This is because it is generally perceived by people that small children are not healthy enough to tolerate the toxicity of anthelmintics. Therefore, children should be wormed from two years of age at once a year, from five years of age at six month-intervals. The adolescent and adults can be wormed less frequently, at one to several year-intervals, because they require less worming with their better personal hygienic measures.

In 2002, a WHO Informal Consultation concluded that albendazole and mebendazole are safe and highly recommended for administration to children aged 12 months and older (WHO, 2009). There are no data on the use of these drugs in children aged less than 12 months. Therefore, it was suggested that children under 12 months of age should not be treated (unless indicated by a physician in a clinical setting). This fact was also corroborated by the Centre for disease control (CDC) while specifying deworming schedulees for refugees, recommended that children under 1 year of age should not receive presumptive treatment with ivermectin or albendazole but children older than 1 year of age can receive albendazole therapy (CDC).

Although medications are very effective in eliminating helminthes infections, however, reinfection is always a possibility and some types of worms appear to trigger changes in the human immune system that make reinfection easier. Patients may need to be following deworming treatment in order to ensure that the infection has been eliminated. Bundy (2003) however noted that it is only in the most highly infected communities that treatment is required more than once a year. The WHO (2005) pointed out that in a large study conducted in India,

six-monthly deworming was able , within two years, to prevent 82% of the stunting that occurs without intervention; dewormed children showed a 35% greater weight gain (WHO 2005). However, continual re-administration of drugs is necessary due to the non-effective elimination of worm burdens from treatment populations (Bath et al ; 2010).

2.7.5 Procurement of anthelminthics

In Nigeria, generally, drugs for deworming are easily available and accessible. They could be given at the hospitals or purchased at patent medicines / pharmacy stores with or without prescription by a doctor. Treatment for intestinal worms is simple, cheap and effective (Global forum 2008). People like modern medicine because of its better effectiveness, convenience and availability, but they think it is more toxic (Anh, Diep, and Trees (2007). Anh, Diep, and Trees (2007) noted that the majority of people surveyed in Vietnam buy orthodox anthelmintic at the addresses of their choice and a few can get theirs from the hospitals. Others believe in and use the traditional remedies to treat worm infection and get their medicines from traditional practitioners located at various places in the community.

Psychologically, people are more interested in the effectiveness of drug used than in the price. However, most of the respondents in Vietnam buy locally manufactured, low or medium priced anthelmintic. Few of them buy the imported product because of its high price (Anh, Diep, and Trees, 2007). Tanner et al (2010) noted that anthelmintic medication is relatively available in the area and is often given free of charge during childhood vaccination. Anthelminthic medication can also be purchased in pharmacies or from traders but Tsimanes' obtain pharmaceutical treatments from pharmacies or stores in local market towns, from traders who

visit their villages, or from other visitors to their villages (i.e researchers, vaccination campaigns). Acka et al (2010) observed that at Cote d'Ivoire, the majority of participants in a survey ranked medical treatment as the most effective approach and 84% of the household claimed to have taken anthelmintic drugs, among which 58% had taken medicine sold on local street markets and 49% traditional medicine. Medical treatment was considered to be relatively inaccessible and hence traditional medicine and drugs from local street markets were used instead. Two-thirds of mothers reported they were unable to pay for the health services they needed (Curtale et al 1998).

Ulukanligil (2008) also observed that 75% of the parents indicated willingness to pay for the drugs. Loung (2003) made it clear that the experiences of large-scale school de-worming activities in Ghana and Tanzania demonstrated that parents and children realised the benefits in terms of improved health and school performances through de-worming. More than 90% of parents in the project schools in both Ghana and Tanzania indicated a willingness to pay for continuation of drug treatment (Brooker et al. 2000).

However, Bath et al (2010) pointed out that actions against STHs are constantly challenged by factors such as availability and affordability of anthelminthic drugs, the efficiency and limited coverage of deworming programs among others. The cost of delivering one round of treatment is approximately $0.15 per child for children when administered in school, and $0.25 per child for preschool children when combined with another intervention in programs such as Child Health Days or in primary health care facilities (Hall and Horton, 2000). Therefore, although single-dose drug costs are relatively under control due to recent heightened awareness and research to drive down costs of treating neglected tropical diseases (the total cost for treatment with albendazole is 0.25-0.50 USD per child using the school system for delivery), it

ultimately can be expensive to carry out several long-term deworming programs (Bath et al, 2010).

2.8 Benefits of deworming

According to the WHO (2004), successesss recorded in deworming was based on knowledge and experience from controlled operational research, extensive trials and powerful advocacy. Regular deworming will help children avoid the worst effects of infection even if there is no improvement in sanitation. The economic analysis of benefits of deworming is best applied to children who can be kept free of moderate or heavy worm burdens throughout their childhood by deworming often enough to prevent moderate to heavy infections from accumulating, ideally supported by sanitation and health education. Periodic deworming also helps to reduce transmission by removing worms (Hall and Horton, 2009).

The growth rate and weight gain of children who are regularly de- wormed is higher than those who are not; hence, regular deworming is the best solution for many of the childhood illnesses (UNICEF,2001). FRESH (2010) noted that anthelmintics may reverse growth and nutritional deficits caused by even modest worm infection, pointing out that intervention studies have shown that infection with as few as ten roundworms is associated with deficits in growth of school-age children and that moderate whipworm infections can cause growth retardation and anemia. There is a significant reduction in wasting, malnutrition and anaemia in children after deworming. According to the WHO (2004), the benefits of deworming on malnutrition and anaemia in preschool children have been demonstrated in recent studies from India and Nepal. The evidence calls for inclusion of young children in control programmes where helminth infections are endemic since the studies have further confirmed the safety of deworming

treatment in this age group. Therefore, both school age and pre-scool children are at great risks and both would benefit most from deworming.

In young rural African children with prevalent helminth infections and malnutrition, a placebo-randomized trial was conducted to measure the effects of low-dose daily iron and/or 3-monthly deworming on growth, iron status and anemia, and development. It was observed that periodic deworming after 12 months reduced mild wasting, malnutrition by 62% reduced the prevalence of small arm circumference by 71% in children < 30 months reduced moderate anaemia (Hb < 9 g/dl) by 59% in children < 24 months, and improved appetite by 48% in all children. In addition, periodic mebendazole had a positive effect on children's motor and language development (Jukes, 2006).

Stoltzfus et al (1998) observed that deworming had no effect on annual hemoglobin change or prevalence of anemia. However, the relative risk of severe anemia (hemoglobin < 70 g/L) was 0.77 (95% confidence limits: 0.39, 1.51) in the twice-yearly deworming group and 0.45 (0.19, 1.08) in the thrice-yearly deworming group. It was estimated that the deworming program prevented 1260 cases of moderate-to-severe anemia and 276 cases of severe anemia in a population of 30,000 school children. Although the deworming programs had no overall effect on the prevalence of anemia, the incidence of more severe forms of anemia was lower in the thrice-yearly deworming group. Severe anemia was reduced by 23% in the twice-yearly deworming group and by 55% in the thrice-yearly deworming group. Although the reduction was large in the thrice-yearly deworming group, therefore anthelmintic therapy might bring about an improvement in children's growth as well as in erythropoiesis and iron storage.

Deworming makes a significant contribution to the education of children, and in so doing to a nation's development as it enhances childrens education through better school

attendance and performance and thereby contributes to national development as results from studies in Jamaica and Kenya shows that children enduring intense infections spend fewer days in schools compared with those who are free from infection. Not surprisingly, children experiencing the debilitating effects of worm infections spend fewer days in school compared with those who are free from infection. For example, children enduring intense infections with whipworm miss twice as many school days as their infection-free peers however. children who have been treated gain much more from their increased time at school because their cognitive performaces also improved. Tests have shown that a child's short-term me mory, long-term memory, executive function, language, problem solving and attention respond positively to deworming. Interestingly, girls display greater improvements than boys. In addition, periodic mebendazole had a positive effect on children's motor and language development (WHO 2004).

Jukes (2006) reviewed literature extensively and concluded that when infected children are given deworming treatment, immediate educational and cognitive benefits are apparent only for children with heavy worm burdens or with nutritional deficits in addition to worm infections. He pointed out that one study in Jamaica (Nokes et al., 1999) found around a 0.25 SD increase in three memory tests attributable to treatment for moderate to heavy infection with whipworm (*Trichuris trichiura*). But for most children, treatment alone cannot eradicate the cumulative effects of lifelong infection nor compensate for years of missed learning opportunities. He asserted that deworming does not lead inevitably to improved cognitive development but it does provide children with the potential to learn. This suggests that children are more ready to learn after treatment for worm infections and that they may be able to catch up with uninfected peers if this learning potential is exploited effectively in the classroom. Jukes (2006) noted that two studies (Jukes et al., in prep, Stoltzfus et al., 2001) have demonstrated cognitive improvements in

preschool children following combined treatment for worm infections and iron deficiency anemia.

However, the DCPP (2008) observed that a study in Kenya showed that deworming children reduced primary-school absenteeism by at least one-fourth in the first two years of the project. The gains were largest among young children, who suffered the most intense worm infections. In terms of cost-effectiveness as an educational intervention, deworming proved to be far more effective at improving school attendance than other educational interventions. Additionally, because education has a high return on investment, deworming offers large payoffs.

According to DCPP (2008), periodic deworming in high-risk groups can ensure that the levels of infections are kept below those associated with ill health. Deworming often results in immediate improvements in child health and development, and because it is also inexpensive it is the most cost-effective approach to reducing ill health associated with helminths. Similarly, the health, educational, and economic consequences of helminth infections can be avoided through early intervention to treat the infections, particularly in women of reproductive age and children.

Studies of pregnant women showed that deworming treatment reverses anemia and improves birth weight and infant survival (WHO, 2004). A randomized trial in Sierra Leone demonstrated the additive effect of iron and albendazole treatment in the improvement of haemoglobin concentration in the third trimester of pregnancy. This was followed by a major study in rural Nepal that demonstrated in a most convincing and controlled fashion that deworming greatly improves the health of all pregnant women and the birth weight and survival of their infants. The researchers demonstrated that receipt of albendazole in the second trimester was associated with a significant decrease in the prevalence of severe anaemia in treated

mothers, that the birth weight of babies from mothers given two doses of albendazole rose on average by 59g. and that the infant mortality rate at 6 months had fallen by 41% (DCCP, 2008). Regular, synchronised deworming is the quickest way to help these children and to eventually reduce the overall cost of health care (Fincham and Dhansay, 2005)

Bundy (2003) gave the following as benefits of school based deworming programme:

- Deworming contributes to Education for All
- Deworming is an exceptionally low cost intervention (especially with inclusion of deworming activities in ongoing, well-organized, large-scale interventions with a strong monitoring system, such as immunization campaigns, micronutrient distribution interventions or mother and child health days (Gabrielli, 2008).
- Deworming gives a high return to education and labor income
- Deworming has major externalities for untreated children and the whole community
- Deworming targets one of the most common, long-term infections of children in low-income countries
- Deworming contributes to an effective immune response (Gabrielli, 2008) and it increases vitamin A absorption. This view is also supported by Bundy (2003), who concluded that worm-free children have a better vitamin A status.

2.9 Usefulness of deworming in achieving the Millenium Development Goals (MDG)

The WHO (2005) highlighted the underlisted as the usefulness of deworming in helping to achieve the MDGS:

Goal 1: Eradicate extreme poverty and hunger- Deworming was found to boosts the prospects of school-age children to earn their way out of poverty highlighting that the improvements in intellectual development and cognition that follow deworming have been shown to have a substantial impact on professional income later in life based on studies conducted in USA and Japan. Studies conducted in the USA estimated the benefits of a hookworm-free childhood at around 45% of adult wages. When these estimates are applied to a developing country like Kenya, studies show that deworming could raise per capita income from the present US$ 337 per person to approximately US$ 490 per person. In Japan, successful deworming programmes in the 1950s are considered one reason for the country's subsequent economic boom.

Goal 2: Achieve universal primary education- In 2003, a report to the United States Congress on the world economic situation concluded that in developing countries treatment of school children with deworming drugs can reduce primary school absenteeism by 25%, leading ultimately to higher wages. This finding agrees with data on United States school children, which showed a 23% drop in school attendance in children infected with hookworm. Moreover, when compared with other measures for improving school attendance, deworming was ranked as by far the most cost effective. The evidence is most compelling when viewed at the global level. Of the estimated 562 million school-aged children in the developing world, worm infections are estimated to cause around 16 million cases of mental retardation in primary school children and 200 million years of lost primary schooling

Goal 3: Promote Gender equality and empower women- A girl's best head-start in life is a good education. It is also her best chance of finding employment outside the agricultural sector. Although the gender gap in education is slowly closing in the developing world, the percentage

of boys in schools still out numbers that of girls globally. Deworming programmes, especially when associated with other simple measures such as school enrolment by girls improved their drop-out and retention rates. In 2000, a pilot project in Nepali schools, involving deworming tablets, a hot afternoon meal and food gifts for girls to take home, resulted in a 43% growth in school enrolment by girls.

Goals 4, 5: Reduce child mortality, improve maternal health- Worm infection weakens very young children in ways that increase their vulnerability to infections diseases. Recent studies conducted in areas where malaria is a major childhood killer show that deworming and the resulting reductions in anaemia improve the chances of surviving severe malaria as evident by the large reductions in wasting, malnutrition and anaemia that followed deworming which contributed to the survival as well as development of these children. Similarly, as it was found that poor nutrition in general and anaemia in particular are the main underlying causes of poor pregnancy outcomes in the developing world. Deworming drugs – which can be safely administered during pregnancy – contributed directly to maternal survival. In anaemic women, the risk of dying during pregnancy or childbirth is up to 3.5 times higher than in non-anaemic women. Abundant evidence shows that regular deworming reduces anaemia in adolescent girls and women of childbearing age, thus preparing them for a healthier pregnancy. A large study of pregnant women in Nepal has shown that women given a deworming drug (albendazole, for treatment of soil-transmitted helminths) in the second trimester of pregnancy had a lower rate of severe anaemia during the third trimester. Deworming also improves birth outcome as evidenced by studies conducted in Guatemala and in Sri Lanka.

Goal 6: Combat HIV/AIDS, malaria and other diseases- While worm infections do not cause the same high mortality as that of AIDS and malaria, they do number among the "other diseases"

that impair the health, physical and mental development, and productivity of huge numbers of the poor. In so doing, they anchor large populations in poverty. Reducing worm infections and other ancient companions of poverty builds the very foundation for good health and – in the spirit of the Millennium Development Goals – contributes to human progress. Evidence that worm infections may influence the clinical burden of AIDS and malaria is just beginning to emerge. One recent study indicates that worm infections disrupt the immune response in ways that could hasten the progression from HIV infection to AIDS. Another recent study found that malaria attacks were more frequent in persons infected with intestinal worms. Even though it was suggested that these studies need to be confirmed, the role of deworming in building good health during a critical period of life has been amply demonstrated.

Goal 8: Develop a global partnership for development. This goal includes a target, to be achieved in cooperation with pharmaceutical companies, of access to affordable, essential drugs in developing countries. Many studies have clearly shown that morbidity can be significantly reduced through repeated and regular treatment with single-dose drugs delivered through school health programmes. The drugs are safe, inexpensive and simple to administer, and thus ideally suited for mass administration. Because such huge numbers are affected, the benefits of bringing these drugs to the masses in need is likewise huge. Systematic delivery of deworming drugs in sustainable ways is a pro-poor strategy with great potential for development. That potential is further amplified by its suitability for integration with other mass-treatment programmes for diseases of the poor – onchocerciasis, lymphatic filariasis, blinding trachoma, and the foodborne trematode infections. As these are diseases of the poor, they frequently overlap, thriving under the conditions of poor hygiene and sanitation seen throughout the developing world.

According to the WHO (2004), concurrent use of anthelminthic drugs for schistosomiasis and soil-transmitted helminthiasis results in the following:

- Considerable coverage of primary school-age children through schools
- Extension of deworming to pregnant and lactating women
- Inclusion of preschool children as young as 12 months in deworming activities
- Deworming can be combined with other health interventions
- Deworming can increase community health awareness and compliance
- Deworming serves as an entry point into health care systems
- Deworming represents a high return for low investment
- Benefits for participating communities include increases in growth rates of children, better school attendance and performance, improved iron status, decline in anaemia rates, healthier pregnancies and birth outcomes, greater adult productivity.

Also, an added bonus is that a dewormed child may respond better to vaccination (WHO, 2007)

2.10 Global response to intestinal worm control

According to the WHO (2004), nearly 2 billion people worldwide are infected with soil-transmitted helminthes (intestinal worms) or water-borne trematode worms called schistosomes. many of those affected by worms live in low and medium income countries (LMIC) and do not have access to clean water and functional sanitation systems. Worm infections, while not immediately life-threatening, can have a significant negative impact on a child's cognitive ability and general health. Worms also present a barrier to increased economic development since children who have worms are less likely to be productive as adults. When considering disability-adjusted-life-years (DALYs), NTD, including hookworm, rank among diarrheal diseases,

ischemic heart disease, malaria, and tuberculosis as one of the most important health problems of the developing world. It has been estimated that as many as 22.1 million DALYs have been lost due to hookworm infection alone. DALY is a composite measure that combines the number of years lived with a disability and the number of years lost to premature death.

The costs of antihelmitics are quite low, so also is the capacity cost of deworming interventions. Implementing deworming activities for school-age children is probably the most economically efficient public health activity that can be implemented in any low-income country where such infections are endemic. This is because teachers can be used to deliver antihelmithics to students (WHO: 2004).

Presently, a number of prominent health organizations and experts have promoted the deworming of children in the developing world as a potentially effective public health and development strategy. In low and middle-income countries (LMIC) where deworming policies have been adopted, it has generally proven to be a highly effective and economically efficient public health intervention. Because of its proven effectiveness and the relatively low cost of intervention, deworming has attracted the attention of public health officials, development experts, and others concerned with global health.

Recently, there has been increasing interest to address the public health concerns associated with IPIs. For example, the Bill and Melinda Gates Foundation recently donated US$34 million to fight NTD including hookworm infection. Former US President, Clinton also announced a mega-commitment at the Clinton Global Initiative (CGI) 2008 Annual Meeting to

Feed The Children, a Christian, international, non-profit relief organization with headquarters in Oklahoma City, Oklahoma, is an organisation committed to donating 300 million deworming tablets over three years to support national school-based deworming programs strategically identified through Deworm the World.

Loung (2003) asserted that the United Nations Children's Fund (UNICEF) has supported governments for years to assist in the provision of water supply and sanitary facilities and intensive hygiene education in many schools through the Water, Environment and Sanitation (WES) programme. The UNICEF supported School Sanitation and Hygiene Education (SSHE) programme could effectively enhance children's behavioural change to break the routes of worm transmission and other waterborne diseases.

The WHO (2004) therefore recommended that for effective long-term improvement of health and well being of children and communities, de-worming school children should be linked with SSHE and the community-based WES programme as preventive interventions and not as an isolated activity. Furthermore, the availability of segregated sanitary toilets in schools for boys and girls would enhance the enrolment of girls and help ensure completion of education in many rural areas. In 2001, the 54th World Health Assembly passed a resolution demanding member states to attain a minimum target of regular deworming of at least 75% of all at-risk school children by the year 2010. A 2008 World Health Organization publication reported on these efforts to treat at-risk school children. It is interesting to note that only 9 out of 130 endemic countries were able to reach the 75% target goal, and less than 77 million school-aged children (of the total 878 million at risk) were reached which means that only 8.78% of at-risk children are being treated. While there is progress being made globally, these numbers are pointers to the

fact that more work is still needed especially in Nigeria where there is no national committment to IPI control and deworming efforts.

2.11 National response to intestinal worms

Ekpo et al (2008) observed that at present, there is no national school-based parasite or soil-transmitted helminthes control programme in Nigeria. They also noted that in the past, there have been sporadic and uncoordinated deworming programmes undertaken by government officials without any baseline information or data. In 2008; an indigenous pharmaceutical company in Nigeria, Emzor Pharmaceutical Industries Limited partnered with the Lagos State Government for the 2008 Mass De-worming Exercise for primary school children in Lagos State. ZOLAT (Albendazole) a single dose therapy recommended by the WHO was used for the excercise. About 5000 pupils from 31 schools were de-wormed at the 2008 mass de-worming program held at Oshodi Local Government Area. The deworming programme was necessitated by the need to improve the survival and growth rate of the children and provide them with a unique opportunity to develop properly, physically and mentally (Emzor News ,2009).

In 2009, the former First Lady of Nigeria, Hajia Turai Umaru Yar'Adua, flagged off de-worming exercise for school children organized by her NGO, the Women and Youth Empowerment Foundation (WAYEF). She pledged that WAYEF would partner with Governors' wives to ensure that all school children are covered within the shortest possible time to ensure that the whole country is covered. The exercise is to guaranty the healthy living of Nigerian children who are the leaders of tomorrow (WAYEF, 2009).

According to Ann M. Veneman, UNICEF Executive Director, "Malnutrition is a silent emergency in Nigeria," and pointed out that more children die in Nigeria than any other country in Africa, largely from "preventable disease" which she described as unacceptable. "Among children under age five, 29 per cent are underweight. Nearly 3 million children are suffering from chronic malnutrition and more than 1 million from stunting. During the Child Health Weeks in 2004, children, especially those in rural areas, received immunizations, de-worming medicines, and insecticide-treated mosquito nets (UNICEF, 2004). In addition, mothers received counseling on key household practices such as breastfeeding and basic hygiene (Afrol news, 2005)

2.12 Other control measures for IPIs

2.12.1 Improved Sanitation

It is known that poverty, low socio economic and poor environmental states encourages the endemicity of intestinal parasitic infection in populations. According to DCCP (2008), when improvements in sanitation are made alongside deworming, the results obtained last longer. Adequate sanitation removes the underlying cause of communicable diseases and benefits communities beyond eliminating worms and parasites. But the investment in sanitation needed to interfere with the transmission of helminths may be high. Improving hygiene is a huge undertaking that requires the cooperation of the society as a whole.

2.12.2 Health Education

For effective deworming outreaches and desirable behavioural change, the role of health education cannot be over emphasized. It is important to health educate populations and those at

risk or highly endemic areas with intestinal parasites in order to achieve attitudinal change. This also involves exploring the local beliefs and practices that encourage the habitation of intestinal parasites in human bodies and efforts at informing them appropriately. Increasing people's health awareness is always beneficial, but its effectiveness in reducing the transmission of worms is unclear. Few studies have measured the effects of health education on helminth infection rates or determined the cost-effectiveness of this approach in isolation. Nevertheless, health education builds trust and engages communities and therefore can be critical to the success of public health initiatives (DCPP, 2008) like deworming. Also, Loung (2003) pointed out that children's deworming programme has proven to be an effective entry point and educational tool to create the demand for household sanitary latrines, for use of safe water and improved hygiene behaviour change in communities based on some project experience. On seeing worms coming out from their children bodies, parents were convinced of the need for a clean environment, for the use of sanitary toilets and for handwashing with soap. An 80% reduction of childhood diarrhoea was achieved within 12 months of intervention and many households had built and used simple sanitary toilets (Luong, 1987). However, the project proved that hygiene education alone would not lead to behaviour change unless strengthened by the availability of safe drinking water and sanitary facilities in enabling environments (Loung, 2003).

Evaluations of numerous public health interventions have generally shown that improvement in each individual component ordinarily attributed to poverty (for example, sanitation, health education, footwear, and underlying nutrition status) often have minimal impact on transmission. However the long term solution is to promote changes in behaviour through public health education so that people use latrines (Nock *et al*., 2006) and to install effective sanitation to keep people and human faeces apart (Hall and Horton, 2009). Preventive

chemotherapy targeting school-aged children (only) has limitations, as older population segments are neglected, and hence lack knowledge about how to prevent and control parasitic worm infections. Improved access to clean water and sanitation is necessary, along with health education to make a durable impact against helminth infections (Acka et al. 2010).

2.13 CONCEPTUAL FRAMEWORK

This study utilized the Health Belief Model (HBM) to explain preventive health behaviour as it relates to deworming of children. The HBM, developed in the 1950s is credited to a group of U.S. Public health service social psychologist (US Department of Health and Human Services, 2005) as a way to explain why medical screening programmes offered by the US Public Health Service, particularly for Tuberculosis, were not very successful. The original concept of the original HBM is that health behavior is determined by personal beliefs, or perceptions about a disease and the strategies available to decrease its occurrence (Hochbaum, 1958). The HBM holds that health behavior is a function of individual socio-demographic characteristics, perceptions, knowledge and attitudes and it is useful for predicting the likelihood of taking preventive health behavior e.g., deworming of children. The HBM has six dimensions:

Perceived susceptibility Personal risk or susceptibility is one of the more powerful perceptions in prompting people to adopt healthier behaviours. The greater the perceived risk, the greater the likelihood of engaging in behavior to decrease the risk. Perceived susceptibility motivates people to take preventive health behavior. A perception of risk or increased susceptibility is linked to healthier behaviours and decreased susceptibility to unhealthy behaviours. Although this is not always the case.

Perceived severity This construcls speaks about an individual's believe about the seriousness or severity of a disease. While perception of seriousness is often based on medical information or knowledge, it may also come from the belief a person has about the difficulties a disease will create or the effect it would have on his or her life in general (McCormick -Brown, 1999) It relates to the perception of seriousness of a disease condition or the consequences of not taking a preventive health behavior. For example, how does the mother or care giver perceive the seriousness of the effect or result of not deworming children on their health and well being? The perception of the mother on the negative effect of not deworming children regularly resulting in the child becoming under weight, listless, anaemic and not performing well at school may influence her adoption of regular deworming.

Perceived benefits This is a person's opinion of the value or usefulness of a new behavior in decreasing the risk of developing a disease. People tend to adopt a healthier behavior when they believe the new behavior will decrease their chances of developing a disease It plays an important role in the adoption of secondary preventive behavior e.g. screening for intestinal parasite and breast self examination (BSE)

Perceived barriers. This is an individual's own evaluation of the obstacles in the way of his or her adopting a new behavior. It was described as the most significant in determining behaviour change (Janz and Becker, 1984). In order for a new behavior to be adopted, a person need to believe the benefits of the new behavior outweighs the consequences of continuing the old behavior (Centre for Disease control and Prevention, 2004). This enables barriers to be overcome and the new behavior adopted. The individuals decision about the uptake or otherwise of a health

promotive action may be challenged by barriers such as, fear of not being able to perform the action correctly, economic ability, availability and accessibility of products.

Modifying variables

The four main construct of perception described above are modified by other variables such as educational attainment, culture, skill, motivation, cultural belief, religion, influence of significant others etc.

Cues to action. These are events, people, or things that move people to change behavior. Examples includes illness of a family member, media report (Graham.2002), mass media campaigns, advice from others, reminder post card from a health care provider (Ali, 2002) These are reinforcing factors that promote the adoption of preventive health actions e.g., influence of mass media to provide necessary enlightenment, availability of services and health promoting programmes, influence of social networks and significant others. Hearing a gingle on the need to deworm children regularly is a cue to action on promoting deworming.

Self efficacy. In 1998, self efficacy was added to the four constructs of HBM (Rosenstock, Stretcher, and Becker, 1998). It is the belief in one own's ability to do something (Bandura, 1977). People do not generally try to do something new unless they think they can do it. This relates to the confidence at carrying out the required health behavior. In this context, it relates to confidence at administering worm expellers correctly to children. Self efficacy can be achieved by observation, acquiring requisite knowledge and skill and by practicing the behavior required

Modifying factors - This includes age, level of education, marital status, number of children, type of family and perception of mothers and caregivers about intestinal worms and need for deworming.

BENEFITS: better health state, avoid anemia, improved intelligent quotient,

CONSTRAINTS: upbringing, cultural belief and values, economic power to purchase drugs regularly

PERCEIVED THREAT: fear that child can become sick, stunted, malnourished and learn poorly at school

Likelihood of initiating recommended preventive deworming intervention by major stakeholders

PERCEIVED SUSCEPTIBILTY: Belief that worms is a natural body constituent vs. worms can cause diseases in the body

PERCEIVED SEVERITY: Belief that no serious illness can result from intestinal worm infection vs. belief that serious illness can result from intestinal worm infection

CUES TO ACTION: reinforcing factors: influence of social network, significant others and mass media and health unit campaign, newspaper or magazine article that promote the adoption of deworming practice

SELFEFFICACY- confidence at correctly deworming children which can be improved by training and reinforcement of information.

Figure 2.8. Schematic application of health belief model to perceptions about intestinal worms and Practice of regular deworming

2.1.1 Application of Health belief Model to the perception of people about intestinal worms and the practice of regular deworming.

Perceived susceptibility to IPIs

Most times, especially among the rural resident that lacked basic knowledge of disease causation, IP are often thought to be normal residents of the body and they cause harm when the quantity of worms is too much. Tsimane's consider worm infections an unavoidable but mild health problem and most people feel they are chronically infected, but only a very small number of individuals consider helminth infections a reportable health concern (Tanner et al 2010). Anh, Diep, and Trees (2007) observed that majority believed that intestinal worm diseases are caused by hygienic factors such as eating in dirty conditions, dirty hands, or eating rotten, putrid foods rather than the faecal-oral route of transmission. Several other studies had associated worm infection with intake of foods such as drinking unboiled water, consumption of meat, sweets, over-ripe fruits, raw (uncooked) food such as raw green vegetable, blood curd, raw fish, raw sweet potatoes, and raw cucumber were severally perceived as key factors in disease transmission.

The relationship between consumption of specific foodstuffs and intestinal helminth infections likely relates to the associated abdominal symptoms (Acka et al; 2010. Curtale et al; 1998 ; Ulukangili, 2008). Intestinal worm infections are associated with eating of sweet foods. Only few of the respondents associated it with the possibility of worm eggs contaminating their food. (Acka et al; 2010). Because of this perception, some mothers try to restrain their children from eating confectionary as a measure of preventing worm infections (Anh, Diep, and Trees, 2007) and in many others instances, children with helminth infections were not allowed to

consume either meat or fruit. From a public health perspective, this is an important issue as these food items are of high nutritional value. Hence, restricting certain foodstuffs as they are perceived to be associated with helmintic infection may lead to, or further exacerbate, delayed child development (Acka et al; 2010). Similarly, Ulukangili (2008) observed that in Sanliurfa, Turkey 53.5% of interviewed parents did not know the causes of helminth infections whereas 46.5% of the respondents were aware of the causes of helminth infections. Some of the other causes of IPI as discovered by Ulukangili (2008) include contamination of vegetables by night soil, poor hygiene and dirty toilet, microbes, environmental sanitation, hands, improper feeding, eating seeds, flies and poverty.

On where exactly intesinal worms reside in human bodies, Anh, Diep, and Trees (2007) observed that majority of the study paticipants perceived that worms live in the human bowel; others l n the stomach. A minority however opined that worms live in the bowel but they travel to the stomach to get food. The symptoms of intestinal worms is often associated with different cultural beliefs and level of enlightenment. It is common to associate intestinal helminthiasis with normal peristaltic movement in the intestine.

Other symptoms often associated withn IPI includes different degree of abdominal pain ranging from mild to severe colic pain, intestinal cramps or feelings of "*something creeping, moving*" in the abdomen, the sign of abdominal pain is especially at hunger time, dyspepsia, frequent stooling, lying on the stomach, feelings of disturbance in the abdomen and/or some touchable lump in the abdomen at night. A large majority of the respondents asssociated IPI with pale skin and weakness because it is believed that worms have got all the nutritious food from the body (Anh, Diep, and Trees (2007). Ulukangili (2008) observed that 54.2% parents did not know the symptoms of the IPI whereas 45.8% were aware of them. The perceived symptoms of

intestinal worms infection mentioned by the parents in Turkey includes weakness, anemia. swollen belly, nausea, loss of appetite. diarrhea, fever. fatigue. hunger. anal itching, headache. abdominal cramps, vertigo, disruption of bowel etc.

Perceived severity of the condition

It is customarily believed in the Yoruba part of the Nigerian ethnic group that intestinal worms is a common constituent of the body and it is neeeded in the body. Most people do not associate the presence of IP in the body with any hazard. It is only when they are too many in the body that they are perceived to be dangerous or have any adverse effect. Cunale et al (1998) observed that almost all the respondents considered worms harmful and were aware of the need for treatment, however, only one-third of mothers of children with worms in their stools did not seek any treatment for their children. however, in part due to drug shortages in the area.

Ulukangili (2008) observed that only 13.1% of parents rated Intestinal helminthiases as a major health problem. Anh. Diep, and Trees (2007) also observed that some people considered worm infection as an illness, while others were of the opinion that worm infection is not an illness, However, most of the interviewees agreed that severe worm infection is dangerous and a cause of bad health since it is perceived to cause abdominal pain and has the ability to creep to many internal organs of the human body, others considered it as a simple issue. Some of the participants however believed that mild worm infection is not a disease, it is only when there are many worms in the body that it becomes a disease

Acka et al (2010) however observed that all household heads considered intestinal worms to be a serious disease as revealed by a quantitative questionnaire results. Common beliefs were that intestinal worms cause fatigue, liver damage, anemia, and other illnesses which

were believed to ultimately lead to the progressive destruction of the body. Most participants considered worms as a very serious problem in children, capable of causing fatalities in the absence of early treatment. One-fifth of the respondents perceived intestinal worms as inborn diseases. Result from the Focus Group Discussions (FGD) conducted revealed that participants did not establish a link between intestinal worm infections and contact with soil and only a few women attributed worm infections in children to the habit of soil consumption (Aeka et al, 2010).

Anh, Diep, and Trees (2007) observed that only few families that had suffered from and required treatment from IP considered it as one of the dangerous diseases. Others perceived it to be less dangerous than other diseases such as malaria, pneumonia, liver or stomach diseases etc. Ujukangili (2008) pointed out that majority of the surveyed sample considered that IP infection is normal. In ranking, IPI was ranked as less dangerous than some other diseases and as dangerous just as the cold or flu which is considered as the mildest illnesses and easiest to cure as well. Although IPI was not ranked as a high priority in the list of common diseases by the local people at the four investigated communes at Vietnam, the majority of the interviewees considered that helminthic diseases were harmful to human health. The older aged people believed that there should be a few worms in the human body, because worms were perceived to facilitate digestion of foods.

Generally speaking, the local people did not understand adequately the harms IP infection causes and its associated complications such as: bile stone (billiary Lithia sis), anemia, even death. Moreover, Ulukangili (2008) found out that 61.1% of the parents did not know the consequences of IPI, whereas 37.5% of them quoted anemia and 1.4% cited weakness as consequences of the infection.

Perceived benefits of intestinal worms in the body

It is generally perceived that intestinal worms are created by God for a specific reason in the body and it should be allowed in limited amount. Anh, Diep, and Trees (2007), found out that many of the respondents perceived that intestinal worms in limited amount is useful in that it helps in the digestion of foods in the human body thereby preventing indigestion and helping the body to have a feeling of hunger. Other perceived benefits of the presence of intestinal worms in the body included the movement of the worms in the bowel helps to clear the bowels and avoid constipation.Hence, the perception that it is not necessary to eliminate all the worms

Perceived benefits of deworming

People often assess the effectiveness of an anthelmintic by the amount of worms visually observed upon defeacation after taking an anthelmintic. The effectiveness of treatment is questioned when people don't observe any worms passed out. Some people wonder if the medicine can lead to the lysis of the worms. A good anthelmintic, according to peoples opinion, has to eliminate a large amount of worms. This may be up to as many as ten worms otherwise the quality of the antihelminthic is thought to be ineffective and this may lead to discontinuation of the regular worming schedule. Similarly in Vietnam, children frequently asserted that since they did not see worms when using flush toilets even after taking albendazole, they cannot quantify the effectiveness of the antihelminthics used (Anh, Diep, and Trees, 2007).

Ulukanligil (2006) while evaluating community perception of the implemented School Based Health Program (deworming), which delivered anthelmintics to 96,000 school children in Sanliurfa, Turkey pointed out that when the parents were asked about the benefits obtained from the school health program (deworming) 95 (65.9%) reported that their children had benefited

from the program whereas 33 (23.4%) of them reported their children had not benefited and 16 (11.1%) of them reported they did not know whether they got any benefits. The parents who declared that their children had benefited from the school health program said that the major benefits were expulsion of worms, increase in growth rate, learning about helminth diseases, increase of appetite, decrease of appetite, diminishing of abdominal pain, diminishing of anal itching, and improvement in well being of children.

Perceived barriers.

The individuals decision about the uptake or otherwise of a health promotive action may be challenged by barriers such as cultural belief, religion, influences of significant others etc. A major barrier that may militate against the use of antihelminthics are cultural beliefs of the people and financial constraint of the parents. If people believe that the use of antihelminthics is not essential, especiallly for their children, they will not give it to their wards. Also, if the prices of the antihelminthics drugs is thought to be expensive and beyond their financial capability, this may militate against the use of antihelminthic for the children and themselves. Traditionally, the use of antihelminthics is associated with some cultural beliefs.

Some people perceived that children are too young to take antihelminthics as it is too strong which might have deliterous effect on them. Also, it is customarily believed some segments of the Nigerian population believes that sugary things should be taken with antihelminthics in order to attract worms. Hence, the traditional belief of taking antihelminthics with sugar. Also, some fragments of population are of the opinion that antihelminthics should be taken on empty stomach early in the morning or last at night before going to bed as this is believed to combat intestinal worms better. In Vietnam, people believe in some supportive

means, which are "synergic" with anthelmintics such as taking medicine before meal while fasting, attracting worms by giving them their favorite foods (sweets, bananas, coconut jus, fried peanuts), having liquid meals (gruel, soup) etc. However, others living in communities around the sea side believe in the contrast that taking sweet things will help worms to develop. Some women recommend abstaining from sweets while taking anthelmintic because sweets can resuscitate worms. This opinion is quite popular among the fishing women and women sellers of traditional anthelmintics (Anh, Diep, and Trees; 2007).

Cues to action. These are reinforcing factors that promote the adoption of preventive health actions e.g., influence of mass media to provide necessary enlightenment, availability of services and health promoting programmes. Mothers' education was found to have a positive effect for the decreasing of parasitosis among children (Kanoo and Al-Hindi; 2009). Several studies have associated maternal knowledge with perception about intestinal worms and practices relating to it. Tanner et al (2010) found out that only maternal ethnomedical knowledge showed a protective effect against child hookworm infection, it was discovered that mothers with greater ethnomedical knowledge of plant-based cures were more likely to have children without hookworm infections. For example, mothers with greater knowledge may be more likely to effectively administer plant-based treatments to their children on a regular basis to prevent infection. Another possibility is that mothers with higher knowledge may be more likely to maintain plants believed to treat parasites in their gardens and treat their children if they suspect infection.

Most deworming programs are aimed at children of school age because most infections occur in this age group and school children are easy to reach and treat in schools. School-based

mass deworming programs have been the most popular strategy to address the issue of IPIs in children. School-based programs are extremely cost effective as schools already have an available, extensive, and sustained infrastructure with a skilled workforce that has a close relationship with the community. Teachers need only a few hours of training from a local health system to understand the rationale for deworming and to learn how to give out the pills and keep a record. With this little training in place, teachers can easily administer the drugs to pupils. Delivering the drugs in schools takes advantage of existing infrastructure, making it more cost-effective than distributing drugs through mobile clinics or to out-of-school children.

FRESH (2010) also noted that in addition, population dynamic theory has predicted that focusing treatment effort on this age group would significantly reduce transmission in the population as a whole (Bundy et al., 1990). Large-scale field studies have supported these conclusions. A school based program in Montserrat treated 95% of school children on a regular basis which caused a decline in intensity in both the treated children and the untreated population outside the school (Bundy et al., 1990). In Kenya, treating only school children had almost the same impact on S. mansoni re-infection rates as a comprehensive program that sought to treat the entire population. Population dynamic models of these data suggest that these observations can only be satisfactorily explained by the assumption that school children are the major contributor to helminth transmission (Chan & Bundy, 1997 in Bundy et al., 1990).

However, school-based distribution does not eliminate the need for other modes of delivery as is often encountered in practice as both pre- and- out-of- school children as well as adult are all infected with IPI. DCCP (2008) opined that in vulnerable communities, women of reproductive age and children not attending school are still at risk and may need deworming

drugs, which could be offered along with other health services and in addition, household distribution could be encouraged to cater for the pre-school and out of school children who also have a high worm burden. Awasthi, Peto, Pand, Fletcher, and Read (2008) pointed out that to this end in North India, the State Integrated Child Development Scheme (ICDS) provides a system of preschoolers and teachers that could potentially deliver treatment to younger children.

Recently, many people have begun to question if the school-based programs are necessarily the most effective approach. An important concern with school-based programs is that they often do not reach children who do not attend school, thus ignoring a large amount of at-risk children. The DCCP (2008) noted that a 2008 study by Nassa et al. continued the debate regarding schoolbased programs. The effects of community-directed treatments versus school-based treatments in the Tanga Region of Tanzania was examined and a major conclusion was that the mean infection intensity of hookworm was significantly lower in the villages employing the community-directed treatment approach than the school-based approach. The community-directed treatment model used in the study allowed villagers to take control of the child's treatment by having villagers select their own community drug distributors to administer the anthelminthic drugs. Additionally, villagers organized and implemented their own methods for distributing the drugs to all children. The positive results associated with this new model highlight the need for large-scale community involvement in deworming campaigns.

Similarly, in order to to see whether deworming would be feasible and beneficial for pre-school children, Awasthi, et al (2008) conducted a study on its effects on the growth of 4,000 children initially aged 1 to 5 years in the urban slums of Lucknow, North India. Over a 2-year period, the intervention successfully provided regular 6-monthly treatment to 95% of the

children targeted, and the treated children gained about an extra kilogram in weight when compared to untreated children in neighbouring slums. These results show that the pre-school program in India could provide regular deworming simply and cheaply, and suggest that poor and malnourished preschool children with a heavy worm load could show a substantial gain in weight.

The economic analysis of benefits of deworming is best applied to children who can be kept free of moderate or heavy worm burdens throughout their childhood by deworming often enough to prevent moderate to heavy infections from accumulating, ideally supported by sanitation and health education (Hall and Horton, 2009).

DCCP (2008) pointed out that many mass deworming programs should combine their efforts with a public health education. These health education programs often stress important preventive techniques such as: always wearing shoes, washing your hands before eating, and staying away from water/areas contaminated by human feces. But while these may seem like simple tasks, they raise important public health challenges. The fact is that most infected populations are from poverty-stricken areas with very poor sanitation. Thus, it is most likely that at-risk children cannot afford shoes to wear, do not have access to clean water to wash their hands, and live in environments with no proper sanitation infrastructure. Health education, therefore, must address preventive measures in ways that are both feasible and sustainable in the context of resource-limited settings.

The DCCP (2008) noted that a study found that the introduction of latrines into a resource-limited community only reduced the prevalence of hookworm by four percent and that another study in Salvador, Brazil found that improved drainage and sewerage had minimal

impact of the prevalence and no impact at all on the intensity of hookworm. This seems to suggest that environmental control alone has minimal effect on the transmission of hookworm. It is imperative, therefore, that more research be performed to understand the efficacy and sustainability of integrated programs that combine numerous preventive methods including education, sanitation, and treatment.

Deworming school children with anthelmintic drug is a curative approach for expelling heavy worm load. However, drug therapy alone is only a short-term measure for reducing worm infection in a target population. Re-infection is frequent within a short period and control measures through improved sanitation, hygiene and de-worming are needed to prevent infection and re-infection (Loung, 2003).

According to the WHO (2004), the Partners for Parasite Control (PPC), agreed that while worm-induced disease may not have such an obvious impact on the well-being of people as Tuberculosis (TB), malaria and human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), it is nevertheless a relentless drain on the health, development, education and economy of socially-marginalized poor people in low-income countries. The partners therefore propose that the control of parasitic worm infections (cestodiasis, dracunculiasis, lymphatic filariasis, onchocerciasis, schistosomiasis, soil-transmitted helminthiasis, strongyloidiasis and trematodiasis) should be effectively incorporated into a multidisease control approach together with TB, malaria and HIV/AIDS (WHO, 2004) noting that this strategy will contribute significantly to the attainment of most of the eight MDGs. It concluded that, without action to control worm-induced disease, measures to bring relief from TB, malaria and HIV/AIDS are incomplete and may be compromised.

CHAPTER THREE

METHODOLOGY

This chapter describes the research methodology used for the study. The main components of the methodology include the following: Study design, description of study area, the study population, sample size and sampling procedure, methods and instruments for data collection, validity and reliability, data collection process, data management and analysis, ethical consideration and limitation of the study.

3.0 Study design

This study was a descriptive, cross-sectional study, designed to assess the perception of mothers of U-5 children about intestinal worms and their practice of regular deworming and also identify the factors that influence their deworming practices.

3.1 Study setting

This cross-sectional survey was carried out in Moniya, a rural settlement under Akinyele local Government Area (LGA) which was founded in August 1976 being formerly part of Ibadan North District Council Authority. In 1989, Ido local Government was carved out of the defunct Akinyele LGA leaving it with the present structure of 12 wards namely Ikereku, Olanla/ Labode, Aroro, Onidundu, Moniya, Akinyele, Iwokoto, Ojoo, Ijaye, Alabata, Olorisaoko and Iroko. The LGA is one of the 33 LGA in Oyo state, south west of Nigeria, and it is the largest in terms of expanse of land mass out of all the local governments in the state covering about 575 square metres of land. The estimated projected population of the LGA was 574,915 out of which 286,612 were males and 288,303 were females (Projected Census of the NPC, 2006). Under one and under five populations are 21114 and 105563 respectively (Preliminary Report of

Investigation of Wild Polio Virus Case in Akinyele LGA, Oyo State, November, 2007. projected).

The administrative office of the LGA is located at Moniya, which is ward 5 of the LGA and it is made up of the following communities Asanmajana, Apapa, Isale Awero, Dagbolu, Labiyi, Tose, Barrack, Aleje/ Irepodun, Seriki, Abiola, Onilu, Elebu, Sawmill, Arikeuyo, Okeola, Aponmode, Abanise, Moruya, Balogun, Islamic, and Akuro. Moniya is highly populated by the Yoruba ethnic region while other tribes like Igbo and Hausa also reside there. The main occupation of the residents of the LGA is trading and farming. Others includes farmers, civil servants, skilled and unskilled workers.

The Oyo state government General hospital as well as a Grade C customary and a Magistrate courts are located within the administrative headquarters' compound for the health needs and smooth dispensation of justice within the area respectively.

The environmental condition of the area shows the presence of factors predisposing to intestinal parasitic infections in majority of the areas as described by Morenikeji et al (2008) such as poor sanitary conditions, inadequate water supply, unhealthy cultural practices and ignorance. Most of the people of the area had no toilet facilities and so defecated in nearby bushes, streams and around residential areas. It is common to see household liquid and refuse around the houses and on the streets.

In addition, a walk through the environment shows that the area was dirty, with clustered houses in most part of the area living in rooming apartments sharing conveniences, if available. Also, there are no refuse collection bins around houses except few mammoth bins located in few places on the main street of the area. Hence, it is common to see children playing in dirty or filthy environment, playing and swimming in natural water bodies and the natural

geophagus habit of children also facilitating the transmission of the parasites (Odelowo (1990) and Ighoboja , Ikeh (1997) in Morenikeji et al (2008) in the area Lack of these adequate sanitation infrastructure will make efforts at eliminating intestinal worms ineffective. However, a part of the new development areas have better residential conveniences in place and better sanitation conditions.

Child rearing practices of the area is similar to those found in a rural area within the region. It is common for parents to use water to clean up for themselves and their children after defeacating as the use of toilet rolls for such purpose is uncommon. Also, parents do not often visit health centres for treatment of ailment in children as a first choice of action. Other remedies and alternatives would have been tried before resulting to institutional medical care when there are no improvements.

Similarly, the popular Akinyele cattle market and kraal is located very close to the study area and it was gathered that many of the males / household heads work as butchers which makes the family to have access to meat sources but the extent to which these animals are dewormed is uncertain. Also, dung from the cattle market was often used by farmers who were involved in subsistence agriculture in this area to fertilize their farms which may be a risk factor for the prevalence of intestinal parasite in the area and encourage its transmission.

According to the medical officer of health of the local government, the local government participates in the child health week and community deworming programme twice yearly but not many houses were usually covered as the supply of anthelmintic given to the LGA is usually inadequate to meet the population of children within the local government.

3.2 Study Population

The mothers and care givers of children that are aged 12 months – 59 months old, who are permanently resident in the study area as at the time of this study constituted the study population

1.1.Inclusion and exclusion criteria

The criteria for eligibility to participate in the study were two fold. One. the participant must be a mother or care giver of a child/children aged twelve months to < five years as at the time of study. Secondly, the participant must be permanently residing in the study area as the time of the study. This inclusion criterion automatically excludes those mothers and caregivers within the study setting who were not permanently resident at the study area and that do not have children within the stipulated age bracket as at the time of the study.

1.2.Sample size determination

The sample size was calculated for the survey using the documented 52% prevalence rate of intestinal worms in the study area (Morenikeji et al 2009) to be the estimate that gives the maximum sample size, with 95% level of confidence and 5% bound on the error of estimation. The minimum sample size required was 354 children. However, it was rounded up to 500

The sample was calculated using the formula below:

$$n = \frac{t^2 \times p(1-p)}{m^2}$$ (WHO, 1986)

n = desired sample size

t = degree of confidence 95% (standard value)

p = estimate prevalence of intestinal worms (52%- Moronkeji et al 2009)

m = margin of error (0.05)

$$n = \frac{1.96^2 \times 0.52(1-0.52)}{0.05^2}$$

$$n = \frac{3.8416 \times .52(.48)}{0.0025}$$

$$n = \frac{3.8416 \times 0.2304}{0.0025}$$

$$n = \frac{0.8851}{0.0025}$$

n = 354.04

n = ~354

Having known the minimum sample size calculated to be 354, incomplete response rate of 10% of the sample size was added and for recording error and improperly filled questionnaire, the sample size was rounded up to 500.

1.3. Sampling techniques

A multi-stage sampling technique involving three stages was used to select a total of 500 mothers and care givers of U-5 children within the study setting. This was done by following the steps below:

Stage 1:

The first stage was the selection of 50% of the areas into which the study site, Moniya was divided. This was done by the selection of eleven (11) out of the existing twenty-two (22) areas using simple random sampling (ballot) technique. This was done because it is not possible to cover the whole population of study given the time available to complete the study and financial constraint on the part of the researcher.

Stage 2:

Generating a list of clusters: A cluster was made up of houses and neighbourhood within the selected areas because the area did not have well laid out streets, the number of houses within each of the selected clusters of neighbourhood was determined and a rough estimate of the average number of buildings there made. The sample size of 500 was divided equally between the eleven areas which gives an average of 45.5, rounded up to 46 respondents per area. Based on the average number of houses in the area which was 150 houses, the 150 houses was then divided by 46 giving an average of 3.2 which gives the interval between the houses for the estimated number of respondents expected from each area. Therefore, 46 buildings per neighbourhood were selected from each cluster by systematic random sampling at the interval of every third house.

Stage 3:

Selection of eligible household. In each building, only one household was selected from the eligible occupants through simple random sampling. Any house at the third interval that did not have the eligible respondent that meets the inclusion criteria to be interviewed is omitted and the next house checked. In a house with more than one eligible mother or respondent, a ballot was cast to select the respondent.

1.4. Instrument For Data Collection

The instrument for data collection in this study was a pretested semi-structured questionnaire The design of the questionnaire was done after literature review and contained four sections labeled A-D. Section A focused on the respondents' socio-demographic characteristics. The perception of the respondents about intestinal worms was explored with the questions in Section B. Section C focused on the practice of regular deworming of children . Questions in Section D was used to determine the factors that influenced the respondents' practice of deworming.

3. .7 Validity of research instruments

Validity means that the instrument is testing what it is supposed to test. In order to ensure the validity of the instrument, literature search was done and a draft questionnaire was prepared in simple English language, which was then translated to Yoruba language by someone versed in both English and Yoruba languages for accuracy of translation. The essence of this is to allow for ease of administration and understanding of the concept especially for the illiterate respondents. The instrument translated to Yoruba was then translated back into English language

by an expert in the field in order to minimize the errors in translation and in order not to alter the meaning of the concepts and for face and content validity. Validity was ensured by asking the questions in an uncomplicated way with the permission to explain any difficult area for some respondent. The instrument was reviewed by the research supervisor, experienced researchers, health education specialists and colleagues to ascertain its content validity.

3.8 Reliability of research instruments

Reliability of a research instrument talks about the precision, reproducibility, or repeatability of the procedure (Bamgboye 2008). The instrument for data collection was pre-tested at Egbeda local government, a different community but with similar characteristics with the actual study area in terms of ethnic composition, religion, level of development, type of infastructural amenities and health facilities.

Ten percent (10%) of the questionnaire to be administered for the main study was used during the pre-test thus, fifty questionnaire was administered during the pre-test. The pre-test enabled the researcher know trends in participants responses, level of understanding of each item on it and the approximate time it will take to adminster the questionnaire. At the end of the administration, necessary corrections and modifications on the instrument such as reframing or removing difficult questions that was not easily understood before the main study was done.

The Cronbach's, Alpha model technique was used to measure the co-efficient of the reliability of the instrument using the Statistical Package For The Social Sciences (SPSS) computer software (Version 15). A co-efficient score of 0.05 and above was used to establish the reliabihy of the instrument. A co-efficient score of .685 was obtained which implied that the instrument was reliable. Appropriate corrections were made on the instruments as necessary

before they were finally used. Such corrections includes but not limited to a more logical arrangement of the section on perception of respondents on intestinal worms, item 20 where 'good effect' was changed to 'benefit'. Also, age when deworming should start was changed to months and years as against the month that was previously used in the pre-test. Patent medicine store was changed to patent medicine/ pharmacy shops. Similarly, item 43 (G) was changed from 'you need to fast overnight before you take it' to 'you need to use it before breakfast', it causes 'abdominal upset' was changed to 'stomach upset', support 'deworming programe' was changed to 'deworming intervention'. Other questions that were removed includes 'if your child is required to be dewormed when having immunization, will you support'? As it was found to be complicated. In addition, 'Not sure' and 'Don't know' was merged into 'Don't know' as they both represent the same idea and dosages of anthelminthics was omitted from the final questionnaire.

3.9 Recruitment and training of interviewers

Four (4) Research Assistants (RA): two males and two females were recruited as interviewers to administer the questionnaire to the target population. These were people with minimum of National Certificate of Education (NCE) and can communicate effectively in both English and Yoruba languages; in addition, they are resident within the Moniya communities as at the time of collecting the data. Appropriate training was conducted for them in order to ensure that they have common understanding of the instrument prior to the commencement of data collection. The training took two days and focused on the objectives of the study, sampling procedure, data collection procedure, ways to elicit information from the respondents and other ethical issues which needs to be addressed such as those relating to how to ensure confidentiality

and secure respondents' informed consent. It also focused on basic interviewing skills and how to review questionnaire to ensure completeness. The research assistants were involved in the pretesting of the questionnaire in order to create an opportunity for them to acquire practical interviewing skills.

They were trained on how to elicit information concerning each item on the questionnaire with a review of both version of the instrument. The verification of the competence and interviewing skills of the assistants was done through a role play during the pre-test of the instrument. They were involved in the collection of the data of the pre-test which affords them the opportunity to have practical skills, get aquainted with what obtains on the field and how they would eventually collect the main data.

3.10 Data collection process

The recruited research assistants who were previously trained and familiar with the community and can communicate effectively in English and Yoruba languages were paired into a male and a female and while administering the semi-structured questionnaire. Consent of the participants was sought and obtained verbally before the administration of the questionnaire after explaining the purpose of the study, the approximate time it would take, the benefits of the research and future incentives that may be gained. Data was collected in December, 2011.

The interview was conducted with the respondents alone either in the respondents' backyard, Verandah or other mutually agreeable venue within the house to ensure privacy of the respondents and to provide an enabling environment for free disclosure of information. The interviewer administered and recorded the responses of the respondents on the copies of the questionnaire. All the 500 copies of questionnaire administered were returned. The research

assistant filled the questionnaire as the interview was being conducted and answered any question the respondent may have. The RA then thank the respondents for the cooperation received.

Quality control was ensured during and after collection of the data by ensuring frequent monitoring and direct supervision of the research assistant to ensure they comply with the data collection procedure. After data collection, completed questionnaires were checked regularly to rectify any discrepancy, logical errors or missing values. Regular review of data report was carried out everyday to identify inconsistencies or invalid response in data collected

3.11 Data management and analysis

Serial number was assigned to each of the administered questionnaire for easy identification and recall of any instrument with problems and to facilitate entry of data into the computer. The questionnaires used were stored safely from destruction by liquid or fire and where unauthorized persons cannot have access to them. They will be destroyed after the defence of the dissertation.

The data collected from the questionnaire was cleaned, coded using a coding guide which aid in the coding of the participants responses. The data was entered into a computer software i.e. Statistical Package for Social Sciences (SPSS) version 15. Thereafter, the quantitative data was analyzed using descriptive statistics such as mean and median. Chi- square test was used to test for associations between the variables examined in the hypotheses. Differences in means of the perception of respondents on intestinal worms and practice of regular deworming was tested using the t-test. A ten-point perception scale was used to further assess the respondents'

perception on intestinal worms. A score of 0-4 was considered negative perception while 5-10 was regarded as positive perception.

3.12 Ethical considerations

Ethical principles guiding the use of human participants in studies were followed in the design and conduct of the study. As the participants to be included were mothers and care givers of children aged 12 -59 months, informed consent was therefore sought from them. Information concerning the essence of the research was made and clarifications when necessary were made so that participants could decide freely to participate or not. Voluntary participation was encouraged and those unwilling to participate were excused from participating in the study. Informed consent was obtained from each respondent verbally. Also, support for the study was sought from the gate keepers at Moniya community. Ethical approval of the study was sought and obtained from the Oyo State Ministry of Health Ethical Review Commitee (OSMHERC). Information obtained from the participants were kept confidential by using only assigned numbers and not names of the participants on the questionnaire.

3.13 Limitations of the study

The study employed a cross-sectional design and therefore the results are limited to the area for which the participants were surveyed. Also, there are scanty studies focusing on this topic which imposed some limitations that needs to be considered while interpreting the result. Only quantitative data collection technique was used however, due to logistic constraints, which could have underestimated the perceptions, as optimal perceptions assessment requires

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exploration using qualitative and quantitative techniques to explore issues about factors influencing the subject matter.

In addition, an exploration of the respondents' knowledge on the modes of transmission and prevention of intestinal worm infection apart from deworming would have been used to develop a quantitative instrument that would be tailored to the experiences of the respondents that participated in the study. Lastly, the study focused only on a ward situated in a rural population in the LGA and also on only the local Government Area (LGA) out of the 33 LGA in the state. This may hinder the generalization of the study findings to all mothers within the state.

CHAPTER FOUR

RESULTS

This chapter presents the result of this study. It consist of the following sub-sections: Socio-demographic characteristics, perception of the respondents about intestinal worms, practice of deworming of children, factors influencing the practice of deworming.

4.1 Section A: Socio-demographic Information.

The age distribution of the respondents is highlighted in figure 4.1. Their ages ranged from 15 to 72 years and their overall mean age was 29.2 ±7.6 years while the modal age range was 25-34 years representing (56.6%) of the respondents.

The distribution of the respondents according to their level of education revealed that 222 (44.4%) of the respondents had secondary education. 171(34.2%) had primary education. 51(10.2%) had tertiary education while 54(10.8%) had no formal education. Three hundred and twenty-five (65%) of the respondents were married, 98 (19.6%) were co-habiting, 68 (13.5%) were single. Others are shown in Table 4.1.

The Yoruba tribe constituted the predominant (89.6%) ethnic group followed by the Hausas which accounted for 32 (6.4%) respondents, Igbos were 6 (1.2%) while Ghanaians and Cotonue were 0.4% and 0.6% respectively (Table 4.1).

Trading was the predominant occupation practiced by 299 (59.8%) respondents, civil servants were 17 (3.4%), 113 (22.6%) were artisans, housewives and unemployed were 2.6% each, 2.4% worked in private organizations while 0.2% were students (Table 4.1). Four hundred and seventy-nine (95.4%) of the interviewee were mothers while twenty three (4.6%) were guardians of under five children (Table 4.1).

Figure 4.1 Respondents age groups in years

Table 4.1- Socio-demographic information of the respondents

N=500

Socio-demographic variables	Frequency (No)	Percentage (%)
Highest level of Education		
Secondary education	222	44.4
Primary education	171	34.2
No formal education	54	10.8
Tertiary education	51	10.2
Modern school	2	0.4
Marital status		
Married	325	65
Co-habiting	98	19.6
Never married	68	13.5
Widowed	6	1.2
Separated	3	0.6
Ethnicity		
Yoruba	448	89.6
Hausa	32	6.4
Igede	9	1.8
Igbo	6	1.2
Edoma	3	0.6
Ghanian	2	0.4
Occupation		
Trading	299	59.8
Artisan	113	22.6
Self employed	32	6.4
Civil servant	17	3.4
Housewife	13	2.6
Unemployed	13	2.6
Private organization	12	2.4
Student	1	0.2
Status of respondents		
Mother	477	95.4
Guardian / Caregiver	23	4.6

The numbers of children the respondents have ranged from 1-7 per woman with a mean of 2.8 ±1.3 children.

Three hundred and fifty three (70.6%) of the respondents were in a monogamous relationship while 147(29.4%) belonged to a polygynous family (Figure 4.2). Islam was the predominant religion practiced by 334 (66.8%) of the respondents, followed by Christianity 163 (32.6%) while 0.6% were traditional religion adherents.

4.2 Section B: Perception of respondents about intestinal worms

Out of the 500 study participants interviewed, 318 (63.6%) perceived that intestinal worms normally resides in human beings intestine, 49 (9.8%) disagreed while 133 (26.6%) cannot say categorically if intestinal worms resides in the intestine or not (Table 4.2). When asked whether respondents perceived that intestinal worms is transmissible from person to person. 353 (70.6%) pointed out that worms cannot be transmitted from person to person, 87 (17.4%) indicated that worms are transmissible while the remaining 60 (12.0%) were undecided (Table 4.2).

Majority (87.0%) of the respondents indicated that intestinal worm will always be in the intestine no matter what people do or fail to do. Only 35 (7.0%) of the respondents disagreed with this idea while 30 (6.0%) were undecided (Table 4.2).

More than half (62.8%) of the respondents perceived that intestinal worms should be allowed to stay in the body beacause it is believed to have its usefulness while less than a quarter (23.2%) disagreed with this idea while 70 (14.0%) cannot say if they are useful in the body or they are not useful (Table 4.2). When asked if children that are under the ages of five can have intestinal worms or not. Majority (65%) of the respondents do not agree that children under the age of five cannot have intestinal worms while a little above quarter (26.6%) perceived children that are under the ages of five are immuned to intestinal worms. Only 8.4 % of the respondents were undecided (Table 4.2).

Concerning the perception of the respondents on the time that people acquire intestinal worm 350 (70.0%) perceived that intestinal worms are present in the intestine from birth, and 73(14.6%) disagreed while 77 (15.4%) were undecided (Table 4.2). When the respondents were asked if only children that play with sand have intestinal worms, majority (71.6%) disagreed while 94 (18.8 %) agreed and 33 (6.6%) were undecided.

Greater than a quarter (32.2 %) of the respondents opined that intestinal worms does not negatively affect the health of children under the age of five but about half (51.6%) of the respondents believes in the contrary while 81 (16.2%) are undecided. On the perceived benefit of intestinal worms i.e if it helps in the digestion of foods, majority (66.4%) agreed that it helps in the digestion process while 15.6% disagreed and the remaining 18.0% were undecided if it helps in digestion or not.

Also, when the respondents were asked if intestinal worms have any benefit that it conferred on the health of children under the age of five, 240 (48.0%) of the respondents were of the opinion that it does not but 29.8% disagreed that it does have some benefit on the health of U-5 children while 22.2% cannot say. Lastly, on the need for intestinal worms in the body, the results from the study show that 347 (69.4%) of the respondents perceived that everybody needs a certain amount of intestinal worms to stay healthy while 16.8% disagreed and 13.8% were undecided (Table 4.2)

The mean perception score of the respondents was 3.7±1.5. Majority (73.4%) of the respondents had a negative perception while only 26.60% have positive perception.

Table 4.2- Respondents perception about intestinal worms

Statements on perceptions of respondents about intestinal worms	Agree	Undecided	Disagree
	No (%)	No (%)	No (%)
Worms normally reside in human beings intestine	318 (63.6)	133 (26.6)	49 (9.8)
Worms cannot be transmitted from person to person	353 (70.6)	60 (12.0)	87 (17.4)
Worms will always be in the intestine no matter what you do or did not do	435 (87.0)	30(6.0)	35 (7.0)
Intestinal worms should be allowed to stay in the body because it has its usefulness	314 (62.8)	70 (14.0)	116 (23.2)
Children that are under the ages of five do not have intestinal worms	133 (26.6)	42 (8.4)	325 (65.0)
Intestinal worms are present in the intestine from birth	350 (70.0)	77 (15.4)	73 (14.6)
Only children that play with sand have intestinal worms	94 (188)	33 (66)	373 (74.6)
Intestinal worms does not affect the health of under- five children in a bad way	161 (32.2)	81 (16.2)	258 (51.6)
Intestinal worms helps in the digestion of foods taken	332 (66.4)	90 (180)	78 (15.6)
Intestinal worms does not have any benefit on the health of under-five children	240 (48.0)	111 (22.2)	149 (29.8)
Everybody needs an amount of intestinal worm to stay healthy	347 (69.4)	69 (138)	84 (16.8)

4.3 Section C: Awareness and Practice of regular deworming

Using the signs of intestinal worms, necessity of deworming U-5 children and time at which deworming should start in children as a proxy of their awareness on deworming, two hundred and eighteen (43.6%) of the respondents could identify signs of worm infestation in their children by loss of weight, 35.6% by vomiting, 19.2% by not eating well, 11.8% by complaining of stomach pains, 0.6% when child is sleeping too much, while 3% do not know what signs to watch out for. Other opinion/signs identified by one hundred and fifty nine (31.8%) of the respondents includes being pale or whitish in appearance, salivating, passing out/vomiting worms, fever, diarrhoea/bloody/watery stool, itchy anus, fever, weakness, irritation on neck/chest, big stomach/noise in stomach, expanded umbilicus, rubbing hands on the stomach, over eating etc as shown in table 4.3.

A large proportion (82.8%) of the respondents agreed that it is necessary to deworm U-5 children, 14.4% disagreed with the necessity of deworming U-5 children while 14 (2.8%) do not know whether it is necessary or not.

When the respondents were asked the time they perceived deworming of children should start, 54 (10.8%) were of the opinion that it should start before six months, 261 (52.2%) support from twenty four months while 138 (27.6%) mentioned twelve months. (Other responses are as shown in Table 4.4).

Table 4.3 Awareness of respondents on signs of intestinal worms in children

Signs of intestinal worms observed by respondents*	No	%
Loss of weight	218	43.6
Vomiting	178	35.6
Not eating well	96	19.2
Pallor, fever/chills/sickly/weak/shivering/stunted	61	12.2
Stomach pain	59	11.8
Spiting/salivating/has irritation in the throat or chest/stretching neck/has hiccups	58	11.6
Big stomach /hard stomach/sound and noise in stomach/ indigestion/rubbing/touching navel/collections and expansion on navel	40	8
Child has blood / watery stool, pass worms, vomit worms, itchy anus.	18	3.6
Don't know	15	3
Eating too much/ eating cloths	2	0.4
Sleeping too much	3	0.6

* Multiple response

Table 4.4 The ages the respondents perceived deworming of children should start

Age (Months)	No	%
≤6	54	10.8
6-11	30	6
12*	138	27.6
≥13-23	17	3.4
≥24	261	52.2
Total	500	100

* The correct age as recommended by the WHO.

More than half (58.2%) of the respondents claimed they had ever deworm their under-five children at a point in time while 209 (41.8%) have never done so (Table 4.5).

Out of the 291 (58.2%) of the respondents that have deworm their U-5 children in the past, only 213 (73.2%) of the respondents claimed they did so recently while 78 (26.8%) of those that had ever deworm their U-5 child/children did not do so recently (Table 4.5).

When asked when last deworming was done, 52 (24.4%) of the respondents indicated that they did so in less than 1 month, 67 (31.5%) in a month, 50 (23.5%) two months, 18 (8.5%) in three months and 26 (12.1%) between 4-11 months preceeding the study. Overall, a total of 205 (96.2%) of those that claimed to deworm recently did so in about 6 months or less preceeding the interview (Table 4.5).

Table 4.5 Respondents' practice of deworming, how recently it was done and last time it was done

Ever dewormed	No	%
Yes	291	58.2
No	209	41.8
Total	500	100
How recently deworming was done		
Recently	213	73.2
Not recently	78	26.8
Total	291	100
Last time deworming was done (months)		
<1	52	24.4
1-6	153	71.8
7-11	8	3.8
Total	213	100

Only one hundred and fifty-two (52.2%) out of those that had dewormed their U-5 children in the past (30.4% of all the respondent) claimed they did so regularly while 139 (48.8%) did not (Table 4.6).

When the respondents who claimed they worm their under-five children regularly were asked to state how regularly this was done, the results shows every month (12.5%), every two months (2.0%), every three months (79.6%), every four months (1.3%), every six months (2.6%). Others are as shown in Table 4.6.

It was discovered that only 107 (36.8%) of the respondents' reportedly kept records of deworming for their U-5 children while 184 (63.2%) claimed they did not do so (Figure 4.2).

Table 4.6 Respondents practice of regular deworming and how regularly it was done

Respondents acclaimed regularity of deworming	No	%
Regularly	152	52.2
Not regularly	139	48.8
Total	291	100
Regularity of deworming		
Every months	19	12.5
Every two months	3	2.0
Every three month	121	79.6
Three times in a year	2	1.3
Every six months	4	2.6
Once in a while	2	1.3
When ill/ worm is disturbing child	1	0.7
Total	152	100

Among those that had dewormed their U-5 children in the past, majority (87.3%) of them usually use orthodox medicines in wonning their wards, 30 (6.0%) used local concoctions obtained from local drug dealers. 1.2% used lime while 0.2% pluck leaves to deworm their U-5 children.

Levamisole (ketrax) was the commonly used medicine by 71 (21.4%) of the respondents, others used piperazine citrate 27 (9.3%), pyrantel pamoate 24(8.3%). mebendazole 14(4.8%). and albendazole 2 (0.7%). While 116 (41.5%) cannot recall the names of the medicines used for deworming their U-5 children (Table 4.7).

Among the respondents that used traditional substances as worm expellers, only one per cent of the respondents could mention the exact name of the antihelminthics used and another one per cent mentioned leaves. However, 6 (16.2%) used lime as worm expellerst and many (56.8%) could not mention the names of the local substances they used as worm expellant.

A lagre number/greater proportion of the respondents (41.0%) sourced for the medicines and other substances used for deworming from patent medicine / pharmacy shops, 6.4% from hospitals/ health centres, 4.8% from traditional herbalist, others are as shown in table 4.8.

Table 4.7 Types and names of substances/medicines reportedly used for deworming U-5 children by the respondents.

Types of Substances /Medicines	No	%
Orthodox medicines	254	87.3
Local concoction	30	10.3
Lime	6	2.1
Leaves	1	0.3
Total	291	100
Names of Orthodox/ Medicines used for deworming *		
Levamisole	71	28
Piperazine citrate	27	10.6
Pyrantel pamoate	24	9.4
Mebendazole	14	5.5
Albendazole	2	0.8
Don't know the names	116	45.7
Total	254	100
Names of traditional Medicines used for deworming		
Mixture of concoction	3	8.1
Neem concoction	5	13.5
Lemon	1	2.7
Lime	6	16.2
Dr. Boss Alalakuleia	1	2.7
Don't know the names	21	56.8
Total	37	100

*The different brand names of drugs mentioned were converted to their generic names

Table 4.8 Source of products used for deworming by the respondents

Source of materials/ medicines used for deworming	No	%
Patent medicine/ pharmacy shops	220	75.6
Hospital/health centres	32	11
Traditional herbalist	24	8.3
Local drug vendors	7	2.5
Market	5	1.7
*Others	3	1.0
Total	291	100

- In-law, area nurse, father christmas at Amuludun FM (Radio station)

Relating to the effectiveness of the substances used in deworming in the past. 271 (54.2%) respondents adjudged these substances as effective. However, 0.4% thinks the substances were not effective while 3.6% cannot say how effective the substances used were.

On the signs of effectiveness seen by the respondents in their children after deworming. 202 (61.8%) of the respondents observed that their children passed out intestinal worms after taking the worm expellers. 40 (12.2%) observed improved appetite. 6.7% weight gain. 8.0% mental alertness. 2.4% improved strength while 0.9% affirmed that their children vomited intestinal worms as evidence of the effectiveness of the medicines taken. Other observations made by 26 (8.0%) of the respondents as signs of effectiveness of the medicines used for deworming includes stooling/smelly stool/eggs of intestinal worms seen in stool/ changes in stool, disappearance of fever, palor, stomach noise /pain, spiting, vomiting and changes in child/children and some claimed they do not see any sign but just know that the medicines were effective (Table 4.9).

Table 4.9 Signs of effectiveness of products used for deworming as observed by respondents

Perceived signs of substance effectiveness	No	%
Passing out the worms	202	61.8
Improved appetite	40	12.2
Mental alertness	26	8.0
Weight gain	22	6.7
Improved strength	8	2.4
Vomiting the worms	3	0.9
*Other signs	26	8.0

*Muliple response

*Other signs: Stooling/smelly stool/eggs of intestinal worms seen in stool/ changes in stool; disappearance of fever; palor, stomach noise /pain, spiting, vomiting and changes in child/children.

4.4 Section D: Factors influencing the practice of regular deworming

Using the practice of worming among mothers' respondents as a tool to assess their practice of deworming their children, majority 386 (77.2%) of the respondents indicated that they had deworm themselves at a point in time while 113 (22.8%) had never done so. But when asked how regularly these mothers deworm themselves almost half 248 (49.6%) of those interviewed claimed they deworm themselves once in a while, 14.8% did so every three months, and 32 (6.6%) every month. Another 16 (3.2%) claimed they deworm themselves once a year, 7 (1.4%) did so twice a year. 6 (1.2%) explained that they were deworm last as children, or when they have symptoms suggestive of intestinal worms such as abdominal pains, worms is disturbing them, they feel like using it, and others claimed it was last done a long time ago (Table 4.10).

Less than half (43.6%) of the respondents claimed that they deworm themselves in the last 1-5 years preceeding the study, about a quarter (32.6%) did so in less than a year of collecting the data, others date of last worming are as shown in table 4.10.

Table 4.10 Respondents' acclaimed practice of worming, regularity and last time it was done.

Mothers practice of worming self	No	%
Yes	386	77.2
No	113	22.8
Total	499	100
Regularity of self deworming		
Once in a while	248	64.2
Every three months	74	19.2
Every month	32	8.3
Once a year	16	4.1
Twice a year	7	1.8
Every 4 months	2	0.5
Every 2 months	1	0.3
*Others	6	1.6
Total	386	100
Time of mothers last deworming (years)		
<1 years	126	32.6
1-5	169	43.8
6-10	26	6.7
11-15	7	1.8
16-20	6	1.6
21-25	5	1.3
26-30	4	1.0
>30	1	0.3
I don't know	42	10.9
Total	386	100

*Other responses: When I was a child, when having abdominal pain, when worms is disturbing me, when I feel like using it, long time ago

Using the ability of the respondents to afford worm expellers as a parameter to assess practice of worming, majority of the respondents 340 (68.0%) indicated that they could afford the cost of deworming medicines for their children while 160 (32.0%) claimed they could not afford todo so.

More than half 285 (57.0%) of those interviewed claimed they regularly deworm the other children older than five years. 99 (19.8%) do not do so while 116 (23.2%) do not have children older than five years.

Further exploration of the reasons why the respondents did not deworm their children older than five years regularly included that 'they did not have / pass worms/ worms is not plenty in them, and they should only take worm expellers only when they need it 38 (38.4%), deworming medicines should be given when a child is not eating well/ there is a sign of worm 22 (22.2%). Another 18 (18.1%) opined that there is time for deworming/ children should use it occassionally, and 13 (13.1%) claimed the children are old/ not living with them/living with their in-laws/ they are too old to use it'. Five (5.1%) of the respondents affirmed that they did not know it is necessary / their mind is not there (on deworming). while 3% did not prefer any reason for not deworming their children that are older than years (Table 4.11).

Exploring the respondents opinion on how regular children should be dewormed as a factor that could possibly influence practice of deworming, majority of the respondents 304 (60.8%) were of the opinion that children should be dewormed every three months, 83 (16.6%) opined that deworming should be done once in a while. Few others 29 (5.8%) indicated that it should be done every month, while 20 (4.0%) favoured once a year deworming of children However, 17 (3.4%) do not have any idea of how regularly children should be dewormed while

2((4.296) were of the opinion that they should have it only when sick or show sign of intestinal worms (Table 4.12).

Table 4.11 Reasons respondents gave for not deworming other children >5 years regularly

n= 99

Reasons for not deworming children >5 years	No	%
Did not have worm/ did not pass worm/not plenty in them/when need it	38	38.4
When not eating well/no sign of worm	22	22.2
There is time for deworming/should use it occasionally	18	18.2
They are old/ not living with me/living with in laws /too old to use it	13	13.1
Don't know it is necessary/mind not there	5	5.1
No reason	3	3.0
Total	99	100

*Open-ended question

Table 4.12 – Perception of respondents on how frequently children should be dewormed

Regularity of deworming	No	%
Every three month	304	60.8
Once a while	83	16.6
Every month	29	5.8
Once a year	20	4.0
Every two months	11	2.2
Twice a year	8	1.6
Every day/week	2	0.4
Once in a while	7	1.4
Twice a month	2	0.4
*Others	21	4.2
I dont know	17	3.4
Total	500	100.0

*Others: When sick; have symptom; show signs

Exploring the perception of the respondents about deworming medicines to determine the factors that could possibly influence their practice. 370 (74.0%) of the respondents claimed deworming medicines has to be taken with sugar to be effective while another 353 (70.8%) affirmed that it has to be taken before breakfast. However, majority 399 (79.8%) of those interviewed were of the opinion that deworming medicines are readily available, it is not too expensive 413 (82.6%), it does not cause diarrhoea 395 (79.0%), it is more effective when compared with herbs 231 (46.2%), it does not cause vomiting 321 (64.2.0%), neither is it poisonous 411 (82.2%), nor does it cause stomach upset 329 (65.8%). Other responses are shown in Table 4.13.

Out of all the respondents interviewed, 449 (89.8%) were willing to support deworming interventions for the U-5 children while 91 (18.2%) were not willing to do so.

When asked to give reasons for their reluctance in supporting deworming interventions in the U-5s, 61 (67.0%) of those that do not support deworming interventions for the U-5 children feel they are too young and cannot have intestinal worms/ it should not be given before 5 years/ as it will affect them, 15 (16.5%) opined that it should not be used too much as it will affect their body/ use of deworming medicines should depend on individual child/body type/it is not good to use. Also, 7 (7.7%) of the respondents were of the opinion that it is not necessary/ it has to be used occasionally / worms has its usefulness. 3 (3.3%) said they will not support it unless they were told at the hospital or by the government that it is necessary. A minority 1 (1.1%) has no idea of its usefulness while 4 (4.4%) of the respondents gave no reasons for their reluctance in its support (Table 4.14).

Table 4.13 – Respondents' Perception about deworming medicines

Perception about deworming medicines	Yes	No	Dont know
They are not readily available	71(14.2%)	399 (79.8%)	30 (6.0%)
They are too expensive	42 (8.4%)	413 (82.6%)	45 (9.0%)
They cause diarhoea	43(8.6%)	395 (79.0%)	62 (12.4%)
They are not effective when compared with herbs	51 (10.2%)	231 (46.2%)	61 (12.2%)
They cause vomiting	118(23.6%)	321 (64.2%)	61 (12.2%)
They must be taken with sugar to be effective	370 (74.0%)	88 (17.6%)	42 (8.4%)
They are to be taken before breakfast	354(70.8%)	105 (21.0%)	41 (8.2%)
They are poisonous	24(4.8%)	411 (82.2%)	65 (13.0%)
They causes stomach upset	109(21.8%)	329 (65.8%)	91 (18.2%)

Table 4.14 Mother's reasons for not supporting deworming intervention for the U-5 children.

N=91

Respondents perceived reasons for not supporting deworming	NO	%
Still young, can't have worms/not to be taken before 5yrs/too strong/will affect them	61	67.0
Not to be used too much/affect their body/depends on child and body type/not good to use	15	16.5
Not necessary/use it occasionally/ worm has its usefulness	7	7.7
If respondents were told at hospital /if government said its good/if told its necessary	3	3.3
No idea of its usefulness	1	1.1
No response	4	4.4
Total	91	100.0

Concerning the opinion of the respondents on the likelihood of their significant others supporting regular deworming of U-5 children, majority of the respondents felt that all the support networks around them are likely to support it and is evident by 81% husband, 68.4% mother in law, 73.4% siblings, 74.4% friends and parents each, and 70.8% of colleagues likelihood of supporting regular deworming of U-5 children. About a quarter 129 (25.8%) of the respondents did not know if their mother in law will support. However, a minority of the repondent (<10% in all) opined that their significant others will not support deworming interventions of U-5 children (Table 4.15).

Four hundred and nine (81.8%) of the respondents were of the opinion that their culture is in support of regular deworming of U-5 children while 17 (3.4%) disagreed that it is not in support while 74(14.8%) do not know whether their culture is in support. A large proportion 423 (84.6%) of those interviewed affirmed that their religion is also in support of regular deworming of U-5 children. 15 (3.0%) disagreed that it is not in support while 62 (12.4%) did not know if their religion is in support of deworming of U-5 children.

Table 4.15: Respondents perceived supports of their significant others towards deworming of children below 5 years.

Significant others	Will support		Will not support		Dont know	
	Freq	%	Freq	%	Freq	%
Husband	405	81.0	31	6.2	64	12.8
Mother-in-law	342	68.4	29	5.8	129	25.8
Siblings	367	73.4	27	5.4	106	21.2
Friends	374	74.8	29	5.8	97	19.4
Parents	372	74.4	30	6.0	98	19.6
Neighbours	370	74.0	29	5.8	101	20.2
Colleagues	354	70.8	17	3.4	74	14.8

Concerning whether the respondents perceived that regular deworming of U-5 children as beneficial or not 389 (77.8%) of the respondents perceived that deworming of U-5 children is beneficial. 39 (7.8%) disagreed that it is not while 72 (14.4%) do not know whether it is beneficial or not.

Among those that perceived that regular deworming is beneficial, 210 (42.0%) perceived that regular deworming of U-5 children results into healthy life and 18 (1.6%) were of the opinion that it makes children to be good looking and 'not dry looking' and makes them to eat well, while 12 (2.4%) each opined that it improves their intelligence and combats upcoming worms/ expel worms and reduce wormload in the body and prevents excessive worms. Another 76 (15.2%) of the respondents said regular deworming of under five children stops excess fever, abdominal noise, excessive crying, weight loss, vomiting and pallor. Only 3 (0.6%) of the respondents could not mention any benefit of regular deworming even though they perceived it is beneficial (Table 4.16).

It was however found that only 186 (37.2%) of the respondents opined that there is a negative effect of not deworming an U-5 child regularly while 229 (45.8%) disagreed and the remaining 17.0% are not aware if there is any negative effect of not doing so or not.

Sixty three (30.6%) of the respondents believed that not deworming an U-5 child regularly results in weight loss in children, while 46 (29.7%) perceived that it can result into loss of appetite. Few, 17 (11.0%) opined that it results into reduced blood in the body, while 7 (4.5%) opined that it causes weakness. Others, 1 (0.6%), 4 (2.6%) pointed out that it causes poor learning ability and blocking of the intestine with worms respectively. (Table 4.17)

Table 4.16 Respondents perceived benefits of deworming U-5 children

Perceived identified benefits	No	%
Healthy life	210	42
Growing well	76	15.2
Prevent sickness/makes child light/have good skin/gain weight/not lean again	21	4.2
Improved appetite	51	12.2
Good looking/not dry looking/eats well	18	1.6
It combats upcoming worms/expel worms/reduce worm load/prevent excess worm/worms will not disturb them	12	2.4
Improved intelligence	12	2.4
Can't say/ Don't know	3	0.6

*Multiple response

Table 4.16 Respondents perceived benefits of deworming U-5 children

Perceived identified benefits	No	%
Healthy life	210	42
Growing well	76	15.2
Prevent sickness/makes child light/have good skin/gain weight/not lean again	21	4.2
Improved appetite	51	12.2
Good looking/not dry looking/eats well	18	1.6
It combats upcoming worms/expel worms/reduce worm load/prevent excess worm/worms will not disturb them	12	2.4
Improved intelligence	12	2.4
Can't say/ Don't know	3	06

*Multiple response

Table 4.17 Respondents Perceived negative effect of not deworming an U-5 child regularly

Identified negative effects	No	%
Reduced weight	63	40.6
Loss of appetite	46	29.7
Reduce blood in the body	17	11.0
Weakness	7	4.5
Poor learning ability	1	0.6
Blocked intestine	4	2.6
*Others	20	13.0
Total	155	100

*Others – Result in fever, salivation, stomach pain, reduced growth, vomiting/sickness

Table 4.17 Respondents Perceived negative effect of not deworming an U-5 child regularly

Identified negative effects	No	%
Reduced weight	63	40.6
Loss of appetite	46	29.7
Reduce blood in the body	17	11.0
Weakness	7	4.5
Poor learning ability	1	0.6
Blocked intestine	4	2.6
*Others	20	13.0
Total	155	100

*Others – Result in fever, salivation, stomach pain, reduced growth, vomiting/sickness

When asked to give suggestions to mothers of U-5 children on regular deworming of their wards, 95 (71.42%) of the respondent advised mothers of U-5 children to use deworming drugs regularly and to record its use; use it daily; use it every two weeks; use it if child is lean, use liquid expellers for them. Another 9 (6.8%) suggested that children should be taken to the hospital; follow doctors instruction; seek medical advice before using it. In addition, 6 (4.5%) suggested that it should be given from 6 months; 1 year; 3 years or when children starts eating meat, fishes or fruits.

However, 3 (2.3%) opined that it should only be used for children older than 5 and 6 year olds. 7 (5.3%) said the U-5s should not be given unless signs of worm infestation are seen as they are too young because of accompanying side effects. Lastly, 10 (7.5%) respondents advised that U-5s should not be given deworming medicines regularly in children, while 3 (2.3%) advised the mothers to use herbal medicines, lime or honey for deworming their U-5 children (Table 4.18)

Table 4.18 Respondents' suggestion for mothers of U-5 children on regular deworming of their children

N=133

Suggestions	No	%
Use regularly/use and record/use daily/ use it every 2 weeks/ use if child is lean Use liquid worm expellers for them	95	71.42
Don't give regularly/not to be given much in children/it's not to be given all the time	10	7.5
Take child to hospital/ follow doctors instructions/seek medical advice	9	6.8
Don't give U-5 / they are too young/ give only if signs are seen/ don't give them because of side effects	7	5.3
Give from 6 months /1 year/ 3years/ when child starts eating fruit, meat and fish	6	4.5
Use for only children older than five years5	3	2.3
Use herbal drug/ lime/ honey	3	2.3
Total	133	100.0

Testing of hypotheses

Null Hypothesis one "there is no significant relationship between the socio-demographic characteristics (age group, parity, type of family and educational attainment) of mothers of U-5 children at Moniya and their perception about intestinal worms".

a) Respondents within the 25-34 years age group mostly disagreed with the perception that intestinal worms is necessary in the body than the others ($p>0.05$). The null hypothesis stated above is not rejected and it is concluded that there is no significant relationship between the age groups of the respondents and their perception on intestinal worms (Table 4.19).

b) Many of the respondents that had less than four children disagree that intestinal worms is necessary in the body than the others ($p>0.05$). The null hypothesis stated above is therefore not rejected and it is thus concluded that there is no significant relationship between the parity of the respondents and their perception on intestinal worms (Table 4.19).

c) More of the respondents that belong to a monogamous relationship disagree that intestinal worms is necessary in the body than the others ($p<0.05$). The null hypothesis stated above is therefore rejected and it is concluded that there is a significant relationship between the type of family of the respondents and their perception on intestinal worms (Table 4.19).

d) Since the p value calculated is less than the level of significance, the null hypothesis stated above is therefore rejected and it is concluded that there is a significant relationship between the educational qualification of the respondents and their perception on intestinal worms (Table 4.19).

Testing of hypotheses

Null Hypothesis one "there is no significant relationship between the socio-demographic characteristics (age group, parity, type of family and educational attainment) of mothers of U-5 children at Moniya and their perception about intestinal worms".

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More of the respondents that belong to a monogamous relationship disagree that intestinal worms is necessary in the body than the others ($p<0.05$). The null hypothesis stated above is therefore rejected and it is concluded that there is a significant relationship between the type of family of the respondents and their perception on intestinal worms (Table 4.19).

Since the p value calculated is less than the level of significance, the null hypothesis stated above is therefore rejected and it is concluded that there is a significant relationship between the educational qualification of the respondents and their perception on intestinal worms (Table 4.19).

Table 4.19 Relationship between the age groups, type of family and educational qualification of the Respondents and their attitude to intestinal worms

Socio-demographic variable	Disagree (%)	Undecided (%)	Agree (%)	Total	Chi square	Df	P-value
Age groups (years)							
	17 (20.5)	22 (31.9)	87 (25.0)				
	46 (55.4)	37 (53.6)	185(25.0)				
	17 (20.5)	9 (13.0)	56 (16.1)		5.572	6	.473
	3 (3.6)	1 (1.4)	19 (5.5)				
	83	69	348				
Sex of respondents							
	59 (71.1)	52 (75.4)	23 (68.8)				
	24 (28.9)	17 (24.6)	110(30.2)		1.406	2	.495
	83	69	348				
Type of family							
Polygamous	64 (77.1)	56 (81.2)	233(67.0)				
Monogamous	19 (22.9)	13 (18.8)	115(33.0)		7.629	2	.022
	83	69	348				
Educational attainment							
No formal education	8 (9.6)	6 (8.7)	40(11.5)				
Primary	23 (27.7)	16 (23.2)	132(37.9)				
Secondary	39 (47.00	34 (49.3)	151(43.4)		16.012	6	.011
Tertiary	13 (15.7)	13 (18.8)	25 (7.2)				
	83	69	348				

Null hypotheis two "there is no significant relationship between the the socio-demographic characteristics (age groups, marital status, type of family and educational qualificatioo) of mothers of U-5 children at Mfoniya and their practice of regular deworming of U-5 children".

a) Age groups of respondents : Practice of regular deworming

Respondents within the 25-34 years age group practice regular deworming of their U-5 children than other age groups ($p>0.05$). The null hypothesis stated above is therefore not rejected and it is concluded that there is no significant relationship between the age groups of the respondents and their practice of regular deworming of their U-5 children (Table 4.20)

b) Marital status: Practice of regular deworming

Many of the respondents that were married practice regular deworming of U-5 children than other marital status ($p>0.05$). The null hypothesis stated above is therefore not rejected and it is concluded that there is no significant relationship between the marital status of the respondents and their practice of regular deworming of their U-5 children (Table 4.20).

c) Type of family : practice of regular deworming

More of the respondents in a monogamous relationship practice regular deworming than those in polygamous relationship ($p< 0.05$). The null hypothesis stated above is therefore rejected and it is concluded that there is a significant relationship between the type of family of the respondents and their practice of regular deworming of their U-5 children (Table 4.20).

d) Educational qualification of respondents: Practice of regular deworming

Many of the respondents with secondary education were more likely to practice regular deworming of U-5 child than other educational status/ levels ($P>0.05$). The null hypothesis stated above is therefore not rejected and it is concluded that there is no significant relationship

between the educational status of the respondents and their practice of regular deworming of their U-5 children (Table 4.20).

Table 4.20 Relationship between Respondents' age groups, marital status, type of family educational qualification and practice of regular deworming

Socio- demographic variable	Practice of regular deworming				
Age groups (years)	Yes (%)	No (%)	Chi square	Df	P-value
≤24	35 (23.0)	35 (25.2)			
25-34	87 (57.2)	79 (56.8)			
35-44	24 (15.8)	22 (15.8)	3.894	3	0.827
≥45	6 (3.9)	2 (2.2)			
Total	152	139			
Marital status					
Never married	26 (17.1)	17(12.2)	1.396	2	0.498
Co-habiting	30 (19.7)	28 (20.1)			
Married	96 (63.2)	94 (67.6)			
Total	152	139			
Type of family					
Monogamous	119 (78.3)	95 (68.3)	3.690	1	0.037
Polygamous	33 (21.7)	44 (31.7)			
Total	152	139			
Educational qualification					
No formal education	15 (9.9)	13 (9.4)	7.560	3	0.050
Primary	37 (24.3)	54 (38.8)			
Secondary	76 (50.0)	58 (41.7)			
Tertiary	24 (15.80	14 (10.1)			
Total	152	139			

Null hypothesis three "there is no significant relationship between the mean perception of mothers of U-5 children at Moniya about intestinal worms and their practice of regular deworming of U-5 children".

Test of the mean perception of respondents on intestinal worms and the practice of regular deworming (Table 4.21) below shows that there is no significant relationship between the mean perception of the respondents and their practice of regular deworming ($p>0.05$). Therefore, the null hypothesis stated above is not rejected. Therefore, it is concluded that there is no significant relationship between the perception of mothers of U-5 children about intestinal worms and their practice of regular deworming of U-5 children.

Table 4.21 Relationship between the mean perception of the respondents' on intestinal worms and the practice of regular deworming of U-5 children

Practice of regular deworming	No	Perception		P.Value
		Mean	Std. Deviation	
Yes	152	3.76	1.539	0.086
No	139	3.46	1.452	

Null hypothesis four "there is no significant relationship between the self-deworming practice of mothers of U-5 children and practice of deworming among U-5 children".

Since the p-value is less than the level of significance we reject the null hypothesis stated above and therefore conclude that there is a significant relationship between the self deworming practice of mothers of U-5 children and their practice of deworming their U-5 children".

Table 4.22 Relationship between the self- practice of deworming of mothers of U_5 children and their practice of deworming among U-5 children

Mothers self- deworming	Yes (%)	No (%)	Chi square	DF	P-value
Yes	235(80.8)	151(72.2)	5.001	1	.025
No	56 (19.2)	58(27.8)			
Total	291	209			

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

The findings from this study are discussed in this section and it covers the following areas: Socio demographic characteristics; Perceptions on intestinal worms; Knowledge and practice of regular deworming; Factors influencing the practice of deworming; Implication of the findings to health care. The chapter ended with conclusion, recommendations and suggestion for further research.

5.1 Socio-demographic characteristics of the respondents

The age range of majority of the respondents was similar to what Kanoa and Al-Hindi (2009) obtained. This age is expected since majority of the respondents are expected to be in the reproductive age group. The wide age range of 15-72 was probably due to the fact that the study respondents were both mothers and care givers of under-five children although the elderly ones were grandmothers of these under-five children.

That majority of the respondents claimed to be married was similar to the observation of Acka et al (2009) in a similar study. Although the later targeted household heads hence a higher proportion of married or widowed household heads. The Yoruba dominance observed in the study was not unexpected since the study site was located within a predominant Yoruba population although there was also a minority from other ethnic groups and countries.

The overall educational attainment of the respondents' was fair as majority had secondary education although only a handful had tertiary education. This may be due to a high level of illiteracy in Nigeria as secondary school enrolment in 2000-2005 was 38% (At a glance: Nigeria, 2007). The low level of education could be associated with their predominant occupation (trading) and involvement in low-income earning jobs which required little or no formal education. Although 3.1 % of the respondents claimed to be civil servants, this may not necessarily mean a higher level of education.

5.2 Perceptions of respondents about intestinal worms

It was observed that the overall perception of the respondents on intestinal worms was poor and majority of them were rated as having negative perceptions on intestinal worms. The

perception of the respondents that irrespective of the actions of man, intestinal worms must be present in human beings because they are thought to be normal constituent of the body was similar to the findings of Tannera et al (2010) where worm infections is considered an unavoidable but mild health problem. However, Cunale et al (2011) observed that almost all the respondents considered worms as harmful and were aware of the need for treatment.

The finding that respondents erroneously perceived that intestinal worms should be allowed to stay in the body because it is believed to have its usefulness being present from birth was similar to those of Acka et al (2010) who observed that intestinal worms was similarly perceived as an in-born disease. Roushan (1994) however found that almost all the respondents of a survey considered worms to be a cause of bad health hence a high percentage of mothers had obtained deworming drugs for their children. It was found that more of the respondents that had secondary school education disagree that intestinal worm are necessary in the body than the others.

Tannera et al (2010) pointed out that Caldwell, 1994, observed that in a study, only maternal ethnomedical knowledge showed a protective effect against child hookworm infection and then overall, the importance of maternal knowledge is consistent with previous research documenting the importance of maternal education on child health in diverse settings. Kanoa and Al-Hindi (2009) also found that in a similar study, mothers' education had a positive effect for the decreasing of parasitosis among children. However, Acka et al (2010) demonstrated that there was no significant difference regarding the perceived causes of intestinal worm infection and educational attainment.

The positive perception of majority of the respondents who disagreed that children under the ages of five are not predisposed to intestinal worms infection is commendable, even though greater than a quarter, erroneously believed otherwise. In the same vein, since a large proportion of the respondents disagreed with the proposition that only children playing with sand are susceptible to have intestinal worms is similar to what was reported by Acka et al (2010) that only a few women attributed worm infections in children to the habit of soil consumption. This positive perception among the study respondents is noteworthy as it shows that there is some enlightenment about the vulnerability of children playing with sand to intestinal worms. Bath et

al (2010) found out that a good number of residents in Bangladesh thought that worms were spread from eating sweet foods

The finding that revealed that about half of the respondents were of the opinion that intestinal worms could negatively affect the health of children was fair even though greater than a quarter perceived otherwise. Acka et al (2010) similarly found out that most participants considered worms as a very serious problem in children, capable of causing fatalities in the absence of early treatment. Kaniunvi and Ferguson (1993) however, noted that compared with the other health problems, intestinal worms did not rank highly in people's minds as an important health problem. This fair population of respondents with a positive perception gives a ray of hope that could be used as peer educators and social networks that could influence the perception of others in the neighbourhood.

The result also shows that the respondents largely perceived that intestinal worms are beneficial for health as they are thought to be essential for the digestion process, conferred some benefits on the health of children under the ages of five and everybody needs a certain amount of it to stay healthy. This is similar to the perceptions of Tsinames that most people feel they are chronically infected, but only a very small number of individuals consider helminth infections a reportable health concern (Tanner et al, 2010).

Only the type of family and the educational qualifications of the respondents were found to be significantly related with their attitude towards intestinal worms. The role of mothers' education in child's health is well known. Less than half (44.4%) of the respondents have secondary education. In a study among Kenyan mothers, Kung'u, and Warinu (2011) found that mothers with low level of formal education also had low level of knowledge about both the symptoms and mode of transmission of geohelminths. Similarly, mothers' low level of education had been discovered as a significant factor associated with IPI (Alchraj et al, 2008. Okyay et al; 2004). IPI rate was highest among the illiterate, overcrowded and large sized families (Kamar and Rahim; 1995). The fact that the level of education was significantly related with perception on intestinal worms shows the need for promoting girl child education in the study area.

5.3 Awareness and practice of respondents about regular deworming

The study revealed that a large number of the respondents knew that it is necessary to deworm children under the ages of five although only a little above quarter of the respondents knew it should be started at 12 months which is in line with the WHO and CDC directives on initiation of worming drugs in children. The large number of the respondents that could not correctly pinpoint the exact time for worming in children shows that their lack of knowledge could lead to drug misuse and late initiation of worming regime in children above 12 months of age. This underscores the need for further enlightenment on this topic. Ank, Diep, and Trees (2007) however observed that majority of the study participants are aware of the correct deworming regime.

It was similarly observed that majority of the respondents could correctly identify signs of worm infection in their children. This is similar to findings by Subramoniam, Mohan, and Kavitha; (2005), Ehrlich; (2008), Global Forumn; (2008), and Hipgrave; (2002). This shows that the respondents are well knowledgeable about pointers to intestinal worms disorders in their wards and by this, it is expected that they will take necessary actions as at when due. Kamuniv and Ferguson (1993) also observed that a high proportion of respondents knew the problem of [illegible] and could describe the symptoms with some accuracy and could correctly identify the vectors and parasite samples.

The study shows that even though many of the respondents claimed to have ever dewormed their children, the large number (41.8%) of those that have never done so is less desirable. Even though, about a quarter claimed to do so regularly with majority of them doing so every three months, the authenticity of this information could not be ascertained. Hence, the awareness of the need to deworm children regularly is high, and in line with the observations of Rousham (2004) even though the interval quoted is short as against the standard set by stakeholders especially the WHO on deworming interventions in endemic areas. It was also evident that majority of them do not keep record of worming for their children as this record could have been used to ascertain the authenticity of their claim of regular deworming. A good way of encouraging record keeping for a preventive health behavior like this is inclusion of deworming column in the routine immunization card. Records like this will help mothers to remember the last time worming was done and when it is due.

Orthodox medicine was used by about half of the study participants (50.8%) which is majorly sourced from patent medicine/ pharmacy stores than other outlets e.g markets, health care centres, etc while a small minority used herbs and other local concoctions. Anh, Diep, and Trees (2007) noted that people like modern medicine because of its better effectiveness, convenience and availability, but they think it is more toxic. However, Acka et al (2010) found out that at Cote d'voire, medical treatment was considered to be relatively inaccessible, and hence traditional medicine and drugs from local street markets were used instead. This finding is similar to the observation of Tannero et al (2010).

Worm expellers is one of the most widely available over-the-counter drugs available in Nigeria, hence the ease of access to it. The fact that most of these worm expellers are purchased from these retail outlets and not the hospital within the study area raised a question of efficacy of the drugs in these shops which are often not in accordance with standard requirement on storage of drugs. Also, lack of use of weighing scale/machine by these shop owners for the calculation of the correct dosages for the most widely used worm expeller flaws the whole practice

In this study, a minute percentage of the study population obtained worm expellers from traditional healers. Anh, Diep, and Trees (2007) observed that people use a combination of the traditional anthelmintic medicines and "western" anthelmintic drugs although preferably the traditional anthelmintic bolus which is easily found in the market, was believed to be safer and less toxic for children. This is similar to the observation of Acka et al (2010) that people used both modern and traditional medicine to treat worm infections, although majority of them considered modern medicine to be inaccessible, and used traditional medicine or drugs sold on local markets, consistent with findings from a study in Egypt, where it was found that traditional medications were frequently used, since modern treatments were either unavailable due to high costs or lack of supply.

A wide range of anthelminthics was mentioned by the respondents for worming but Levamisole (ketrax) was mostly used. This may be closely related to its cost as it was found to be the cheapest of available anthelmintic dispensed at patent medicine stores and pharmacy outlets in Nigeria. A finding similar to the observation of Akello, Reis, Ovuga, Kabatesa and Richters (2007) in Uganda and Tannero et al (2010).

Other less patronized drugs such as Albendazole and Mebendazole are of higher prices which may discourage sales outlet from stocking them and respondents too from buying them similar to the observation of Anh, Diep, and Trees (2007) noting that few people buy the imported product because of its high price. The commonly used worm expellers , Levamisole and piperazine, were effective against roundworms and threadworms respectively (UNF 2001) and since they are weight and worm- specific and in cases of multi parasitism, its use may not be effective in eradicating all the types of intestinal worms found to be prevalent in the study area.

It is necessary to point out that the WHO recommended four drugs for the treatment of infection with soil-transmitted helminthes- Albendazole and Mebendazole, Levamisole and pyrantel pamoate. The first two are more appropriate for use in large-scale campaigns because there is no need to weigh the children while the last two required that the correct dose should be calculated on the child's weight, which is not often done where these medicines were purchased making it logistically difficult to correctly ascertain the appropriateness of the dosages used for these children. Subramoniam, Mohan, Kavitha (2005) also observed similarly that in this case, treatment for 2 days was more effective than single dose often used for treatment. Also, Hath et al (2010) pointed out that Keiser and Utzinger discovered that single oral dose treatment with pyrantel pamoate was 31% effective.

More than half of those that had ever deworm their children believed the substances used for these purposes were effective with expelling the worms being the most widely mentioned sign of effectiveness observed by the respondents. Since most of the respondents judged the substances used effective, it shows that these residents are likely to continue purchasing same type of anthelminthic from these sales outlets and also support deworming interventions in the future.

The type of family and educational qualification of the respondents was found to be significantly related with the practice of regular deworming of children. This may be due to the fact that many of those in this study had at least secondary school education. Kung'u and Warigu (2011) however found out that at a community at Kenya, there was no significant association between the level of mothers education and deworming practices.

5.4 Factors influencing the practice of regular deworming

A high majority of the respondents who were mostly mothers of these under-five children claimed they had ever deworm themselves even though close to half of them claimed they do so only once in a while and less than half actually did so within the last 1-5 years preceeding the study, similar to the findings of Anh, Diep, and Trees (2007). Judging from this acclamation, it is not surprising that since the mothers of these children do no regulary deworm themselves, close to half of them had never deemed it fit to deworm theirchildren at all. Therefore, the authenticity of their acclaimed practice is douhtful. Also, the occasional practice of deworming shows that they are not aware of the recommended guideline of the WHO or the magnitude of the problem in the area. This can also be closely linked to the cultural belief of the usefulness of intestinal worms in the human body. This faulty child care practice shows that there is need to improve on education of mothers on child care practices in order to promote the health of these children.

Less than a hundred of these study participants claimed they do not deworm their older children due to various reasons ranging from ignorance of its necessity, fear of the side effect of these drugs, and culturally motivated wrong perceptions. There is therefore the need to address these concerns in the design of intervention that is aimed at encouraging good child care practices.

The ideas of the respondents vary concerning timing of worming schedules in children. However, majority of them were of the opinion that it should be done every three months, this is likely to stem from the ideas commonly passed across at health centres and hospitals during health education sessions. Anh, Diep, and Trees (2007) observed otherwise and six monthly interval is more accepted to those in Vietnam. This erroneous deworming schedule was against the recommendations by the WHO but could have been as a result of the general passive nature of community members towards health issues and the fact that the environmental situation across a large spectrum of community within the country is very dirty thereby promoting the prevalence of intestinal parasite. This may have motivated health care practitioner to assume six monthly deworming schedule proposed for endemic areas by the WHO was not sufficient for the location of the country.

The perception of majority of the respondents about deworming medicines was fairly good as they perceived it to be available, largely safe, inexpensive, but it has to be taken with

sugar, on an empty stomach, before breakfast or late at night to be effective, a finding similar to those observed by Anh, Diep, and Trees, (2007), Bath et al (2010). This misconception is thought to be due to the belief passed down from generation to generations because presence of food in the stomach is thought to prevent the effectiveness of these drugs but an empty stomach ensures that the worms would have come out of their hiding places to seek for food, hence the drugs would have maximal effect on the worms.

Four hundred and forty nine (89.8%) of the respondents were willing to support deworming interventions for their U-5 children similar to the findings of Ulukanligil (2008). This means intervention along this line is likely to be welcome by majority of the residents of the area. Those that were unwilling to do so gave a myriad of reasons but mainly the opinion that U-5 children are too young to be wormed, because of the negative effect it will have on them and worms is also thought to have a protective function, so, should not be totally eliminated from the body.

Similarly,, significant others in the life of the respondents were likely to support deworming interventions in the U-5 children. Only about a quarter of the respondents did not know the likely disposition of their mother-in-laws about it. This may be unconnected with the common misgivings between mother and daughter–in-laws. Hence, health education should not be limited to women of child bearing age but should concern the whole spectrum of the society. Likewise, the respondents' culture and religious belief system largely support deworming interventions for the U-5 children. It is worthy of note that more than a quarter of the study participants believed there is no negative effect of not deworming an U-5 child. This is still connected to the points already mentioned on the effect of cultural opinions on the benefits and the perceived usefulness of intestinal worms in the body.

Cost is an issue that could affect the uptake of preventive health initiatives. The result from this study shows that 32% of the respondents claimed they could not afford the prices of antihelminthics for their children. This is similar to the findings of Curtale et al (2009) who pointed out that two-thirds of mothers reported they were unable to pay for the health services they needed. This means that the health of the wards in care of majority of the respondents are at risk of worm infestation. However, Loung (2003) and Ulukanligil (2008) observed otherwise and noted that more than 90% in Turkey and 75% in Ghana and Tanzania were willing to pay for

anthelmintic drugs after a school based deworming intervention. Kung'u and Warimu (2011) found no association between deworming practice and family's level of income.

Lastly mothers' self- deworming practice was found to be significantly related with the practice of deworming their U-5 children. This is instructive as mothers who did not deworm themselves may not see the importance of deworming their children and it may be related to the gross negative perception of many of the respondents on intestinal worms.

5.5 Implication of the findings

The key findings in this study show the value of taking cultural perspectives and local knowledge seriously when studying child health especially among indigenous populations. A community's perceptions of diseases are of prime importance in ensuring that control strategies of any kind is effective since perception will affect their compliance with and uptake of any available health initiative. Also, the role of mothers' education in deworming practices was brought to light.

Lastly, poverty which generally influences access to health care was seen to have a potential of influencing the type of anthelmintics respondents used for deworming and the overall effect on these children. Because the prices of anthelmintic is quite low, there is therefore need for government to regularly administer antihelmintic drugs (albendazole or mebendazole) against soil-transmitted helminthiasis to preschool, out-of-school and school-age children in addition to the WHO recommended school-aged children. The pregnant women should not be left behind in this effort because of the demonstrated value inherent in the practice. This might also stimulate individual practice after delivery.

5.6 Conclusion

It may be concluded from this study that there was a negative perception on intestinal worms among the respondents which was mostly due to faulty cultural beliefs passed down through the generational lines. Awareness about signs of intestinal worms and the need for deworming children is however good. Majority of the respondents claimed they have ever worm their U-5 children even though there is no evidence to show that the purpoted practice was reliable. The respondents used Levamisole mostly for worming which may be attributed to the

cost of its procurement as many of the respondents claimed they could not afford the prices of anthelminthics. Levamisole is not optimal in worming in a highly endemic area like this local government.

The respondents were also found to have a low practice of worming themselves and other children older than 5 years old and some misconceptions about deworming drugs exists. This negative health care practices and erroneous perception may invariably influence the practice of worming among the U-5 children in particular and the society in general.

5.7 Recommendations

The following recommendations were based on the findings of the study:

1. An appropriate strategy to enlighten the community on the harmful effect of intestinal worms, correct misconceptions on deworming schedule, deworming drugs, intestinal worms and encourage the practice of worming is necessary. Erroneous perceptions about intestinal worms should be corrected with the organization and developments of Information, Education and Communication (IEC) activites and targeted mass scale health promotion and education programmes using a multi-modal approach in the community to reach both the literates and illiterate members of the society.
2. There is the need to advocate for an official policy on deworming interventions which should be both school and community-based. Deworming days should be incorporated in the child health service reforms in the county and promoted in the annual child health week.
3. There should be training in preventive strategies especially on deworming among the key role-players working together. Primary health care workers, environmental health workers, health educators and school health nurses will have to work together in the implementation of this programme.
4. School and community based deworming interventions should be promoted by stakeholders e.g., pharmaceutical companies, NGOs, government etc.

5.8 Further research

1. In order to gather the information needed to design an integrated control programme for intestinal worms in the country, both qualitative and quantitative techniques should be used on a sample representative of the entire community to identify household practices and prevalent environmental situations that favours the prevalence of intestinal worms in the country.
2. There is need to fund sentinel survey to monitor worm infection in the community and market research should be undertaken to establish effectiveness of deworming medicines at suitable intervals.
3. Future research should explore the use of qualitative study to help in the development of a quantitative instrument for better data quality on perception of the respondents.

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Appendix I

ENGLISH VERSION

PERCEPTION OF MOTHERS AND CAREGIVERS OF UNDER FIVE CHILDREN ABOUT INTESTINAL WORMS AND PRACTICE OF REGULAR DEWORMING IN MONIYA, AKINYELE LOCAL GOVERNMENT AREA OF OYO STATE.

Dear respondent,

I am Mrs. Olufemi Oluwatoyin Adewumi, a post graduate student of the University of Ibadan. I am conducting a research on perception and practices of mothers and caregivers of under five children about intestinal worms and practice of regular deworming of children at Moniya. The research work is purely an academic exercise and all information supplied will be treated with due confidentiality. You are not expected to tell us your names or any form of identification on this questionnaire. I shall appreciate it if you could provide honest answers to the questions that follow.

The information you provide here will help in making beneficial interventions in the future.

THANK YOU.

Serial no ____

INFORMED CONSENT

Having been adequately informed about this study, I hereby agree to participate in answering the questions asked in this questionnaire.

Signature _____ Date _____

INSTRUCTION: Please tick (√) the most appropriate answer to you.

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Age at last birthday _____ in years

2. Marital Status

1) Never Married ☐ 2) Co-habiting ☐ 3) Married ☐

4 Separated ☐ 5) Divorced ☐ 6) Widowed ☐

7) Others (Specify) _____

3. Type of family 1) Monogamous ☐ 2) Polygamous ☐

4. Highest Level of education

1) No formal education ☐ 2) Primary education ☐ 3) Secondary education ☐

4) Tertiary education ☐ 4) Others (specify) _____

5. Religion

1) Christianity ☐ 2) Islam ☐ 3) Traditional ☐ 4) Others _____

6. Ethnicity 1) Yoruba ☐ 2) Igbo ☐ 3) Hausa ☐ 4) Others (specify)

_____

7. Occupation

(1) Civil servant ☐ (2) Company worker ☐ (3) Self employed ☐ (4) Housewife ☐

(5) Trading ☐ (6) Artisan ☐ (7) Unemployed ☐ (8) Farming ☐

(9) Others (specify) _____

8. Are you a mother or guardian/ caregiver of the under five child? (1) Parent ☐ (2) Guardian ☐

9. Parity - How many children did you have? _____

10. Number of children less than five years old _____

SECTION B: PERCEPTION ABOUT INTESTINAL WORMS

Some people have made their opinion known about intestinal worms in the past. Kindly indicate the extent to which you agree with the under listed statements.

(Tick√ as applied)

	STATEMENTS	AGREE	UNDECIDED	DISAGREE
11	Worms normally reside in human beings intestine			
12	Worms cannot be transmitted from person to person*			
13	Worms will always be in the intestine no matter what you do or did not do			
14	Intestinal worms should be allowed to stay in the body because it has its own usefulness			
15	Children that are under the ages of five do not have intestinal worms			
16	Intestinal worms are present in the intestine from birth			
17	Only children that play with sand have intestinal worms			

18	Intestinal worms does not affect the health of under five children in a bad way			
19	Intestinal worms helps the digestion of food taken			
20	Intestinal worms does not have any benefit on the health of under five children			
21	Everybody needs an amount of intestinal worms to stay healthy			

*Omitted in the analysis because it is more of a knowledge question

SECTION C: PRACTICE OF REGULAR DEWORMING

22. How do you know that a child has intestinal worms? (Please tick as mentioned) (1) When the child is not eating well ☐ (2) When he/she is complaining of stomach pain ☐ (3) When a child is loosing weight ☐

(4) When he/she is sleeping too much ☐ (5) When he/she child is vomiting ☐ (6) Don't know ☐ (7) Others (specify) _____

23. Do you think it is necessary to deworm a child that is less than five years old?

(1) Yes ☐ (2) No ☐

24. At what age do you think a child should start deworming? _____ (Please specify age in months and years).

25. Have you ever deworm your child? (1) Yes ☐ (2) No ☐ (If No. go to question 36)

26. Did you deworm your child recently? (1) Yes ☐ (2) No ☐

27. If yes. when last did you do so? (Please specify in months) _____

28. Do you deworm your child regularly? (1) Yes ☐ (2) No ☐

29. If Yes to the above question. how regularly do you deworm your child? (Tick (√) as mentioned)

(1) Every month ☐ (2) Every three months ☐ (3) Every six months ☐ (4) Once a year ☐

(5) Twice a year ☐ (6) Once in a while ☐ (7) Others (Specify) _____

_____

30. Do you keep a record of deworming for your child/ children? (1) Yes ☐ (2) No ☐

31. What substances did you normally use to deworm your child?

(1) Medicines ☐ (2) Local concoction ☐ (3) Others _____

32. Where do you get the materials for deworming? (Please tick√ as mentioned)

(1) Traditional herbalist/vendor ☐ (2) Patent medicine/ Pharmacy store ☐ (3) Hospitals/ health centers ☐ (5) Local drug vendors ☐ (5) In-laws ☐ (6) Neighbors ☐ (7) Market ☐ (9) Others (specify) _____

33. State the medicine/substances that you have used for deworming your under five child in the past _____

34. How do you rate the effectiveness of the materials used for deworming?

(1) Very effective (2) Not effective (3) Cannot say the effectiveness

35. If effective, what type of effect did you notice? _____

(1) Improved appetite (2) Improved strength (3) Mental alertness (4) Weight gain (5) Passing out the worms (6) Vomiting the worms (7) Others (please state)

_____

SECTION B: FACTORS INFLUENCING REGULAR DEWORMING

36. Have you ever deworm yourself? 1) Yes ☐ 2) No ☐ (If No, go to question 38)

37. How regularly do you deworm yourself? (Tick as mentioned) (1) Every month (2) Every three months (3) Once a year (4) Twice a year (5) Once in a while (6) Others (specify)

_____

38. When last did you deworm yourself? _____ (State in months)

39. Can you afford to buy deworming medicine regularly for your under five child (ren?) (1) Yes ☐

(2) No ☐

40. Do you regularly deworm your other children that are older than five years? (1) Yes ☐

(2) No ☐

(3) I don't have any child above five years ☐

41. If no, why? _____

42. How regularly do you think your child / children should be deworm? (Please tick√ as mentioned)

(1) Every month ☐ (2) Every three months ☐ (3) Every six months ☐ (4) Every year ☐

(5) I don't know ☐ (6) Other responses _____

(1) Medicines ☐ (2) Local concoction ☐ (3) Others _____

32. Where do you get the materials for deworming? (Please tick√ as mentioned)

(1) Traditional herbalist/vendor ☐ (2) Patent medicine/ Pharmacy stores ☐ (3) Hospitals/ ☐ health centers ☐ (5) Local drug vendors ☐ (5) In-laws ☐ (6) Neighbors ☐ (7) Market ☐ (9) Others (specify) _____

33. State the medicine/substances that you have used for deworming your under five child in the past _____

34. How do you rate the effectiveness of the materials used for deworming?

(1) Very effective (2) Not effective (3) Cannot say the effectiveness

35. If effective, what type of effect did you notice? _____

(1) Improved appetite (2) Improved strength (3) Mental alertness (4) Weight gain

(5) Passing out the worms (6) Vomiting the worms (7) Others (please state)

_____

SECTION D: FACTORS INFLUENCING REGULAR DEWORMING

36. Have you ever deworm yourself? 1) Yes ☐ 2) No ☐ (if No, go to question 38)

37. How regularly do you deworm yourself? (Tick as mentioned) (1) Every month (2) Every three months (3) Once a year (4) Twice a year (5) Once in a while (6) Others (specify)

_____

38. When last did you deworm yourself? _____ (State in months)

39. Can you afford to buy deworming medicine regularly for your under five child (ren?) (1) Yes ☐

(2) No ☐

40. Do you regularly deworm your other children that are older than five years? (1) Yes ☐

(2) No ☐

(3) I don't have any child above five years ☐

41. If no, why? _____

42. How regularly do you think your child / children should be dewormed? (Please tick√ as mentioned)

(1) Every month ☐ (2) Every three months ☐ (3) Every six months ☐ (4) Every year ☐

(5) I don't know ☐ (6) Other responses _____

43. What do you think about medicines used for deworming?

		YES	NO	DON'T KNOW
A	It is not readily available			
B	It is too expensive			
C	It causes diarrhea			
D	It is not effective when compared with herbs			
E	It causes vomiting			
F	You have to take it with sugar to be effective			
G	You need to use it before taking breakfast			
H	It is poisonous			
I	It causes stomach upset			

44. Will you support deworming intervention for children under five years of age? (1) Yes ☐

(2) No ☐

45. If no, why? _____

46. What do you think will be the reaction of the following if they are aware that you regularly deworm your under five children?

SIGNIFICANT ORDERS	WILL SUPPORT	WILL NOT SUPPORT	DON'T KNOW
A) Husband			
B) Mother-in-law			
C) Siblings			
D) Friends			
E) Parents			
F) Neighbors			
G) Colleagues			

47. Is your culture in support of regular deworming of children under the ages of five?

(1) Yes ☐ (2) No ☐ (3) I don't know ☐

48. Is your religion in support of regular deworming of children under the ages of five?

(1) Yes ☐ (2) No ☐ (3) I don't know ☐

49. Are there benefits from deworming an under five child regularly? (1) Yes ☐ (2) No ☐ (3) I don't know

50. If yes, what are the benefits? (Tick as mentioned) (1) Healthy life ☐ (2) Growing well ☐ (3) Improved intelligence ☐ (4) Improved appetite ☐ (5) Others (specify)

_____

51. Is there any negative effect of not deworming your under five child/ children regularly? (1)Yes ☐ (2) No ☐

52. If yes, what effect do you think it has? (Tick as mentioned) (1) Loss of appetite ☐ (2) ☐ Reduced weight ☐ (3) Reduced blood in the body ☐ (4) Weakness ☐ (5) Poor learning ☐ ability (6) Blocking of the intestine ☐

53. What suggestions do you have for mothers of under-five children on regular deworming of their under five children? _____

Thank you for the time you have spent with me.

APPENDIX II

YORUBA VERSION

IRO IYA ATI AI-AGBATO OMO TI KO TO ODUN MARUN LORI ARAN INU IBI ATI ISI LORI IBO OGUN ARAN LOOREKORE NI MONIYA, LIGBA IBIBE AKINYELE,IPINLE OYO.

Oludahun tonto,

E mi ni iyafin Olufemi Oluwatoyin Adewumi. akeko iati ile iwe giga Unifasiti ti Ibadan. Mo n se iwadi laarin awon iya ati alagbato awon omo ti won ko ti to omo odun marun ni agbegbe Moniya lori iba ti won ko si aran inu ifun ati bi won se n lo ogun aran fun awon omodede si Iwadi yi je eyi to nise pelu eto eko nikan, ati wipe gbogbo oro ti a ba gba lenu yin ni a o pamo doradara. A ko fe ki e da oruko yin fun wa nitoripe a fe dabobo idahun yin. Inu mi yoo dun lopolopo ti e ba le dahun ni tooto si awon ibeere ti a o bi yin.

Awon oro ti e ba so yoo ran wa lowo lati gbe igbese to ye fun ojo iwaju awon omode.

E se pupo.

Nomba Leto leto_____

GBIGHA LATI KOPA

Nisinsinyi ti mo ti gbo oro lori iwadi yi, mo faromo lati dahun awon ibere inu iwe iwadi yi

Ifowosi _____ Deeti _____

IPELE A: ORO LORI OLUDAHUN

1. Ojo ori _____ ni ayeye ojo-ibi to gbeyin

2. Ipo Igbeyawo

(1) Mi o ti gbeyawo ☐ (2) A ti gbe Papo lai ti se igbeyawo ☐

(3) Mo ti se igbeyawo ☐ (4) A ti pin ya ☐ (5) A ti ko ara wa sile ☐

(6) Opo ni mi ☐ (7) Awon ipo miran (salaye) _____

3. Iru ebi (1) Idile oko kan aya kan ☐ (2) Idile oko kan aya pupo ☐

4. Ipele eko to ga ju (1) Mi o lo si ile iwe rara ☐ (2) Ile iwe alakobere ☐
(3) Ile iwe girama ☐ (4) Ile iwe giga ☐
(5) Ipele eko miran _____

5. Esin (1)Onigbagbo ☐ (2) Musulumi ☐ (3) Esin ibile ☐
(4) Esin miran (salaye)_____

6. Eya (1) Yoruba ☐ (2) Ibo ☐ (3) Hausa ☐
(4) Awon eya miran (salaye)_____

7. Iru ise ti e n se (1) Osise ijoba ☐ (2) Osise ile-ise aladani ☐ (3) Ise ara mi
(4) Iyawo ile ☐ (5) Onisowo ☐ (6) Onise-owo ☐ (7) Mi o nise lowo ☐
(8) Agbe ☐ (9) Awon ise miran (salaye)_____

8. Se iya omo tabi alagbato omo ti ko to ndun marun niyin? (1) Iya ☐ (2) Alagbato ☐

9. Omo melo ni e ni? _____

10. Awon melo ni ojo ori won ko to odun marun? _____

IPELE B – : IMOYE LORI ARAN INU IFUN

Awon kan ti fi ero won han lori aran inu ifun. E jowo, e so bi e se faramo awon oro isale yi to nipa didahun awon ibere won yin (Maaki √ bi won se fara mo si)

	Oro	Mo fara mo	Mi o le so	Mi o fara mo
11.	Aran ma n farapamo si inu ifun eniyan			
12.	Aran o se ko lati ara enikan si enikeji			
13.	Ohunkohun to wu ki eniyan se, aran o le ran ninu ifun laifasi			
14.	O ye ki a je ki aran o wa ni inu ifun wa nitoripe o ni iwulo ilre lara			
15.	Awon omode ti ko ti to omo odun marun lo ko le ni aran ninu			

16	Aran wa ninu ifun lati igba ti won ti bi wa			
17	Awon omode ti won ba n sere pelu erupe nikan ni o ma n ni aran ninu ifun won			
18	Aran ko kin n pa ilera awon omode ti ko ti to omo odun marun lara			
19	Aran nia n je ki ounje ti awon omode ba je tete da			
20	Aran inu ifun ko ni anfani Kankan to n se fun ilera awon omode ti ko ti to omo odun marun			
21.	Gbogbo eeyan ni o nilo ije aran kan ki o to le ni ilera pipe			

IPELE D- BI A SE N LO OGUN ARAN DI EDE SI

22 Ki ni apere ti e fi ina n mo pe omode ni aran inu? (Nauki ke bi o se n su) (1) Nigba ti omo nan ko ba jeun dada ☐ (2) Nigba ti o ba n so pe inu n run ohun ☐ (3) Nigba ti o ba n gbe ☐ (4) Nigba ti o ba n sun ju ☐ (5) Ti o ba n bi ☐ (6) Mi o mo ☐ (7) Awon apere miran

23. Nje e ro pe o se pataki lati lo oogun aran fun omo ti ko ti to odun marun (1) Beeni ☐

(2) Beeko ☐

24. Ojo ori wo ni e ro pe o ye ki omo bere si ni ma lo oogun aran? _____ (E ko sile ni osu ati odun)

25. Nje e ti lo ogun aran fun omo yin ri? (1) Beeni ☐ (2) Beeko ☐ (Ti o ba je Beeko, e lo si ibere keresimilogaji)

26. Nje e lo ogun aran fun omo yin laipe yi? (1) Beeni ☐ (2) Beeko ☐

27. To ba je Beeni, nigbawo ni e lo fun gbeyin? (E ko sile ni osu) _____ ☐

28. Nje e ma n lo ogun aran fun omo yin loorekoro? (1) Beeni ☐ (2) Beeko ☐

29. To ba je Beeni, ba wo ni e se nu n lo fun? (Maakiv bi o se n so) (1) Osoosu ☐ (2) Osu meta meta ☐ (3) Eekan losu mefa ☐ (4) Eekan lodun ☐ (5) Eemeji lodun ☐

(6) Ee ko kan ☐ (7) Awon igba miran (salaye) _____

30. Nje e ma n se akosile bi e se nu n logun aran fun omo /awon omo yin? (1) Beeni ☐

(2) Beeko ☐

31. Kin ni e ma n sanba lo lati pa aran inu ninu awon omo yin? (1) Ogun eebo ☐ (2) Aseje ibile ☐ (3) Awon nkan miran _____

32. Nibo ni e ti ma n ri awon oun elo lati pa aran inu fun awon omo yin? (1) Ontsegun ibile ☐

(2) Heti ☐ ogun ☐ (3) ile-iwosan ☐ (4) Odo alagbo ☐ (5) Odo ebi eko ☐ (6) Odo alabagbele ☐ (7) Oja ☐ (8) Awon ibi miran (salaye) _____

33. Daruko awon ohun elo tabi oogun ti e ti lo ri fun pipa aran inu omo yin ti ko to odun marun

_____

4. Ki ni igbele won yin nipa ise ohun ti e lo lati fi pa aran inu omo yin? (1) O sise dada ☐

(2) Ko sise dada ☐ (3) Mi o le so bi o se sise si ☐

35. To ba je pe o sise dada, abajade wo ni e sakiyesi? (Maakiv bi o se n so) (1) O le jeun dada si

(2) O tun okun re se ☐ (3) O je ko ji pepe si ☐ (4) O sanra si ☐ (5) O ya aran naa ☐

(6) O bi awon aran na ☐ (7) Awon abajade miran (se akosile won)-

_____

IPELE E: AWON OHUN TI O NI SE PELU LILO OGUN ARAN FUN OMODE

36. Nje e ti lo ogun aran fun ara yin ri? (1) Beeni ☐ (2) Beeko ☐

37. Bawo ni e se ma n lo ogun aran si (1) Osoosu ☐ (2) Osu meta meta ☐ (3) Eekan lodun ☐

(4) Eemeji lodun ☐ (5) Eekokan ☐ (6) Awon igba miran (salaye) _____

38. Igbawo ni e lo ogun aran gbeyin? _____ (Se akosile ni osu ati odun)

39. Nje e lowo ta to lati ra ogun aran deede fun awon omo yin ti ko to omo odun marun bi?

(1) Beeni ☐ (2) Beeko ☐

40. Nje e ina n lo ogun aran fun awon omo yoku ti won ju odun marun lo bi? (1) Beeni ☐

(2) Beeko ☐ (3) Mi o ni omo ti o ju odun marun lo

41. To ba je beeko, ki ni idi? _____

42. Bawo ni e se ro pe o ye ki e se ma lo ogun aran fun awon omo yin deede si? (maki ibi o se n dahun) (1) Osoosu ☐ (2) Osu Meta meta ☐ (3) Osu Mefa mefa ☐ (4) Eekan lodun ☐ (5) Mi o mo ☐ (6) Awon idahun miran _____

43. Kin ni ero yin nipa ogun oyinbo fun pipa aran inu?

		Beeni	Beeko	Mi o mo
A	Ko si laroyoto			
B	O ti won ju			
D	O ma n fa igbe gbuuru			
E	Ko kin sise to ogun ibile			
F	O ma n fa eebi			
F	O ni lati lo pelu suga ki o le sise dada			
G	O ni lati lo ki o to jeun naro			
Gb	O ni mojele ninu			
H	O ma n da ikun ru			

44. Se e ma faramo lilo ogun aran fun awon omode ti ko ti to omo odun marun? (1) Beeni ☐

(2) Beeko ☐

45. To ba je beeko, ki ni idi? _____

46. Ki ni e lero pe yo je orongba awon won yi ti won ba gbo pe o n lo ogun aran lorekore fun awon omo yin ti ko ti to omo dun marun?

Awon ti a se pataki	Yo fara mo	Ko ni fara mo	Mi o mo
A) Oko			
B) Iya oko			
D)Awon omo iya yin			
E) Ore			
F) Awon obi			
F) Awon alabagbe			
G) Awon alabasisepo			

47. Nje asa yin fowo si lilo ogun aran lorekore fun awon omo ti ko ti to omo odun marun?

(1) Beeni ☐ (2) Beeko ☐ (3) Mi o mo ☐

48. Nje esin yin fowo lilo ogun aran lorekore fun awon omode ti ko ti to omo odun marun?

(1) Beeni ☐ (2) Beeko ☐ (3) Mi omo ☐

49. Nje anfani wa ninu lilo ogun aran fun awon omo ti ko ti to omo odun marun lorekore?

(1) Been☐ (2) Beeko ☐ (3) Mi o mo ☐

50. To ba je beeni, awon anfani wo lo wa nibe? (Maaki√ bi o se n dahun) (1) Idena pipe ☐

(2) Idagbasoke bo ti ye ☐ (3) O ma n mu ki opolo jipepe ☐ (4) O ma n mu ni jeun dada ☐

(5) Awon idahun miran (Se akosile won) _____

51. Nje alebu Kankan wa ninu ki a ma lo ogun aran deede fun awon omode ti ko ti to omo odun marun? (1) Beeni ☐ (2) Beeko ☐

52. To ba je beeni, awon abuku wo ni o to pe o wa nibe? (Maaki ibi o se n dubun) (1) O le ma je ki uunje wu won je dada ☐ (2) O ma di sisanra lowo ☐ (3) O ma n din eje ku lara ☐ (4) O ma n mu ki o re eyan ☐

(5) O ma n mu ki omo ma le keko dada ☐ (6) O ma di inu ifun ☐ 7) Awon aleebu miran (se alosile won) _____

53. Awon imoran wo ni e ni fun awon iya ti omo won ko iii to odun marun lori lilo ogun aran lorekoore fun awon omo won _____

E se fun akoko ti e ti lo pelu wa.

APPENDIX III

TELEPHONE.....

TELEGRAMS.....

MINISTRY OF HEALTH

DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION

PRIVATE MAIL BAG NO 5057, OYO STATE OF NIGERIA

Your Ref. No. _____

Our Ref. No: AD 13/479/102

Date 16th March, 2011

The Principal Investigator,
Department of Health Promotion & Education,
Faculty of Public Health,
University of Ibadan,
Ibadan

Attention: Olufemi, Oluwatoyin A. (Mrs.)

Ethical Approval for the implementation of Your Research Proposal in Oyo State.

This acknowledges the receipt of the corrected version of your Research Proposal titled "Perception and Practice of Mothers and Care Giver of Under Five Children about Regular Deworming at Akinyele Local Government Area, Oyo State

The Committee has noted your compliance with all the ethical concerns raised in the initial review of the Proposal. In the light of this, I am pleased to convey, to you, the approval of the committee for the implementation of the Research Proposal in Oyo State, Nigeria

Please, note that the committee will monitor, closely, and follow up the implementation of the research study. However, the Ministry of Health would like to have a copy of the results and conclusions of the findings as this will help in policy making in the health sector

Wishing you all the best

Adepoju

Mrs V A Adepoju
Director, Planning, Research & Statistics
Secretary, Oyo State, Research Ethical Review Committee