

**SURVEY OF INTESTINAL PARASITE IN CHICKENS BROUGHT
FOR SLAUGHTER AT DAN KURE MARKET SOKOTO.**

BY

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**A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF ZOOLOGY
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CERTIFICATION

This research project entitled “**Survey of Intestinal Parasite in Chickens brought for Slaughter at Dankure Market Sokoto.**” was carried out by “Aminu Muhammad Ahmad” with admission number “201309024”. has been read and approved by the undersigned as meeting the requirement for the award of Bachelor of Science (B.Sc. Hons.) Degree in zoology, Department of zoology, Faculty of Chemical and Life Science, Usmanu Danfodiyo University, Sokoto.

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DEDICATION

This Project is dedicated to the loving memory of my late grandmother, Maryam Ahmed. Whose prayers and kindness continue to inspire me every day. May her gentle soul rest in perfect peace.

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All praise and gratitude goes to Almighty Allah the most Beneficent, the most merciful and all-knowing for his protection and guidance throughout my period of study.

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ABSTRACT

This study investigated the prevalence of intestinal parasites in chickens sold at Dan Kure Market, Sokoto State. A total of 100 chickens were examined using flotation and sedimentation techniques. Seventy-two birds were infected, giving an overall prevalence of 72%. Five parasite species were identified: *Taenia* spp (40%), *Eimeria* spp (30%), *Heterakis gallinarum* (25%), *Raillietina* spp (18%), and *Capillaria* spp (12%). Age-related prevalence showed that chickens aged 0–4 weeks had a 50% infection rate, while body condition strongly influenced parasitism, with birds in poor condition showing the highest prevalence (83.3%). These findings indicate that intestinal parasites remain a major constraint to

chicken health and market quality in Dan Kure Market. Improved hygiene, routine deworming, and better poultry management practices are essential to reduce the burden of parasitic infections.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Poultry refers to domesticated birds such as chickens, turkeys, ducks, and geese that are raised primarily for meat and egg production (FAO, 2013). Among these, chickens (*Gallus gallus domesticus*) are the most widely kept globally due to their adaptability, short production cycle, and minimal resource requirements (Adene and Oguntade, 2006). Poultry farming plays a significant role in enhancing food security, employment, and income generation, especially in rural communities (FAO, 2013).

Despite the economic importance of poultry production, the industry is faced with numerous health challenges, notably gastrointestinal parasitic infections. These parasites negatively impact the health and productivity of chickens by competing for nutrients, damaging intestinal tissues, and reducing immunity. Common intestinal parasites include helminths such as *Ascaridia galli*, *Heterakis gallinarum*, *Raillietina spp.*, and protozoa like *Eimeria spp.*, which causes coccidiosis a major disease responsible for significant economic losses in poultry worldwide (Abebe et al., 2014).

Several factors influence the prevalence of intestinal parasites in poultry. These include poor hygiene, inadequate management practices, lack of veterinary care, and environmental conditions favorable to the survival of parasite eggs and larvae. Free-range chickens are especially susceptible due to constant exposure to contaminated environments and intermediate hosts (Alemayehu et al., 2015).

In Nigeria and other parts of sub-Saharan Africa, intestinal parasitism is a common problem due to the widespread use of backyard and semi-intensive poultry systems. Unfortunately, many poultry farmers lack awareness and access to routine diagnostic services, resulting in untreated infections and increasing transmission rates (Nnadi and George, 2010).

To reduce the burden of intestinal parasitic infections and improve poultry productivity, there is a need for continuous monitoring and surveys to determine the local prevalence and types of parasites affecting chickens. This study aims to provide such information for improved health management (Ybañez et al., 2014).

As of 2023, Africa had an estimated 2.4 billion poultry birds, with chickens making up over 90% of the total poultry population.

This reflects a steady increase from about 1.66 billion in 2010, driven by population growth and rising demand for animal protein. Statista (2023).

Nigeria has an estimated 180 million poultry birds, mainly chickens.

Poultry is raised under three major systems:

Extensive (free-range/backyard): ~80 million birds

Semi-intensive: ~60 million birds

Commercial/Intensive: ~40 million birds (CSIRO, 2022). Poultry Production in Nigeria.

While exact figures are not officially published in sokoto, Sokoto has a growing poultry population. A 2022 study reported:

Majority of backyard farmers kept 10–50 birds.

Some medium-scale farms kept 1,000–3,000 birds.

Only ~13% of farms had more than 5,000 birds.

(Nigerian Journal of Animal Production (2022). Poultryfarming characteristics in Sokoto).

1.2 Importance of Chicken

Chickens are among the most widely domesticated animals globally, playing a vital role in food security, income generation, and rural livelihoods. They serve as a primary source of high-quality animal protein through the production of meat and eggs, both of which are rich in essential nutrients like amino acids, iron, zinc, and vitamins such as B12 and riboflavin (FAO, 2020). In many low-income households, eggs provide an affordable and accessible source of protein, particularly for children and pregnant women. Economically, poultry farming—especially chicken production—contributes significantly to the livelihoods of both rural and urban dwellers. In countries like Nigeria, chickens are raised under various systems ranging from backyard to intensive commercial production, thereby supporting household income and providing employment opportunities across the value chain, including feed production, veterinary services, processing, and marketing (Adene and

Oguntade, 2006; Ajala et al., 2007). Chickens also hold cultural and social significance in many communities, where they are used in traditional ceremonies, exchanged as gifts, or employed as a form of financial security. Furthermore, smallholder poultry keeping—particularly by women—has been recognized as a pathway for promoting gender equity and poverty reduction in rural settings (Gueye, 2009). From a public health and food security perspective, chicken farming ensures a consistent supply of animal protein with relatively low input requirements. However, diseases like intestinal parasitism can reduce productivity and pose zoonotic risks if not effectively managed, making their control a matter of both agricultural and public health importance (Permin and Hansen, 2002). In addition to their economic and nutritional value, chickens are also important in biomedical and agricultural research as model organisms in studies on embryology, genetics, and disease transmission (Kaufman et al., 2011). Thus, ensuring the health and productivity of chickens is not only critical for meeting the protein needs of the growing population but also for supporting livelihoods, advancing scientific research, and achieving sustainable agricultural development.

1.3 Statement of the Problem

Parasitic infections are among the leading constraints to profitable poultry production, yet they are often under-reported and poorly managed. In many rural and peri-urban areas, poultry keepers lack knowledge of intestinal parasites and do not practice regular

deworming or disease monitoring. As a result, infections persist and become endemic within flocks (Obasi et al., 2015).

Although several studies have documented parasitic infections in chickens in Nigeria, there is still a lack of recent, area-specific data in many regions. Without such data, veterinary interventions remain generalized and often ineffective. Additionally, changing climate patterns and management systems may alter parasite prevalence over time, making updated surveys essential (Nnadi and Nwosu, 2008).

This study addresses the need to identify current intestinal parasites affecting chickens in a selected locality, quantify their prevalence, and assess risk factors associated with their transmission and persistence (Phiri et al., 2007).

1.4 Justification of the Study

Intestinal parasites continue to be a major challenge to poultry health and productivity, especially in developing countries like Nigeria. Chickens are a vital source of animal protein and income for smallholder farmers. Yet, due to poor management practices, lack of veterinary extension services, and inadequate awareness, gastrointestinal parasitic infections remain poorly diagnosed and managed in many poultry farms (Abebe et al., 2014).

It is hoped that this study will make poultry farmers that are unaware of the specific intestinal parasites affecting their birds and often rely on inappropriate or inconsistent use of antiparasitic drugs. By identifying the types and prevalence of intestinal parasites in chickens, this research equips farmers with knowledge that will enable early detection,

targeted treatment, and better farm hygiene practices. This can reduce production losses, improve bird health, and increase income for both commercial and backyard poultry farmers (Nnadi and George, 2010).

Also, the findings of this study will provide vital epidemiological data that can support the government in planning and implementing poultry health programs. Such data help inform national disease surveillance, guide veterinary policy, and improve extension services targeted at parasite control. With the poultry industry contributing significantly to national food security and rural livelihoods, improving poultry health directly supports economic development and poverty alleviation (Adene and Oguntade, 2006; FAO, 2013).

Healthy chickens are essential for the production of safe and high-quality poultry meat and eggs. Intestinal parasitism can compromise the nutritional value and safety of poultry products, potentially exposing consumers to zoonotic infections or chemical residues from indiscriminate drug use. By promoting healthier poultry through targeted parasite control, this study indirectly benefits consumers by ensuring the supply of wholesome animal protein (Phiri et al., 2007).

In summary, the study benefits farmers through improved management, the government through better disease control planning, and consumers through safer poultry products. Additionally, it contributes to academic knowledge and serves as a reference for future research and public health interventions (Obasi et al., 2015).

1.5 Aim of the Study

The aim of this study is to survey and identify intestinal parasites present in the intestines of chickens from selected farms or markets in the study area (Alemayehu et al., 2015).

1.6 Objectives of the study

1. 1.Determine the overall prevalence of intestinal parasitic infections among different chicken populations (e.g., local vs. commercial breeds).
2. Identify the types and species of intestinal parasites present in the intestines of chickens slaughtered or examined within the study area.
3. Evaluate the influence of host-related factors, such as age, sex, and body condition, on susceptibility to intestinal parasitic infections.
4. To determine the prevalence of intestinal parasites in chickens sold across different markets within the study area.

CHAPTER TWO

2.0

LITERATURE REVIEW

2.1 Poultry Production and Its Importance

Poultry production is a key component of the global livestock industry and plays a vital role in enhancing food security, generating income, and providing employment, especially in developing countries. Chickens are the most commonly reared poultry species due to their adaptability, rapid growth, and relatively low production costs (FAO, 2013). In Nigeria and other African nations, indigenous chickens are predominantly raised under traditional free-range systems where they serve both subsistence and commercial purposes (Adene and Oguntade, 2006; Nnadi and George, 2010).

2.2 Classification of Chickens

Chickens are generally classified based on breed, production purpose, and rearing system:

By breed type:

- a. Indigenous (local) breeds: Adapted to harsh environments, disease-tolerant but slow-growing and low-yielding.
- b. Exotic/commercial breeds: Bred for productivity (e.g., layers for egg production and broilers for meat).

By production purpose:

Layers (for egg production),

Broilers (for meat), and

Dual-purpose breeds (for both meat and eggs).

By management system:

Extensive/free-range,

Semi-intensive, and

Intensive systems (Alemayehu et al., 2015; Abebe et al., 2014).

This classification is important as different breeds and systems are associated with varying levels of resistance or susceptibility to diseases, including parasitic infections. For example, free-range indigenous chickens are more exposed to parasitic infection due to their foraging behavior (Ibrahim et al., 2018).

2.3 Overview of Intestinal Parasites in Chickens

Intestinal parasites reside in the gastrointestinal tract of chickens and adversely affect digestion, nutrient absorption, and overall health. These include helminths such as nematodes, cestodes, and trematodes, as well as protozoa like *Eimeria* spp., which cause coccidiosis (Abebe et al., 2014). Infections often result in reduced growth, lowered productivity, and even mortality, especially in young or immune compromised birds (Phiri et al., 2007; Shirzad et al., 2011).

2.4 Classification of Intestinal Parasites

2.4.1 Helminths (Worms)

Helminths are parasitic worms and include:

- Nematodes (Roundworms): e.g., *Ascaridia galli*, *Heterakis gallinarum*

- Cestodes (Tapeworms): e.g., *Raillietina* spp.
- Trematodes (Flukes): Less common in poultry, e.g., *Echinostoma* spp. (Kaufmann et al., 2011)

Ascaridia galli is the most pathogenic nematode, leading to blockage, malnutrition, and death in severe infections (Ibrahim et al., 2018). *Heterakis gallinarum*, while mildly pathogenic, transmits *Histomonas meleagridis*, which causes blackhead disease in turkeys and chickens (Soulsby, 2005).

2.4.2 Protozoa

Protozoan parasites in chickens mainly include species of *Eimeria*, responsible for coccidiosis—a disease characterized by bloody diarrhea, reduced feed efficiency, and high morbidity in intensively managed flocks (Shirzad et al., 2011).

Protozoa are single-celled organisms found in most habitats, and they include some parasitic pathogens of humans and domestic animals. Protozoan parasites that are important to backyard poultry growers are coccidia (species of the *Eimeria* genus), cryptosporidia (*Cryptosporidium baileyi*), and histomonads (*H. meleagridis*). (Shirzad et al., 2011).

By far, the most common protozoan parasites of chickens and turkeys are coccidia. Nine species of coccidia affect chickens, and seven affect turkeys. Coccidia are species-specific, meaning that coccidia that affect chickens, for example, do not affect turkeys or other livestock. Coccidia live and reproduce in the digestive tract, where they cause tissue

damage. This damage reduces nutrient and fluid absorption and causes diarrhea and blood loss. Coccidiosis (infection with or disease caused by coccidia) can increase a bird's susceptibility to other important poultry diseases, such as necrotic enteritis. Coccidia are in nearly all poultry. Chicks develop immunity to coccidiosis over time, with most severe cases occurring when chicks are three to six weeks old. Signs of coccidiosis include bloody diarrhea, watery diarrhea, abnormal feces, weight loss, lethargy, ruffled feathers, and other signs of poor health. Most store-bought feeds contain medication that controls but does not eliminate coccidia. Eating such feed allows young birds to develop resistance to the coccidia prevalent in their environment. However, if the birds are exposed to a different species of coccidia, they will not have immunity, and disease symptoms may result. A common medication for controlling coccidiosis in birds not fed medicated feed is amprolium. As mentioned above, following the instructions for administration is important for proper drug delivery and bird recovery. Vaccines are currently available that give newly hatched birds a small amount of exposure to coccidia, allowing them to develop immunity without developing the disease. With proper vaccination and management, routine anticoccidial medications are not necessary.

Cryptosporidiosis is infection with or disease caused by cryptosporidia. Cryptosporidia are not specific to chickens and can infect other birds and even mammals. Cryptosporidia

frequently spread from flock to flock on the feet of animals and people and can be carried by wild birds.

Intestinal cryptosporidiosis is common, and symptoms are usually mild. Frequently, the only symptom is pale skin in yellow-skinned breeds. Cryptosporidiosis also can be contracted by inhalation, resulting in a respiratory infection that is more severe than the intestinal form. There is no treatment for this form of cryptosporidiosis. Providing supportive therapy and guarding against secondary infection are the only courses of action. Once recovered, birds are immune to future infection. (Asumang et al., 2019)

Intestinal parasites are a significant concern in both animal and human health. Chickens are susceptible to various intestinal parasites that can impact their health, productivity, and welfare. Domesticated birds, known as poultry, are reared by humans for meat, eggs, and occasionally feathers to support livelihoods. This group includes chickens, ducks, geese, and turkeys. Poultry is a vital source of protein and farm fertilizer (Jegade et al., 2015). The most commonly raised poultry is domestic chicken (*Gallus gallus domesticus*) (Asumang et al., 2019)

Lawal et al., 2020). Over the past few decades, poultry production has steadily risen globally (Mottet and Tempio, 2017). According to the Food and Agriculture Organization, developing countries account for approximately 75% of the existing 15 billion chickens (Ferdushy et al., 2016). This sector is recognized as an important mechanism for alleviating

problems associated with poverty in developing countries in terms of food security and malnutrition (Ola-Fadunsin, 2017; Ola-Fadunsin et al., 2019b).

Gastrointestinal parasites (GIPs) significantly hinder poultry production, leading to economic losses from reduced productivity, poorer feed conversion rates, and inadequate weight gain. They cause issues such as decreased egg production, catarrh, anorexia, diarrhea, intestinal obstruction, emaciation, anemia, weakness, paralysis, poor feathering, and even death (Jegade et al., 2015; Shifaw et al., 2021). Additionally, Intestinal Parasites can increase disease susceptibility and weaken the immune response to vaccinations (Pleidrup et al., 2014; Saadoon Ibadi Al-Alwani and Hamle Abid, 2023). Gastrointestinal helminths can also transmit pathogens like *Histomonas meleagridis*, resulting in high morbidity and up to 20% mortality in chicken flocks (McDougald, 2005; Clark and Kimminau, 2017). Intestinal Parasites that infects poultry include; cestodes, nematodes, trematodes, and protozoans (Nnadi and George, 2010; Shifaw et al., 2021). Nematodes are the most significant intestinal worms in the poultry industry due to their species diversity and the diseases they cause (Hafiz et al., 2015; Ola-Fadunsin et al., 2019).

2.4.3 Nematods

Roundworms (nematodes) are common in poultry, waterfowl, and wild birds. Species of roundworms that affect poultry include species of large roundworms (*Ascaris* sp., also known as ascarids), species of small roundworms (*Capillaria spp.*, also known as capillary

worms or threadworms), and cecal worms (*Heterakis gallinarum*). Roundworms can cause significant damage to the organ(s) they infest. Most roundworms affect the digestive tract; others affect the trachea (windpipe) or eyes.

Large roundworms are the most damaging of the worms common to backyard flocks. A severe infestation can cause a reduction in nutrient absorption, intestinal blockage, and death. Easily seen with the naked eye, large roundworms are about the thickness of a pencil lead and grow to 4-1/2 inches long. Occasionally, they migrate up a hen's reproductive tract and become included in a developing egg. The life cycle of a roundworm is direct; that is, worm eggs are passed in the droppings of infected birds and then directly to birds that consume contaminated feed, water, or feces. Also, worm eggs may be picked up by snails, slugs, earthworms, grasshoppers, beetles, cockroaches, earwigs, and other insects. Known as intermediate hosts, these insects carry the eggs and when eaten by a bird pass the eggs to the bird. Identifying and minimizing the number of intermediate hosts that poultry have contact with helps prevent the birds from being infected with worms. Because approved wormer medication in poultry is limited, you should check the US Food and Drug Administration (FDA) Approved Animal Drug Products list (known as the Green Book) for currently approved medication. Medication containing the active ingredient piperazine is available for use against large roundworms in poultry but is not effective against other internal parasites

of poultry. As with all medications, read the label concerning dose to administer and withdrawal period before consumption of eggs or harvesting for meat.

Several species of small roundworms can affect different parts of birds and cause a variety of symptoms. Species that infect the crop and esophagus cause thickening and inflammation of the mucus membranes located there. Turkeys and game birds are most commonly affected by such species, and producers can suffer severe losses due to these parasites. Other species of small roundworms are found in the lower intestinal tract and cause inflammation, hemorrhage, and erosion of the intestinal lining. Heavy infestations result in reduced growth, reduced egg production, and reduced fertility. Severe infestations can lead to death. If present in large numbers, these worms can be seen during necropsy (examination after death). Small roundworm eggs are very small and difficult to see in bird droppings without a microscope.

Medications that contain levamisole are effective in treating small roundworms.

Cecal worms are commonly found in chickens. As the name implies, they grow in the ceca (two blind pouches at the junction of the small and large intestines). Although cecal worms typically do not affect chickens, the worms can carry *Histomonas meleagridis*, a species of protozoan parasite that causes histomoniasis (blackhead) in turkeys. Turkeys can contract histomoniasis by eating chicken manure containing infected cecal worm eggs or earthworms that have ingested infected cecal worm eggs. So, although chickens generally are immune to

problems caused by cecal worms, controlling the worms is still important for turkey health. Levamisole is effective in controlling cecal worms. A veterinarian's prescription is required for use of the drug in poultry.

2.4.4 Cestodes

Several species of tapeworms (Cestoda) affect poultry, ranging in size from very small (not visible to the naked eye) to more than 30 cm in length (Permin & Hansen, 2002; Soulsby, 2005). Tapeworms are composed of multiple flat segments (proglottids), which are shed in groups of two or three daily. Each segment contains hundreds of eggs, and a single tapeworm is capable of releasing millions of eggs during its lifetime (Ssenyonga, 2009; Taylor et al., 2016).

Each species of tapeworm attaches to a different section of the digestive tract. Attachment is facilitated by four pairs of suckers located on the scolex (head) of the tapeworm (Yoriyo et al., 2008; Taylor et al., 2016). Most tapeworms are host-specific, with chicken tapeworms affecting only chickens and related gallinaceous birds (Permin & Hansen, 2002; Fatihu et al., 2018).

Tapeworms require at least one intermediate host to complete their life cycle. Reported intermediate hosts include ants, beetles, houseflies, slugs, snails, earthworms, and termites (Permin & Hansen, 2002; Fatihu et al., 2018). For caged birds, houseflies are the most likely

intermediate host; for poultry raised on litter, termites and beetles are common; and for free-range birds, earthworms and snails are important (Molla et al., 2012).

Currently, there are no approved anticestodal drugs specifically for poultry in many regions (Yoriyo et al., 2008; Taylor et al., 2016). Therefore, effective control strategies focus on managing intermediate hosts to prevent infection and reinfection. Accurate laboratory diagnosis is essential to identify the specific tapeworm species and its intermediate host, since host specificity varies significantly among species (Permin & Hansen, 2002; Fatihu et al., 2018). Targeted preventive measures can then be directed against the appropriate intermediate host. (Permin & Hansen, 2002; Fatihu et al., 2018).

2.4.5 Trematodes

Trematodes, commonly known as flukes, are parasitic flatworms belonging to the class Trematoda within the phylum Platyhelminthes. These parasites are typically leaf-shaped, dorsoventrally flattened, and possess suckers for attachment to the host's intestinal wall. While trematodes are more commonly associated with ruminants and aquatic birds, some species are known to infect poultry, particularly in areas where birds have access to intermediate snail hosts or water bodies. (Permin and Hansen, 2002)..

In chickens, intestinal trematodes such as *Echinostoma revolutum*, *Prosthogonimus* spp., and *Postharmostomum gallinum* have been identified, though their prevalence is generally lower compared to nematodes and cestodes. These parasites require at least one

intermediate host, often freshwater snails, in their life cycle. Chickens become infected by ingesting encysted metacercariae from contaminated water, snails, or aquatic plants (Permin and Hansen, 2002).

Infected birds may exhibit symptoms such as diarrhea, anorexia, weight loss, and poor egg production. In heavy infections, trematodes can cause intestinal inflammation, hemorrhage, and in severe cases, death. Diagnosis is typically made through fecal examination to identify characteristic eggs, and treatment usually involves anthelmintic drugs such as praziquantel or albendazole (Taylor et.,al 2016).

Control of trematode infections in chickens focuses on breaking the life cycle by limiting access to snail-infested environments, improving sanitation, and administering routine dewormers (Nnadi and George, 2010).

Morphology and Anatomy of Chickens

The domestic chicken (*Gallus gallus domesticus*) is a warm-blooded vertebrate belonging to the class Aves. Its morphology and anatomy are highly specialized for functions like flight (in wild relatives), digestion of grains, and egg production. Understanding chicken anatomy is crucial in parasitology because many intestinal parasites inhabit specific regions of the gastrointestinal tract and affect organs based on their feeding mechanisms and migratory patterns. (Permin and Hansen, 2002).

External Morphology

Externally, chickens have a body divided into three main parts: head, trunk, and limbs. The head contains a beak, comb, wattles, eyes, and ears. The beak is used for pecking and prehension of food, while the comb and wattles play roles in thermoregulation and sexual signaling. Chickens are covered in feathers, which provide insulation and aid in courtship behavior. (Mench, 2004).

The limbs are adapted for walking (hindlimbs) and limited flapping or balance (wings). The hindlimbs have scaled skin and end in claws used for scratching the ground, a behavior relevant for the transmission of parasites from contaminated soil (Schmidt and Roberts, 2013).

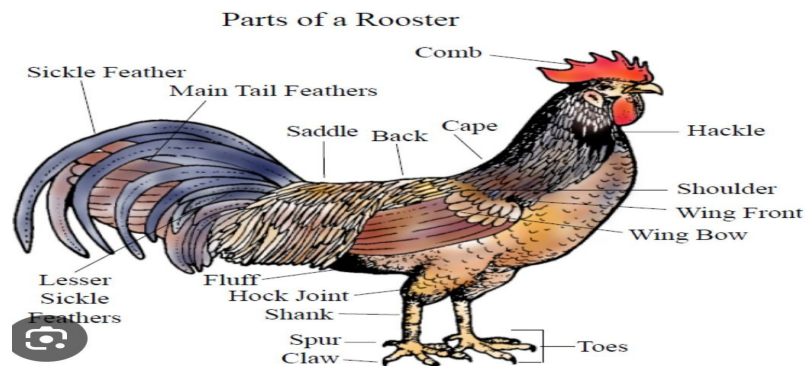


Fig 1: external structure of chicken

Internal Anatomy

Internal, chickens have well-organized systems: digestive, respiratory, circulatory, reproductive, nervous, and excretory systems. Of parasitological interest, the digestive system begins at the beak and includes the esophagus, crop, proventriculus, gizzard (ventriculus), small intestine (duodenum, jejunum, ileum), ceca, large intestine, and cloaca. (Schmidt and Roberts, 2013).

- The crop stores and softens food.
- The proventriculus is the glandular stomach where enzymatic digestion begins.
- The gizzard mechanically grinds food using ingested grit.
- The small intestine is the primary site for nutrient absorption and the habitat for many parasites like *Ascaridia galli* and *Capillaria* spp.

The ceca are two blind sacs at the junction of the small and large intestines, which host protozoa such as *Eimeria tenella*.

The cloaca is a common chamber for the digestive, urinary, and reproductive tracts and also serves as an exit for fecal matter and parasite eggs (McLelland, 2003).

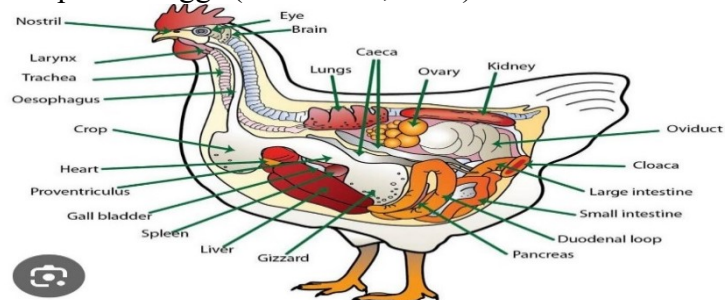


Fig 2 :Internal structure of chicken

The respiratory system is composed of rigid lungs and nine air sacs that allow unidirectional airflow. The circulatory system includes a four-chambered heart and well-developed vasculature. The reproductive system is sexually dimorphic, with hens having only a functional left ovary and oviduct, which are often affected by systemic parasitic infections. (Signh et al., 2015).

Nutrition of Chickens

Proper nutrition is fundamental to the health, productivity, and immune competence of chickens. Chickens require a balanced diet comprising carbohydrates, proteins, fats, vitamins, minerals, and water to maintain body functions, support growth, egg production, and resist diseases, including parasitic infections. mating (Yegani and korver, 2008).

1. Carbohydrates and Energy

Carbohydrates are the primary energy source in poultry diets and are usually supplied by cereal grains such as maize, wheat, and sorghum. Adequate energy intake is crucial for metabolism, thermoregulation, and physical activity. Energy deficiency can lead to poor weight gain, reduced egg production, and increased susceptibility to disease (leeson and summers, 2005).

2. Proteins

Proteins provide essential amino acids required for tissue development, enzyme production, and immune system function. Sources of protein in chicken feed include soybean meal, fish meal, groundnut cake, and blood meal. Protein deficiency can result in stunted growth, poor feathering, and immunosuppression, making chickens more vulnerable to parasitic infections like *Ascaridia galli* and *Eimeria* spp. (NRC, 1994; Oluyemi and Roberts, 2000).

3. Fats and Oils

Fats are concentrated sources of energy and essential fatty acids such as linoleic acid, which is important for egg production and skin health. They also aid in the absorption of fat-soluble vitamins (A, D, E, and K). While moderate fat inclusion improves feed efficiency, excess fat can lead to obesity and metabolic disorders (Olomu, 2011).

4. Vitamins and Minerals

Vitamins such as A, D₃, E, K, and B-complex are vital for physiological functions, including bone development, vision, blood clotting, and antioxidant defense. Minerals like calcium and phosphorus are essential for bone formation and eggshell quality, while others like iron, zinc, selenium, and copper play roles in enzyme activity and immune response.

Deficiencies in vitamins and minerals can compromise gut health and increase parasite load (Abdelqader et al., 2008).

5. Water

Water is often referred to as the “forgotten nutrient” but is critical for digestion, thermoregulation, and toxin elimination. Chickens should have continuous access to clean and cool drinking water. Contaminated water sources can serve as a transmission medium for parasites and other pathogens (FAO, 2020)

Reproduction in Chickens

Reproduction in chickens is a critical biological process that ensures the continuity of the species and the sustainability of poultry production. It is a sexually dimorphic process, involving the male reproductive system, which produces and delivers sperm, and the female reproductive system, which produces eggs. The reproductive performance of chickens, especially hens, directly influences egg production, hatchability, and the economic success of poultry farming. (FAO 2020).

1. Male Reproductive System

The male chicken, known as the rooster, has two internal testes located near the kidneys. These testes produce sperm and male sex hormones such as testosterone. Sperm is transported via the vas deferens to the cloaca, from where it is transferred to the female during copulation. Unlike mammals, chickens lack an external penis; instead, sperm transfer occurs through a process called cloacal contact (Lake, 2006).

2. Female Reproductive System

The female chicken, or hen, typically has only one functional ovary and oviduct (usually the left side). The ovary contains follicles at various stages of development. During ovulation, the mature yolk (ovum) is released into the infundibulum, where fertilization occurs if sperm is present. mating (Bakst et al., 2007).

The oviduct is divided into five regions:

- Infundibulum – captures the ovulated yolk and is the site of fertilization.
- Magnum – secretes the thick albumen (egg white).
- Isthmus – forms the inner and outer shell membranes.
- Uterus (shell gland) – deposits the calcium-rich shell.
- Vagina – aids in egg laying through the cloaca (Romanoff & Romanoff, 1972).

A complete egg is laid approximately 24–26 hours after ovulation. Hens can store viable sperm in sperm storage tubules in the oviduct for up to two weeks, allowing fertilization of multiple eggs from a single mating (Bakst et al., 2007).

Excretion in Chickens

Excretion is the biological process by which an organism removes metabolic waste products from its body. In chickens (*Gallus gallus domesticus*), the excretory system plays a vital role in maintaining internal homeostasis by regulating water, salts, and nitrogenous wastes. Unlike mammals, chickens do not produce urine in liquid form but excrete nitrogen mainly as uric acid, which is less toxic and conserves water—an adaptation to their avian physiology. (Braun and Dantzler, 2011).

1. Organs Involved in Excretion

The primary organs involved in excretion in chickens include the kidneys, ureters, and cloaca:

- **Kidneys:** Chickens have two elongated, lobulated kidneys, located in the depressions of the synsacrum (the fused bones of the pelvis). Each kidney consists of nephrons responsible for filtering blood, reabsorbing nutrients and water, and secreting waste products. (Wideman, 2016).

- Ureters: Unlike mammals, birds lack a urinary bladder. The ureters transport urine directly from the kidneys to the cloaca. (Harvey et al, 2008)
- Cloaca: This is a common chamber into which the digestive, reproductive, and excretory systems empty. Nitrogenous wastes are expelled as a semi-solid white paste (urates) along with feces through the cloaca (McLelland, 2003).

2. Nitrogenous Waste

The primary form of nitrogen excretion in chickens is uric acid, which is relatively non-toxic and precipitates out of solution. This allows the body to eliminate nitrogen with minimal water loss—an essential adaptation for egg-laying birds and for survival in hot environments. The uric acid appears as a white cap on top of the brownish fecal matter in droppings. (Wideman, 2016).

2.5 Life Cycle and Transmission of Intestinal Parasites in Chickens

Most intestinal parasites have a direct life cycle. Eggs or oocysts are excreted in feces and develop in the environment before becoming infective. Chickens ingest these infective stages through contaminated feed, water, or litter (Permin & Hansen, 1998). Cestodes, however, require intermediate hosts such as beetles or ants. The risk of infection is greatly increased in systems with poor hygiene or where chickens scavenge for food (Ybañez et al., 2014).

2.5.1 Zoonotic Potential of Intestinal Parasites in Chickens

While most intestinal parasites of chickens are host-specific and do not directly infect humans, some species—especially in environments with poor hygiene—can indirectly pose public health risks. The zoonotic importance of poultry parasites lies primarily in their potential to contaminate food products and water sources, and in rare cases, act as carriers of organisms transmissible to humans. (Obasi et al., 2015).

Certain nematodes like *Ascaridia galli* and *Heterakis gallinarum* may not directly infect humans, but their eggs can contaminate poultry products and serve as mechanical vectors for zoonotic protozoa or bacteria. In addition, poultry litter heavily contaminated with parasitic ova may contribute to environmental pollution and increase the risk of accidental ingestion or cross-infection, especially in children and immunocompromised individuals (Obasi et al., 2015).

Coccidia (*Eimeria* species) are not known to be zoonotic; however, misdiagnosis with other pathogenic protozoa such as *Cryptosporidium* or *Toxoplasma* in free-range systems can complicate public health concerns (Ybañez et al., 2014). Moreover, improper handling and consumption of undercooked or contaminated poultry meat can lead to infections by *Salmonella*, *Campylobacter*, or even helminth larvae in rare zoonotic species.

The significance of these parasites from a One Health perspective cannot be overstated. Farmers, consumers, and veterinarians must be aware of the indirect risks posed by

inadequate parasite control, as well as the importance of farm hygiene and meat inspection protocols to prevent zoonotic transmission (Kaufmann et al., 2011).

2.6 Factors Influencing Parasitic Infections In Chickens

Several factors affect the prevalence and severity of intestinal parasitic infections:

- Age: Young birds are more susceptible due to underdeveloped immunity (Kaufmann et al., 2011).
- Breed and genetics: Indigenous breeds may have higher resistance to parasites than exotic breeds (Alemayehu et al., 2015).
- Management practices: Poor sanitation, overcrowding, and free-range systems encourage parasite transmission (Abebe et al., 2014).
- Environmental conditions: Warm and humid conditions favor the development of parasite eggs and oocysts (Phiri et al., 2007).

2.7 Diagnosis of Intestinal Parasite

Diagnosis is commonly done through:

- Gross examination of intestinal contents for adult worms
- Fecal analysis using flotation and sedimentation techniques
- Microscopy to identify parasite eggs or oocysts based on morphological features

More advanced methods include ELISA and PCR, though these are not widely available in rural settings.

2.8 Clinical Signs and Pathology

Infected birds often present with:

- Poor weight gain and feed conversion
- Diarrhea (sometimes bloody)
- Anemia and pale combs
- Reduced egg production
- Emaciation and weakness
- In severe cases, death

Postmortem examination usually reveals worms in the intestines, inflammation, ulceration, and thickening of the intestinal walls. Coccidiosis causes bloody lesions in the caeca and intestines.

2.9 Control and Prevention of Intestinal Parasites

Effective control involves integrated measures:

- Regular deworming using appropriate anthelmintics and anticoccidials
- Good hygiene in poultry houses (removal of feces, dry litter)
- Proper disposal of dead birds and fecal matter
- Biosecurity measures to limit contact with infected animals or vectors
- Vaccination: Live vaccines are available for coccidiosis (e.g., Paracox, Coccivac)

Management changes such as improved housing, avoiding overcrowding, and preventing contact with wild birds or intermediate hosts are also effective.

2.9.1 Treatment of Intestinal Parasite

Effective treatment of intestinal parasitic infections in chickens involves the use of anthelmintics and anticoccidial drugs, often supported by improved management and hygiene practices. Timely administration is essential to reduce parasite load, prevent re-infection, and limit economic losses.

Anthelmintic Treatment

Nematodes and cestodes are commonly treated using synthetic anthelmintics such as:

- Albendazole – Broad-spectrum benzimidazole used for treating *Ascaridia galli* and *Heterakis gallinarum*. Typically administered at 5–10 mg/kg body weight.
- Levamisole – Effective against roundworms and hookworms. It has immunomodulatory properties and is usually administered orally at 7.5–10 mg/kg.
- Piperazine salts – Effective specifically against *A. galli*. It paralyzes the worms, which are then expelled.
- Praziquantel – Used for treating tapeworm infections like *Raillietina* spp.

Frequent rotation of anthelmintics is recommended to prevent the development of resistance (Abebe et al., 2014).

Anticoccidial Treatment

Coccidiosis caused by *Eimeria* spp. is one of the most common and economically damaging intestinal protozoan infections in poultry. Effective drugs include:

- Amprolium – A thiamine analog that inhibits coccidial metabolism. Effective against mild to moderate infections.
- Toltrazuril – Highly effective in treating both clinical and subclinical coccidiosis.
- Sulfa drugs – Such as sulfadimidine and sulfamethazine, often used in water or feed.
- Diclazuril – A newer-generation anticoccidial agent with a long duration of activity.

Due to drug resistance, alternating or combining anticoccidials is often practiced, and coccidiosis vaccination is increasingly being used in breeder and layer flocks (Shirzad et al., 2011).

Supportive and Preventive Measures

Alongside pharmacological treatments, supportive care—such as electrolyte supplementation, high-protein diets, and vitamins (especially A and E)—helps birds recover from parasite-induced damage. (Ibrahim et al., 2018).

Moreover, prevention is critical. This includes:

- Routine deworming (every 2–3 months depending on risk).
- Rotational use of anthelmintics to avoid resistance.
- Strict hygiene practices in housing and feed.
- Avoiding overcrowding, this increases transmission risk.

- Quarantine of new birds before mixing with the existing flock.

In free-range systems where reinfection is common, integrated parasite control involving environmental sanitation, strategic deworming, and biosecurity is essential (Kaufmann et al., 2011; Ibrahim et al., 2018).

CHAPTER THREE

3.0

MATERIALS AND METHODS

3.1 Study Area

The study was conducted at Dan Kure Market, one of the major livestock and poultry markets located in Sokoto metropolis, Sokoto State, Northwestern Nigeria. Sokoto lies between latitudes 12°15'N and 13°00'N and longitudes 4°8'E and 5°13'E, within the Sudan savanna ecological zone. The area experiences a tropical continental climate characterized by a distinct dry season (October to May) and rainy season (June to September), with an average annual rainfall of about 500–750 mm and mean temperatures ranging from 14°C to 40°C (*Adewuyi et al., 2020*).

Dan Kure Market serves as one of the largest trading centers for livestock and poultry in Sokoto metropolis. The market operates on designated days of the week and attracts traders, farmers, and consumers from Sokoto and neighboring states. A wide variety of domestic animals, including chickens, ducks, goats, sheep, and cattle, are traded in the market. Poultry sold in Dan Kure Market are sourced from both local backyard farms and rural communities, making the market a suitable location for surveying intestinal parasites due to the diverse origins and management systems of the birds.

The market environment is typically characterized by open stalls, temporary cages, and minimal biosecurity measures, factors which may favor the transmission and spread of parasitic infections among poultry. Hence, the market provides a representative sample point

for studying the prevalence and diversity of intestinal parasites in chickens within Sokoto metropolis (*Adewuyi et al., 2020*).

3.2 Ethical Aproval

Introduction letter was obtained from Head of Department, Zoology, Usman Danfodiyo University, Sokoto and then taking to the market committee for approval and research permission.

Only Chikens that were already due for slaughter (for meat or market purposes) were used.

No birds were sacrificed solely for research purposes.

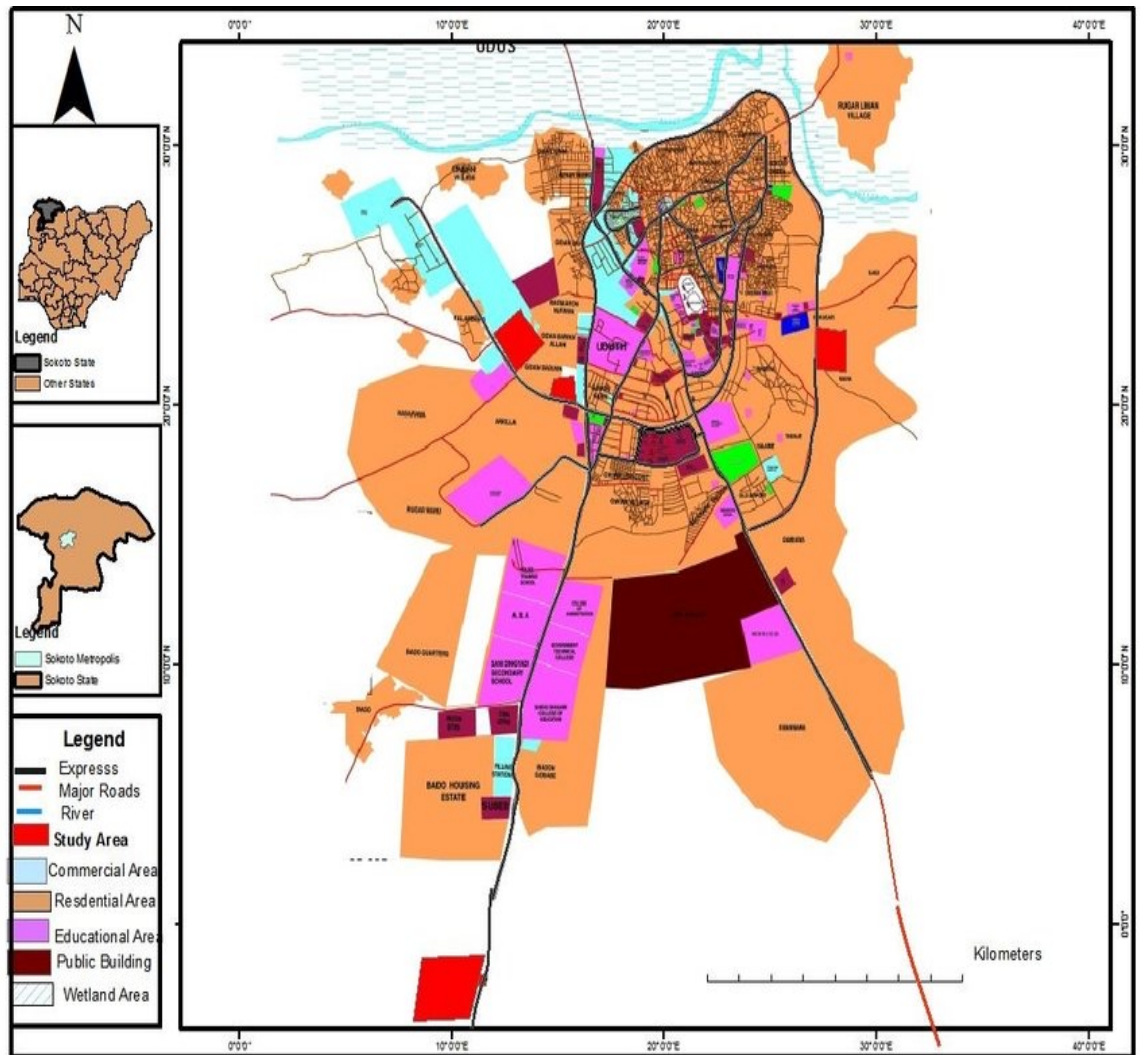


Fig. 3. Map of Sokoto North part of Nigeria locating the study area (Dan Kure Market Sokoto). (GIS Lab Department of Zoology Usman Danfodiyo University. Sokoto 2025).

3.3 Study Population

The study population consisted of both commercial chickens (broilers and layers) and local/native chickens of various age groups and both sexes. Chickens were sourced from:

- Local live bird markets
- Smallholder backyard farms
- Commercial poultry farms
- Slaughterhouses within the study area

Only apparently healthy birds were used to avoid the confounding effects of existing clinical illness on parasite burden.

3.4 Sample Size determination

The sample size of this study was determined mathematically using the fomula described by thrusfield (2018).

$$n = \frac{Z^2 p(1-p)}{d^2}$$

Formula:

$$n = \frac{Z^2 p(1-p)}{d^2}$$

Substitute values:

- $Z = 1.96$
- $p = 0.50$
- $1 - p = 0.50$
- $d = 0.05$

$$n = \frac{(1.96)^2 \times (0.5)(0.5)}{(0.05)^2}$$

$$n = \frac{3.8416 \times 0.25}{0.0025}$$

$$n = \frac{0.9604}{0.0025} = 384.16$$

So Raw Sample Size = 384.16

STEP-2 FINITE POPULATION CORRECTION (N=100)

Formula:

$$n_f = \frac{n}{1 + \frac{n-1}{N}}$$

$$n_f = \frac{384.16}{1 + \frac{384.16-1}{100}}$$

$$n_f = \frac{384.16}{1 + \frac{383.16}{100}}$$

$$n_f = \frac{384.16}{1 + 3.8316}$$

$$n_f = \frac{384.16}{4.8316} = 79.51$$

3.5 Sample size and technique

Total of 100 chickens were randomly selected and examined for intestinal parasites. This included:

50 local chickens (free-range)

50 commercial chickens (broilers/layers)

Chickens were selected using random sampling method. All chickens available in the flock were first counted and assigned numbers. The required number of chickens was then chosen randomly to ensure each chicken had an equal chance of being selected.

After selection, each chicken was identified based on age, breed, and sex as follows:

Age: was identified by observing comb and wattle development, body size, leg appearance, feather maturity, and farm records.

Breed: was identified using external features such as body size, feather colour/pattern, shank colour, and information from farm records.

Sex: was identified based on comb and wattle size, body size, feather shape (pointed in males, rounded in females), spur development, and general behaviour.

3.6 Sample Collection

The chicken was first restrained by holding its legs and wings, after which a sharp cut was made across the jugular veins and carotid arteries to ensure proper bleeding. The carcass was then scalded in hot water at 50–60°C for 30–60 seconds to loosen the feathers, followed by manual defeathering. After defeathering, the vent was opened and the internal organs were carefully removed through evisceration. Finally, the carcass was washed thoroughly and inspected for cleanliness and any abnormalities.

The entire gastrointestinal tract (GIT) was removed and placed in a labeled sterile tray. The GIT was divided into sections: duodenum, jejunum, ileum, caecum, and colon. Each segment was opened longitudinally and examined for parasites according to the method of *mohammed et al., (2017)*

3.7 Sample Analysis

3.7.1 Gross Examination

The intestinal contents were examined with the naked eye and hand lens to detect adult helminths.

Visible worms were collected using forceps and washed in normal saline.

3.7.2 Microscopic Examination

Small amounts of intestinal contents were emulsified in saline and iodine on glass slides.

Smears were observed under a light microscope to detect helminth eggs and protozoan oocysts.

Techniques Used:

Floatation Method: To recover lighter eggs and oocysts using saturated salt or sugar solution. (*Hussein et al.,2017*).

Sedimentation Method: For detection of heavier eggs that sink in water. (*Hussein et al.,2017*).

3.7.3 Preservation and Identification

Recovered helminths were preserved in 70% ethanol.

Morphological identification was done using identification keys from Soulsby (1982) and Hendrix & Robinson (2016).

Coccidian oocysts were identified based on shape, size, and internal structure

3.8 Data Analysis

Data were recorded in tables showing the number of infected birds, and the type of parasites.

Prevalence was calculated as:

$$\text{Prevalence (\%)} = \frac{(\text{Number of infected chickens})}{(\text{Total number of chickens examined})} \times 100$$

Chi-square (χ^2) tests were used to analyze relationships between parasite prevalence and variables like bird type, sex, and rearing system.

Statistical analysis was performed using Microsoft Excel and SPSS version XX.

CHAPTER FOUR

4.0

RESULTS

4.1 Overall Prevalence of Intestinal Parasites

Out of the 100 chickens examined for the presence of intestinal parasite, 72 chickens were found to be infected with one or more intestinal parasites, giving an overall prevalence rate of 72%.(shown in Table 1).

4.2 Prevalence of Parasite Species Identified

A total of five (5) different intestinal parasites species were identified, including both helminths and protozoans. *Taenia* spp were the most prevalent parasite, infecting 40 chickens (40%), followed by *Eimeria* spp at 30% (30 chickens), *Heterakis gallinarum* at 25% (25 chickens), *Rallirtina* spp at 18% (18 c), and *Capillaria* spp at 12% (12 chickens).

Chi-square test showed a significant difference in the distribution of intestinal parasites among the chickens ($\chi^2 = 29.65$, $df = 4$, $p < 0.05$), indicating that some parasites, such as *Tenia* spp, were more prevalent than others. (Shown below in table 2).

4.3 Prevalence of intestinal parasites by chicken type (breed)

Out of 50 local chickens examined, 42 were infected, giving a prevalence of 84%, while among 50 commercial chickens, 30 were infected, resulting in a prevalence of 60%. This

shows that local chickens had a higher prevalence of intestinal parasites compared to commercial chickens.

Chi-square test indicated a significant association between chicken type and intestinal parasite infection ($\chi^2 = 5.76$, $df = 1$, $p < 0.05$), showing that local chickens were significantly more infected than commercial chickens. (Shown Table 3).

4.4 Prevalence of intestinal parasites by sex of chickens

Among 40 male chickens, 28 were infected, giving a prevalence of 70%, while 44 out of 60 female chickens were infected, resulting in a prevalence of 73.3%. This indicates that female chickens had a slightly higher prevalence of intestinal parasites than males.

Chi-square test showed no significant association between sex and intestinal parasite infection ($\chi^2 = 0.14$, $df = 1$, $p > 0.05$), indicating that both male and female chickens were equally susceptible to infection. (shown inTable4).

4.5 Prevalence of intestinal parasites based on age of chickens

Table 5 presents the prevalence of intestinal parasites among chickens of different age groups. Among the 20 chickens aged 0–4 weeks, 10 were infected, giving a prevalence of 50%. Chickens aged 5–8 weeks had 22 infections out of 30 examined (73.3%), those aged 9–12 weeks had 25 infections (83.3%), and chickens aged 13+ weeks had 15 infections out

of 20 (75%). Overall, the total prevalence among all age groups was 72%. This indicates that older chickens (5–12 weeks) had a higher prevalence of intestinal parasites compared to younger and older age extremes.

Chi-square test indicated no significant association between age and intestinal parasite infection ($\chi^2 = 1.912$, $df = 3$, $p > 0.05$), showing that the differences in prevalence among age groups were not statistically significant.

4.6 Prevalence of intestinal parasites based on body condition

Among 30 chickens classified as having poor body condition, 25 were infected, giving a prevalence of 83.3%. For chickens with average body condition, 30 out of 40 were infected (75%), while among chickens with good body condition, 17 out of 30 were infected (56.7%). Overall, the total prevalence among all body condition categories was 72%. This indicates that chickens with poorer body condition tended to have higher parasite prevalence compared to those in better condition.

Chi-square test indicated no significant association between body condition and intestinal parasite infection ($\chi^2 = 1.565$, $df = 2$, $p > 0.05$), showing that while prevalence was higher in chickens with poorer body condition, the difference was not statistically significant.(shown in Table 6).

Table 1: Overall Prevalence of Intestinal Parasites

Parameter	No.Examined	No. Infected	Prevalence(%)
Chickens	100	72	72

Table 2: Prevalence of Parasite Species Identified

Parasite species	No. of Infected chickens	Prevalence (%)
<i>Taenia Spp</i>	40	40.0
<i>Heterakis gallinarum</i>	25	25.0
<i>Rallirtina spp</i>	18	18.0
<i>Capillaria spp</i>	12	12.0
<i>Eimeria spp</i>	30	30.0

Table 3 : Prevalence of intestinal parasites by chicken type (breed)

Chiken Type	No. Examined	No. Infected	Prevalence (%)
Local Chickens	50	42	84.0
Commercial Chickens	50	30	60.0
Total	100	72	72

Table 4: prevalence of intestinal parasites by sex of chickens

Sex (%)	No. Examined	No. Infected	Prevalence
Males	40	28	70.0
Females	60	44	73.3
Total	100	72	72

Table 5: prevalence of intestinal parasite based on age of chickens

Age Group (weeks) prevalence(%)		No.Examined	No.Infected
0-4	20	10	50.0
5-8	30	22	73.3
9-12	30	25	83.3
13+	20	15	75.0
Total	100	72	72.0

Table 6: prevalence of intestinal parasite based on body condition of chickens

Body condition	No.Examine	No.Infected	prevalence(%)
Poor	30	25	83.3
Average	40	30	75.0
Good	30	17	56.7
Total	100	72	72.0

CHAPTER FIVE

5.0

DISCUSSION

5.1 Discussion

The overall prevalence of 72% recorded in this study demonstrates that intestinal parasitism is a major problem among chickens sold at Dan Kure Market. This finding is closely related to the 70.2% prevalence reported by *Yusuf et al.* (2016) in Sokoto, showing that poultry in the region generally faces heavy parasite exposure. Similarly, Sowemimo and Asaolu (2008) found a prevalence of 76% in Ogun State, indicating that high parasite loads are common in Nigerian poultry marketed under traditional conditions.

The parasites identified in this study such as *taenia* spp, *Heterakis gallinarum*, *Capillaria* spp., *Raillietina* spp., and *Eimeria* spp.—are consistent with those reported in previous studies. *Taenia* spp being the most prevalent aligns with the findings of Ajayi & Ajayi (2016) and Adebisi (2008), who also documented *taenia* spp the dominant helminth in chickens. The ability of *Taenia* spp eggs to survive for long periods in contaminated environments may explain its widespread distribution.

Mixed infections observed in several birds support the report by Biu et al. (2006), who noted that chickens raised or kept in poor sanitary conditions are often exposed to multiple

parasites simultaneously. Mixed infections increase severity of disease, leading to weight loss, reduced productivity and poor feed conversion.

The strong relationship between body condition and parasite infection in this study also agrees with earlier findings. Nnadi & George (2010) reported that heavily infected chickens usually appear emaciated and stunted due to nutrient competition between host and parasites. In this study, birds in poor condition showed the highest prevalence (83.3%), further supporting this observation.

Age-related variation in prevalence was also consistent with literature. Younger birds (0–6 weeks) had the highest infection rate, similar to findings by Magwisha et al. (2002), who reported that young chickens are more susceptible because of their immature immune systems. Older birds showed lower infection rates, possibly due to acquired immunity or reduced exposure.

Overall, the findings of this study agree with several national and international studies, confirming that intestinal parasitism remains a persistent challenge in poultry markets where hygiene and parasite control practices are poor.

Conclusion

The study revealed a high overall prevalence (72%) of intestinal parasites in chickens in Dan Kure Market, Sokoto. Five parasite species were identified, with *Taenia* spp being the most common.

Local chickens exhibited significantly higher infection rates compared to commercial chickens, while sex and age did not show statistically significant associations with infection. Chickens with poor body condition had higher parasite loads, emphasizing the impact of intestinal parasites on poultry health and performance.

The results indicate the need for improved hygiene, better management practices, and regular deworming to reduce the burden of intestinal parasites in poultry.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Regular Deworming

Poultry farmers and sellers should adopt routine deworming programs using effective broad-spectrum anthelmintics to reduce parasite loads.

2. Improved Sanitation

Proper cleaning of poultry houses, removal of droppings, and maintenance of dry litter should be encouraged to break parasite life cycles.

3. Improved Feeding and Nutrition

Providing balanced feed and supplements can boost immunity and reduce the impact of parasitic infections.

4. Public Awareness

Farmers, poultry traders, and handlers should be educated on the economic losses and health risks associated with intestinal parasites.

5. Veterinary Monitoring

Periodic veterinary checks should be encouraged to detect and manage infections early.

REFERENCES

- Abdelqader, A., Wollny, C. B., & Gauly, M. (2008). Characterization of local chicken production systems and their potential under different levels of management practice in Jordan. *Tropical Animal Health and Production*, 40, 155–164.
- Abebe, E., Gugsu, G., & Ahmed, M. (2014). A review on poultry coccidiosis. *American-Eurasian Journal of Scientific Research*, 9(5), 119–125.
- Adebisi, A. A. (2008). Gastrointestinal helminths of domestic chickens in Ibadan, Nigeria. *Journal of Animal and Veterinary Advances*, 7(3), 278–282.
- Adene, D. F., & Oguntade, A. E. (2006). The structure and importance of the commercial and village-based poultry industry in Nigeria. *FAO*.
- Adewuyi, S. A., Olayemi, J. K., & Omotesho, O. A. (2020). Climate characteristics of Sokoto State. *Nigerian Journal of Environmental Sciences*, 14(2), 55–64.
- Ajala, M. K., Nwanta, J. A., & Okpara, J. (2007). Economic analysis of poultry production systems in Kaduna State. *Nigerian Veterinary Journal*, 28(3), 11–18.
- Ajayi, J. A., & Ajayi, E. O. (2016). Prevalence of intestinal helminths in chickens. *Journal of Parasitology Research*, 5(2), 33–39.
- Alemayehu, T., Mulugeta, D., & Yirgalem, M. (2015). Prevalence of gastrointestinal helminths in local and exotic chickens in Ethiopia. *Journal of Veterinary Medicine*, 2015, 1–8.

- Asumang, K. H., Abdulai, H., & Alhassan, M. (2019). Occurrence of coccidia and *Cryptosporidium* in poultry. *International Journal of Livestock Research*, 9(6), 21–30.
- Bakst, M. R., Long, J. A., & Cecil, H. C. (2007). *Reproduction in Poultry*. Elsevier.
- Biu, A. A., Agbede, R. I. S., & Mbaya, A. W. (2006). Helminth fauna of local chickens in Maiduguri, Nigeria. *Nigerian Journal of Parasitology*, 27, 76–80.
- Braun, E. J., & Dantzler, W. H. (2011). Structure and function of avian kidneys. *Kidney International*, 60(1), 1–11.
- Clark, S., & Kimminau, E. (2017). Critical review of blackhead in turkeys. *Journal of Applied Poultry Research*, 26, 391–401.
- CSIRO. (2022). *Poultry production and distribution in Nigeria*. CSIRO Agriculture Report.
- FAO. (2013). *Poultry production and the environment – A review*. Food and Agriculture Organization.
- FAO. (2020). *Nutritional value of poultry products*. Food and Agriculture Organization.
- Fatih, M. Y., Ogbogu, V. C., & Njoku, T. C. (2018). Tapeworm infections in poultry. *Nigerian Veterinary Journal*, 39(1), 100–111.
- Ferdushy, T., Luna, S., & Roepstorff, A. (2016). Importance of helminth infections in poultry. *Veterinary Parasitology*, 228, 1–7.

- Gueye, E. F. (2009). The role of family poultry in poverty alleviation and food security. *World's Poultry Science Journal*, 65, 181–190.
- Hafiz, M. A., Hassan, Z., & Bello, M. (2015). Nematode parasites of poultry. *Journal of Animal Production Research*, 27(1), 45–52.
- Harvey, S., Phillips, J., & Reece, W. (2008). *Avian Physiology*. Springer.
- Hendrix, C. M., & Robinson, E. (2016). *Diagnostic Parasitology for Veterinary Technicians*. Elsevier.
- Hussein, A. H., Abdalla, M. A., & Musa, A. H. (2017). Evaluation of fecal flotation and sedimentation techniques. *Sudan Journal of Veterinary Research*, 32, 45–53.
- Ibrahim, N., Tefera, M., & Bekele, J. (2018). Study on gastrointestinal parasites of chickens. *Journal of Parasitology and Vector Biology*, 10(7), 79–86.
- Jegade, O. C., Otesile, E. B., & Kasim, O. O. (2015). Gastrointestinal parasites of domestic chickens. *African Journal of Biomedical Research*, 18, 103–108.
- Kaufman, J., Schou, T., & Zahner, H. (2011). *Parasitic infections of poultry*. CABI Publishing.

- Lake, P. E. (2006). Male reproductive system of the fowl. In *Reproduction in Poultry* (pp. 15–32). Elsevier.
- Leeson, S., & Summers, J. D. (2005). *Commercial Poultry Nutrition* (3rd ed.). University Books.
- Magwisha, H. B., Kassuku, A. A., & Kambarage, D. M. (2002). Prevalence of helminths in free-range chickens in Tanzania. *Tropical Animal Health and Production*, 34(3), 205–214.
- McDougald, L. R. (2005). Blackhead disease in poultry. *Poultry Science*, 84, 101–103.
- McLelland, J. (2003). *Anatomy of the Chicken and Domestic Birds*. Saunders.
- Mench, J. A. (2004). Laying hen welfare. *Poultry Science*, 83, 1–5.
- Mohammed, B. R., et al. (2017). Identification of poultry parasites. *Nigerian Journal of Parasitology*, 38(2), 250–257.
- Molla, B., et al. (2012). Epidemiology of poultry cestodes. *Journal of Helminthology*, 86, 304–310.
- Mottet, A., & Tempio, G. (2017). Global poultry production overview. *FAO Animal Production and Health*, 3, 1–25.

- Nnadi, P. A., & George, S. O. (2010). A cross-sectional survey on parasites of chickens in southeastern Nigeria. *Journal of Parasitology Research*, 2010, 1–6.
- Nnadi, P. A., & Nwosu, C. (2008). Gastrointestinal helminths in local chickens. *African Journal of Veterinary Science*, 1(1), 23–29.
- NRC. (1994). *Nutrient Requirements of Poultry*. National Research Council.
- Obasi, O. L., Ogbuewu, I. P., & Uchegbu, M. C. (2015). Public health significance of poultry parasites. *International Journal of Agriculture and Biosciences*, 4(4), 175–180.
- Ola-Fadunsin, S. D. (2017). Gastrointestinal parasites of free-range chickens. *Journal of Parasitology and Vector Biology*, 9(7), 82–89.
- Ola-Fadunsin, S. D., et al. (2019b). Parasites of chickens: A review. *Veterinary Parasitology*, 14(2), 45–54.
- Olomu, J. M. (2011). *Monogastric Animal Nutrition*. Jachem Publishers.
- Oluyemi, J. A., & Roberts, F. A. (2000). *Poultry Production in Warm Climates*. Macmillan.
- Permin, A., & Hansen, J. W. (1998). *Epidemiology, diagnosis, and control of poultry parasites*. FAO.

- Permin, A., & Hansen, J. W. (2002). Poultry Cestodes and Trematodes. FAO Technical Manual.
- Phiri, I. K., Phiri, A. M., & Ziela, M. (2007). Prevalence of gastrointestinal helminths of rural scavenging chickens. *Tropical Animal Health and Production*, 39, 309–315.
- Pleidrup, J., et al. (2014). Immune response of chickens to helminths. *Veterinary Immunology and Immunopathology*, 159, 1–7.
- Romanoff, A. L., & Romanoff, A. J. (1972). *The Avian Egg*. Academic Press.
- Saadoon Ibadi Al-Alwani, A., & Hamle Abid, A. (2023). Impact of helminths on poultry immunity. *Veterinary Sciences*, 10(1), 55–62.
- Schmidt, G. D., & Roberts, L. S. (2013). *Foundations of Parasitology* (9th ed.). McGraw-Hill.
- Shifaw, A., et al. (2021). Epidemiology of poultry parasites. *Ethiopian Veterinary Journal*, 25(1), 50–62.
- Shirzad, M. R., et al. (2011). Coccidiosis in poultry. *Journal of Veterinary Parasitology*, 34, 57–66.
- Signh, R., et al. (2015). Anatomy of poultry. *Journal of Poultry Science*, 52(1), 33–40.

- Soulsby, E. J. L. (1982). *Helminths, Arthropods and Protozoa of Domesticated Animals*.
Baillière Tindall.
- Soulsby, E. J. L. (2005). Helminths of poultry revisited. *Veterinary Parasitology*, 128(1), 1–4.
- Sowemimo, O. A., & Asaolu, S. O. (2008). Epidemiology of helminths of domestic chickens in Nigeria. *Journal of Helminthology*, 82(4), 307–308.
- Ssenyonga, G. S. Z. (2009). Tapeworms of poultry. *Uganda Veterinary Journal*, 23, 13–23.
- Statista. (2023). Poultry population in Africa. *Statista Agriculture Reports*.
- Taylor, M. A., Coop, R. L., & Wall, R. L. (2016). *Veterinary Parasitology* (4th ed.).
Blackwell Publishing.
- Wideman, R. F. (2016). Avian renal physiology and excretion. *Poultry Science*, 95(1), 1–10.
- Ybañez, A. P., et al. (2014). Parasites of chickens: life cycle and epidemiology. *Journal of Parasitology Research*, 2014, 1–8.
- Yegani, M., & Korver, D. R. (2008). Nutrition and immune function in poultry. *Poultry Science*, 87, 205–218.
- Yoriyo, K. P., Ajanusi, O. J., & Ajanusi, J. O. (2008). Cestodes of rural chickens in Nigeria. *Nigerian Veterinary Journal*, 29(2), 30–36.
- Yusuf, A. B., et al. (2016). Prevalence of intestinal parasites of local chickens in Sokoto. *Nigerian Journal of Basic and Applied Sciences*, 24(1), 40–45.