SURVEY OF MOSQUITO SPECIES WITHIN ILORIN METROPOLIS

A PROJECT REPORT SUBMITTED

BY

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ND/23/SLT/PT/0180

BEING A RESEARCH POROJECT SUBMITTED TO THE DEPARTMENT OF SCIENCE LABORATORY TECHNOLOGY, INSTITUTE OF APPLIED SCIENC E, KWARA STATE POLYTECHNIC, ILORIN.

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF NATIONAL DIPLOMA (ND) IN SCIENCE LABORATORY TECHNOLOGY.

JULY,2025

CERTIFICATION

This is to certify that this project work was carried out by SANNI RUKAY AT MORENIKEJI with Matric Number: **ND/23/SLT/PT/0180** in the Depar tment of Science laboratory Technology (SLT), Institute of Applied Scien ce (IAS) and has been read and approved as meeting the requirements for award of National Diploma, Kwara State Polytechnic Ilorin.

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DEDICATION

I dedicate this project to Almighty Allah, who has seen me through it all.

Also, to my lovely parent and to my loved ones for their love and suppor

t, am very grateful for everything.

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ACKNOWLEDGEMENT

My first and deepest appreciation goes to Almighty Allah, the beneficen t, the merciful, for guiding and protecting me always throughout my jour ney on campus and for the time fulfilment of His promises concerning my life.

All thanks to my supervisor MR IBRAHIM A.W for his guidance and his a dvise all this time. I say thanks you sir for the support, TO my H.O.U Mr. Opeyemi, A. A. Also to my Head of Department H.O.D in person of DR.A BDULKAREEM USMAN for his encouragement.

My sincere appreciation and deep sense of gratitude is given to no one but my parent, Special thanks to individuals who has contributed to my success, my Allah bless you all.

ABSTRACT

This study presents a comprehensive survey of mosquito species within Ilorin Metropolis, Nigeria, with the aim of identifying the distribution, abundance, and diversity of mosquito vectors across three major zones: Ilorin South, Ilorin East, and Ilorin West. Mosquito specimens were collected using standard entomological techniques including CDC light traps, aspirators, and larval dipping from selected breeding sites such as stagnant water bodies, gutters, and containers. A total of 263 mosquitoes were collected and identified morphologically into three genera: Anopheles, Culex, and Aedes. The results showed that Culex spp. were the most abundant (39.9%), followed by Anopheles spp. (31.9%) and Aedes spp. (28.2%). Ilorin South recorded the highest mosquito count, while Ilorin West had the lowest. The Shannon-Wiener diversity index indicated moderate species diversity across all zones, with the highest diversity observed in Ilorin East (H' = 1.06). Larval stages represented the highest proportion of specimens collected, reflecting active breeding across the study sites. The findings highlight the influence of environmental factors, urbanization, and poor sanitation on mosquito proliferation in Ilorin. This baseline data is critical for guiding targeted vector control strategies and strengthening public health interventions to mitigate mosquito-borne diseases such as malaria, lymphatic filariasis, and yellow fever. The study emphasizes the need for integrated vector management, community engagem

ent, and routine entomological surveillance in Ilorin and similar urban ce nters.

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CHAPTER ONE

1.0 Introduction

Mosquitoes are significant vectors of many human and animal diseases, including malaria, dengue fever, yellow fever, and filariasis. Their presence and proliferation are often influenced by environmental, climatic, and anthropogenic factors, especially in tropical regions like Nigeria. Ilorin, the capital of Kwara State, is experiencing increasing urbanization, which alters mosquito breeding habitats. Consequently, a detailed understanding of mosquito species distribution in this area is vital for effective vector control strategies (Olawoyin *et al.*, 2021). Such surveys help in identifying the predominant mosquito species and in assessing the risk of vector-borne diseases within the metropolis.

Ilorin, located in the north-central zone of Nigeria, has a mix of urban, peri-urban, and rural settings. These diverse ecological zones within the city provide suitable breeding sites for different mosquito species. The presence of stagnant water, poor drainage systems, and household contain

ers further encourages mosquito breeding (Adeniran *et al.*, 2022). Furth ermore, the city experiences a tropical wet and dry climate, which creat es alternating favorable and unfavorable conditions for mosquito surviv al. These climatic dynamics necessitate seasonal and spatial monitorin g of mosquito populations. Identifying the species composition is also i mportant for targeted insecticide application and public health interventi on.

Urbanization in Ilorin has led to several environmental modifications suc h as construction of drainage systems, waste dumps, and artificial cont ainers that may hold rainwater. These changes unintentionally provide h abitats for mosquito larvae development. The lack of proper environme ntal sanitation and community awareness further aggravates the situati on (Muhammed *et al.*, 2020). As a result, the mosquito burden in Ilorin is not limited to rural areas but has become a growing concern in densely populated urban centers. Hence, a comprehensive survey of mosquito s pecies is important to guide city-wide vector control programs.

One of the major concerns about mosquito proliferation is the increased prevalence of mosquito-borne diseases. Malaria remains endemic in Ni geria and continues to pose a significant public health threat despite co ntrol efforts (Nigeria Malaria Indicator Survey, 2021). In addition, the thr eat of yellow fever outbreaks has increased, as *Aedes* species have bee n reported in both urban and peri-urban environments. Surveillance data are necessary to monitor trends in mosquito diversity and abundance, w hich directly influence disease epidemiology. Without updated baseline data, health authorities may struggle to allocate resources effectively.

Seasonal variation plays a critical role in mosquito distribution and speci es dynamics. Mosquito populations typically rise during the rainy seaso n when water bodies become abundant. This temporal fluctuation affec ts not just the number but also the types of mosquito species prevalent at different times of the year (Adesina *et al.*, 2023). For example, *Anoph eles* mosquitoes prefer clean, slow-moving waters, which are more abu ndant in certain seasons. A proper survey must take into account both d

ry and rainy seasons to capture a representative sample of the mosquit o fauna.

Climate change is another factor influencing mosquito distribution. War mer temperatures, altered rainfall patterns, and increased humidity can extend the breeding season and expand the geographical range of certa in mosquito species. Studies have shown that climate variability correlat es with increased mosquito abundance and the spread of mosquito-bor ne diseases (Okoye *et al.*, 2022). These changes highlight the importanc e of conducting periodic entomological surveys. Ilorin, being a rapidly ur banizing city with dynamic climatic conditions, requires regular mosquit o species assessments to inform public health preparedness.

Socioeconomic factors also affect mosquito proliferation and control wit hin Ilorin. Areas with poor housing structures, limited access to healthca re, and inadequate drainage tend to harbor more mosquitoes. The awar eness and practices of residents regarding mosquito control—such as th

e use of insecticide-treated nets or environmental sanitation—also play a role (Yahaya *et al.*, 2020). Therefore, any mosquito species survey mu st consider the local demographic and socioeconomic context. Including such data in mosquito surveillance can aid in identifying high-risk zones for intervention.

Technological advances in mosquito identification, such as molecular te chniques and digital surveillance tools, now make species-level identific ation more accurate and efficient. However, many areas like Ilorin still re ly on conventional methods such as larval sampling and morphological i dentification due to limited resources. Despite these challenges, even b asic survey techniques can yield valuable insights when consistently an d correctly applied (Ibrahim *et al.*, 2021). Integrating new tools with tradi tional methods may improve the precision of future mosquito surveys. T he goal is to develop a reliable dataset that supports sustainable vector control strategies.

Community involvement is essential for the success of any mosquito co ntrol program. Conducting surveys without community cooperation ofte n results in limited access to potential breeding sites and inaccurate dat a. Engaging the community through education, sensitization, and partici patory monitoring ensures better data collection and sustainable control outcomes (Olatunji and Bello, 2023). Residents of Ilorin must be encoura ged to eliminate breeding sites, report mosquito infestations, and suppo rt entomological studies. Empowering local populations can significantly contribute to reducing mosquito burden and the diseases they transmit.

The results of mosquito species surveys have broad implications for pu blic health. They provide crucial data that influence the selection of cont rol measures such as larviciding, indoor residual spraying, and the distrib ution of insecticide-treated nets. For example, areas with high *Culex* mo squito prevalence may require different interventions compared to thos e with *Anopheles* dominance. A species-specific approach ensures that interventions are both cost-effective and impactful (WHO, 2021). Thus, u

nderstanding mosquito biodiversity in Ilorin can enhance vector control planning and disease prevention efforts.

Environmental management remains a cornerstone of mosquito contro l. Proper waste disposal, drainage maintenance, and urban planning can drastically reduce mosquito breeding sites. Surveys help to identify envi ronmental factors contributing to mosquito proliferation in specific area s. This makes it possible to develop targeted interventions such as drain ing stagnant water, modifying habitats, and promoting environmental hy giene (Akinyemi *et al.*, 2020). These measures are especially crucial in Il orin where rapid development is often not accompanied by proper wast e and water management systems.

The survey of mosquito species within Ilorin Metropoly is both timely an d necessary. It provides a scientific basis for vector control, guides publi c health interventions, and fosters a healthier urban environment. The g rowing urbanization, changing climate, and increasing population densit

y in Ilorin make mosquito surveillance a priority. The data generated will not only benefit Ilorin but can also serve as a model for other Nigerian ci ties facing similar challenges. By investing in entomological research an d community-based interventions, the city can effectively combat mosq uito-borne diseases and protect public health (Adebayo *et al.*, 2021).

1.2 LITERATURE REVIEW

Mosquitoes are one of the most significant vectors of infectious disease s, transmitting pathogens that cause malaria, dengue, chikungunya, yell ow fever, and Zika virus. The global burden of mosquito-borne diseases remains high, particularly in sub-Saharan Africa where species of *Anoph eles*, *Aedes*, and *Culex* predominate (Afolabi *et al.*, 2020). Understandin g species distribution is essential for targeted vector control, especially i n urban and semi-urban areas where ecological changes drive mosquito adaptation. Urbanization, poor drainage systems, and improper waste di sposal contribute significantly to mosquito breeding in Nigerian cities lik e Ilorin (Adepoju *et al.*, 2021). Consequently, surveys are crucial to detec

t shifts in species composition and to design evidence-based interventio

n s .

Recent studies have shown a growing diversity of mosquito species in u rban and peri-urban environments in Nigeria. For example, *Aedes aegyp ti*, the vector of yellow fever and dengue, has been increasingly reported in urban areas due to its affinity for artificial containers and stagnant wa ter bodies (Oluwasogo *et al.*, 2020). *Culex quinquefasciatus*, a primary v ector of lymphatic filariasis, also thrives in polluted environments with hi gh organic matter. As Ilorin continues to urbanize rapidly, the cohabitatio n of these species raises serious public health concerns. Understanding which species dominate specific localities within Ilorin can assist in direc ting vector control to critical hotspots (Aliyu *et al.*, 2022). A study conducted in Kwara State revealed seasonal variations in mosq uito abundance, with a notable increase during the rainy season (Yahay a *et al.*, 2021). The researchers identified that mosquito species thrive i n different breeding habitats such as stagnant drains, uncovered wells,

and improperly disposed containers. This seasonal pattern reflects the dependency of mosquito life cycles on moisture and temperature, which are influenced by the region's tropical climate. Rainfall occurs between A pril and October, breeding sites expand dramatically, necessitating inten sified surveillance during this period.

Mosquito-borne disease control is hindered by the increasing resistance of vector species to commonly used insecticides. Studies in neighboring regions, including Oyo and Osun States, have reported high levels of resi stance in *Anopheles* and *Culex* species to pyrethroids and carbamates (Ajayi *et al.*, 2020).

The ecological preferences of mosquito species also affect their spatial distribution. *Aedes* mosquitoes are primarily container breeders, often f ound in tires, buckets, and flower pots, while *Culex* mosquitoes prefer or ganically rich stagnant water. *Anopheles* species typically favor clean, s unlit pools for oviposition (Mohammed and Onimisi, 2023). A study cond

ucted in Ilorin found that open drainage and poor waste management s ystems facilitated the coexistence of multiple species within residential areas (Abdulsalam *et al.*, 2022). The variation in habitat preference und erscores the need for targeted environmental management strategies a longside chemical control.

The presence of mixed-species populations within small geographic zon es complicates mosquito control. For instance, in a survey of mosquito diversity in Ibadan, over six species from three genera were identified wi thin a 10 km radius, revealing overlapping niches and breeding grounds (Oladipo and Salami, 2021). Similar ecological dynamics are likely in Ilori n due to comparable environmental and demographic factors. This indic ates the importance of localized surveys and community participation in mosquito surveillance and control efforts to ensure sustainability and ef fectiveness.

Citizen engagement and public awareness are vital components of succ

essful mosquito surveillance programs. Public education campaigns on the dangers of mosquito breeding and personal protection methods can significantly reduce vector-human contact (Nnadi *et al.*, 2023). In Ilorin, a coordinated effort involving health officials, researchers, and communi ty stakeholders will enhance the implementation of integrated vector m anagement strategies. Furthermore, encouraging household-level larval source management can reduce the proliferation of mosquitoes in dens ely populated areas.

1.3 STATEMENT OF PROBLEM

Mosquito-borne diseases remain a major public health threat in Ilorin du e to the increasing population of mosquito species and inadequate vect or control measures. The lack of current data on species distribution ha mpers effective intervention. Identifying mosquito species present withi n the metropolis is crucial for targeted disease prevention strategies.

1.4 AIM

The aim of this study is to survey and identify the mosquito species pre

sent within Ilorin metropolis in order to provide baseline data for effectiv e vector control and disease prevention strategies.

1.5 OBJECTIVES

- To collect and identify different mosquito species present in selec ted areas within Ilorin metropolis.
- To determine the relative abundance and distribution of the identif ied mosquito species.
- To assess the environmental factors contributing to mosquito bre eding in the study areas.

CHAPTER TWO

2.0 MATERIALS AND METHODS

2.1 Materials

The materials used in this study included essential entomological tools and laboratory equipment necessary for the collection, identification, an d analysis of mosquito species. The materials comprised mosquito colle ction traps such as CDC light traps, ovitraps, and aspirators, which were strategically placed at different locations to capture adult mosquitoes. L arval collection equipment, including dippers and pipettes, was used to c ollect immature mosquito stages from various breeding sites. Other ess ential materials included sterile sample containers, forceps, dissecting microscopes, and identification keys to aid in species classification. Lab oratory materials such as reagents for molecular or morphological identi fication, Petri dishes, slides, ethanol (70%) for preservation, and labels w ere also employed to ensure proper documentation and storage of sam ples for further analysis.

2.2 Sample Collection

- ➢ Ilorin South: Tanke & Agbado
- ➢ Ilorin East: Amilengbe & Sao garage
- ➢ Ilorin West: Ologe & Sawmill

Mosquitoes were collected at different times of the day in ilorin to ensur e a comprehensive survey of species composition and abundance. Both immature (larvae and pupae) and adult mosquitoes were sampled to ac count for all life stages. Larvae and pupae were collected using standar d dippers or pipettes from stagnant water sources such as puddles, drai ns, and containers. These samples were transferred into labeled plastic containers containing water from their original habitat and transported t o the laboratory for further analysis. Adult mosquitoes were captured us ing CDC light traps, human-baited traps, and aspirators from various loc ations, including residential areas, agricultural fields, and forests. Captur ed mosquitoes were carefully transferred into collection vials containing