# PREVALENCE OF *HISTIDINE-RICH PROTEIN II* GENE DELETION IN *Plasmodium falciparum* ISOLATES FROM SUBJECTS IN ADO-OTA, OGUN STATE

**KWARPO, ZEENDI SILAS**

**(22PCQ02458)**

**BSc Microbiology, University of Jos, Plateau State**

**AUGUST 2024**

# PREVALENCE OF *HISTIDINE-RICH PROTEIN II* GENE DELETION IN *PLASMODIUM FALCIPARUM* AMONG SUBJECTS IN ADO-OTA, OGUN STATE

**BY**

**Kwarpo, Zeendi Silas**
**(22PCQ02458)**
**BSc. Microbiology University of Jos, Jos, Plateau State**

**A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE (M.Sc) DEGREE IN MICROBIOLOGY IN THE DEPARTMENT OF BIOLOGICAL SCIENCES, COLLEGE OF SCIENCE AND TECHNOLOGY, COVENANT UNIVERSITY, OTA, OGUN STATE, NIGERIA**

**AUGUST 2024**

# ACCEPTANCE

This is to attest that this dissertation is accepted in partial fulfilment of the requirements for the award of the degree of Master of Science in Microbiology in the Department of Biological Sciences, College of Science and Technology, Covenant University, Ota, Nigeria

**Miss Adefunke F. Oyinloye**
**(Secretary, School of Postgraduate Studies)** **Signature and Date**

**Prof. Akan B. Williams**
**(Dean, School of Postgraduate Studies)** **Signature and Date**

# DECLARATIONS

It is hereby declared that this research work titled "**PREVALENCE OF HISTIDINE-RICH PROTEIN II GENE DELETION IN *Plasmodium falciparum* AMONG SUBJECTS IN ADO-OTA, OGUN STATE**" was undertaken by **KWARPO, ZEENDI SILAS**. It is based on the original study in the Department of Biological Sciences and Technology, Covenant University Ota, under Professor Olayemi O. Akinnola's supervision. The ideas and views of other researchers have been duly expressed and acknowledged.

**KWARPO, ZEENDI SILAS**
**(Student)** **Signature and Date**

# CERTIFICATION

We certify that this dissertation titled **"PREVALENCE OF HISTIDINE-RICH PROTEIN II GENE DELETION IN *Plasmodium falciparum* AMONG SUBJECTS IN ADO-OTA, OGUN STATE"** is an original research work carried out by **KWARPO, ZEENDI SILAS** in the Department of Biological Sciences, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria under the supervision of Professor Olayemi O. Akinnola We have examined and found this work acceptable as part of the requirements for the award of Master of Science in Microbiology.

**Professor Olayemi O. Akinnola**
**(Supervisor)** **Signature and Date**

**Dr Opeyemi I. Ayanda**
**(Head of Department)** **Signature and Date**

**Prof. Segun I. Oyedeji**
**(External Examiner)** **Signature and Date**

**Prof. Akan B. Williams**
**(Dean, School of Postgraduate Studies)** **Signature and Date**

# DEDICATION

This work is dedicated to the Almighty GOD, the Father of all light and giver of good and perfect gifts, who was the source of strength and inspiration for this research.

# ACKNOWLEDGEMENT

I am most grateful to Almighty God for the strength that carried me through my study programme and my parents and the Kwarpo family for their support. I am also deeply thankful to my mentor and supervisor, Professor Olayemi O. Akinnola, for her intuition and guidance throughout my project.

My gratitude goes to my HOD and great lecturers in the Biological Sciences department, particularly Professor Conrad Omonhimmin, who have contributed to the quality of the project. Also, my late supervisor, Professor Grace I. Olasheinde, who inspired this project, and her impact will not be forgotten.

I also want to thank Mr Olabode Onile-Ere for his invaluable contributions to this work. I also appreciate Katchey Laboratories' assistance. I also acknowledge my classmates and schoolmates, Comfort Adedoyin, Dare Oluwatobi, Nike Onabote, Tobi Obadire and Udeme Christopher, who supported me during my benchwork.

Without fail, I must appreciate CApIC-ACE, to whom I am hugely indebted, for their immense financial support and encouragement throughout my research.

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# ABSTRACT

The key to reducing malaria-related deaths in areas with high transmission rates is prompt diagnosis and appropriate treatment. Malaria Rapid diagnostic tests (RDTs or mRDT) that utilize *histidine-rich protein* 2 (*PfHRP2*) as a biomarker are essential for quickly and accurately diagnosing *P. falciparum* infections in endemic regions like Nigeria. However, *PfHRP2* gene deletion and the variability of amino acids threaten the mRDT test sensitivity. This study was carried out to investigate the prevalence of *HRP2* gene deletion in *Plasmodium falciparum* among symptomatic subjects in Ota. Ethical clearance from the Covenant Health Ethics Review Committee (CHREC) was obtained. Three-hundred and ninety-six samples were collected from subjects visiting four healthcare facilities in Ota, Ogun State, Nigeria and tested for malaria using HRP2-based RDT. The presence of parasites in RDT false negative cases and microscopy positive cases were validated using nested Polymerase Chain Reaction (PCR). Thereafter, exon 2 of *PfHRP2* was amplified, and Sanger sequenced. The prevalence of malaria was recorded at 57.07%, with the age group below 5 years showing the highest prevalence of 49.15%. Out of 50 samples, forty-seven were positive by 18sRNA quantitative PCR. Single-copy gene MSP1 showed an overall multiplicity of infection of 1.5. The MAD20 allele had the highest frequency (72.72%), the K1 allele (54.45%) and the RO33 allele recorded the lowest frequency (27.27%) among the samples that amplified the MSP1. The prevalence of HRP2 gene deletion was recorded at 15.4% (2/13) among samples with amplified single-copy genes using Nested PCR. More studies using larger sample sizes for genotyping and more sensitive techniques like digital droplet PCR are recommended to determine the full extent of *PfHRP2* gene deletion in Nigeria.



***Keywords: HRP2 gene, HRP2 gene deletion, RDT, Malaria diagnosis***