Natural Resources for Human Health
eISSN: 2583-1194

Original Research

Received 24 July 2026
Revised 30 Aug 2026
Accepted 20 Sep 2026

Natural Resources for Human Health 2026, Vol. 6 (22s): 395–403

KEYWORDS:
center for disease control and prevention, world health organization, sekyere south hospital, polymerase chain reaction, insecticide treated net

Prevalence Of Malaria and Typhoid Co-Infection in Selected Hospitals in the Ashanti Region [Agona Health Center, Mampong Government Hospital and Quality Health Care Ltd]

Kelvin Osei[1], Paul Antwi Boakye[2], Enoch Owusu[3], Emmanuel Effah Yeboah[4]

[1]Department of Medical Laboratory and Life Sciences, Parul Institute of Allied and Healthcare Sciences, Faculty of Medicine, Vadodara, Gujarat, India
[2]Department of science Education, University of Education Winneba-College of Agriculture Education-Ashanti Mampong
[3]Department of science Education, University of Education Winneba-College of Agriculture Education-Ashanti Mampong
[4]Department of science Education, University of Education Winneba-College of Agriculture Education-Ashanti Mampong
*Corresponding author: Kelvin Osei, kelvinosei008@gmail.com

ABSTRACT: Malaria and typhoid fever are the purposes of health troubles, especially in low and middle- income countries. People in endemic areas are at threat of growing each infection concomitantly. This study was performed to provide epidemiological information on co- infection of malaria and typhoid fever in Agona Health Center, Mampong Government Hospital and Mampong Quality health care Ltd. Malaria and typhoid fever are the most endemic ailments in the tropics. The emergence of multi-drug-resistant strains of Salmonella typhi and Plasmodium falciparum poses a big venture to the eradication of both diseases.

Both ailments share comparable transmission factors, placing folks in areas endemic to each infection at giant risk of contracting both infections concurrently.

A cross-sectional study involving nine hundred and forty-three (943) febrile patients attending Agona Health Center, Mampong Government Hospital and Mampong Quality health care Ltd. Images of handwritten records of patients who meet the criteria were recorded. Data were analyzed using Excel (2016) and IBM SPSS version 26.0

The fundamental goal of the find out was once to determine the incidence of malaria and typhoid fever co-infection in the Ashanti region of Ghana. Nine hundred and forty-three contributors were recruited for the study. A sample size of 943 patients was enrolled on the study. Of this, 316 (33.51%) were males and 627 (66.49%) females. A greater proportion was within the ages less than 20 years.

Even though malaria and typhoid fever are common in Ghana and have similar characteristics, most of the patients were infected with typhoid as compared to malaria in the study population. Almost 2 out of every 10 patients (24.39%) were co-infected with malaria and typhoid fever. There is a significant association between age and infections

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1. INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Malaria and typhoid fever are considered as one the most prevalent diseases in tropical and developing countries (Qureshi et al. 2019). They impose health and socio-economic burden significantly on populations that are affected (Jalani et al. 2019). The two diseases can lead to substantial morbidity and mortality (Vasava et al., 2021). According to the Centre for Disease Control (CDC), the two diseases have been associated with poverty and underdevelopment (Kano & Kano, 2017).

Malaria is an acute febrile illness among humans and other animals that is mainly caused by the parasitic protozoan, Plasmodium. It is transmitted through the bite of the female Anopheles mosquito (Jalani et al. 2019; Kenneth Oshiokhayamhe et al. 2021). Most infections are caused by P. falciparum, which is the most dangerous human malaria parasite, others include P. vivax, P. ovale and P. malariae collectively, causing an estimated 1.4-2.6 million deaths per year (Jalani et al. 2019). Malaria is the most prevalent infectious disease in the tropical and sub-tropical regions of the world and a great public health concern. About 90% of malaria deaths all over the world take place in sub-Saharan Africa. Transmission is seasonal and peaks during and just after the rainy season. Malaria epidemics can also occur when the atmosphere and other conditions abruptly favor transmission in areas where people have minute or absence of an immunity to malaria (Vasava et al. 2021).

Typhoid is also an endemic major public health problem in Africa. It is an acute life- threatening febrile illness caused by the bacterium Salmonella. An estimated 22 million cases of typhoid fever and 200,000 related death occurrences are recorded worldwide each year (Jalani et al. 2019; Udoidung & Eyoh, 2015). A load of typhoid fever in low and middle- income countries are higher due to poor sanitation and an unhygienic lifestyle (Vasava et al. 2021). It is also considered a common disease in children due to unsafe water usage and poor cleaning habits. The species and strains of Salmonella that commonly cause typhoid fever in humans are Salmonella paratyphi A, Salmonella paratyphi B, Salmonella paratyphi C and Salmonella typhi (Eze et al. 2011). Salmonella typhi can survive in fresh, salty and brackish water for several weeks and can multiply in milk products. Flies and other insects transfer infective Salmonella microbes from infected faeces and other materials to drink and food (Qureshi et al. 2019).

Co-infection of malaria and typhoid fever is becoming a major issue in tropical and subtropical countries (Jalani et al. 2019). Both diseases share similar transmission factors and often have similar symptoms (Qureshi et al. 2019). Also, due to the geographical overlap of both infections, co-infections are very common. However, the precise incidence of concurrent malaria and typhoid fever in most geographical areas is largely uncertain, as both share social circumstances which are imperative to their transmission; individuals in areas endemic to both diseases are at substantial risk of contracting both these diseases, either concurrently or an acute infection superimposed on a chronic one (Odikamnoro et al. 2017).

They are found prevalent in ecological environments of warm tropical temperatures and among people with poor hygienic practices and living conditions (Pam VA et al. 2015; Qureshi et al. 2019).

1.2 PROBLEM STATEMENT

Malaria and typhoid fever are both diseases that are similar in terms of factors of transmission and symptoms. They are considered as part of endemic diseases in the tropical and developing countries that are of public health concern (Qureshi et al. 2019). They can lead to substantial morbidity and mortality (Vasava et al. 2021).

Socio-economic and environmental conditions that tend to sustain a high prevalence of malaria in endemic areas also favour the transmission of Salmonella typhi (Pam VA et al. 2015). Individuals in areas endemic for both diseases are at great risk of contracting both diseases, either simultaneously or as an acute infection superimposed on a chronic one (Odikamnoro et al. 2017)

Ghana, despite being one of the countries in the Sub-Saharan region with a high prevalence of malaria and typhoid, has not done enough research in this area (Qureshi et al. 2019). For this reason, the study seeks to assess demographic factors that influence malaria and typhoid co-infection and the prevalence of co-infection despite measures put in place to control both diseases.

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1.3 GENERAL OBJECTIVE

The overall objective of the study is to determine the prevalence and investigate the influence of demographic factors on malaria and typhoid co-infection in the Ashanti Region.

1.3.1 SPECIFIC OBJECTIVES

1. To determine the prevalence of malaria and typhoid co-infection in the Ashanti Region.
2. To determine the effect of demographics on malaria and typhoid co-infection in the Ashanti Region.

1.4 PURPOSE OF THE STUDY

The purpose of this study is to investigate the prevalence of malaria and typhoid co-infection and the influence of demographics using secondary data obtained from hospitals in the Ashanti Region.

1.5 SIGNIFICANCE OF THE STUDY

According to Qureshi et al. (2019), high prevalence has been established for malaria and typhoid co-infection but it was within the last two decades that reports have been made. Malaria and typhoid are known to cause substantial morbidity and mortality (Vasava et al. 2021).

Findings made from this research will suggest to the government to improve environmental factors which tend to encourage the high transmission of malaria and typhoid fever. These include improved housing, sanitation, and provision of social amenities such as good drinking water and electricity. Public awareness programs would also be created to enlighten the people on the need to use preventive measures such as the use of Insecticide Treated Nets to curb the threat of malaria and typhoid which pose a major challenge (Udoidung & Eyoh, 2015).

1.6 HYPOTHESIS

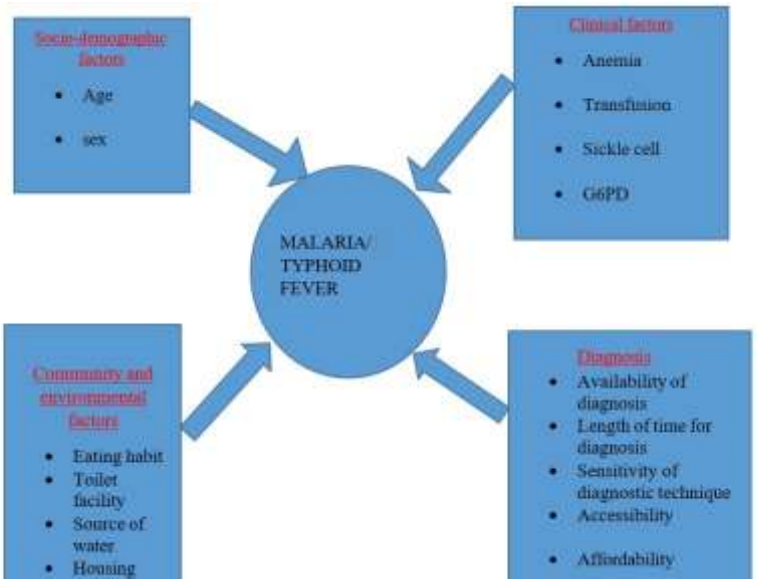
1. The prevalence of malaria and typhoid co-infection is high in the Ashanti Region.
2. Demographics influence malaria and typhoid co-infection patterns in the Ashanti Region.

1.7 RESEARCH QUESTIONS

2 What is the frequency of malaria and typhoid co-infection in the Ashanti Region?

3 How do demographics affect malaria and typhoid co-infection in Ashanti Region?

1.8 CONCEPTUAL FRAMEWORK OF MALARIA AND TYPHOID FEVER INFECTION



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1.8.1 NARRATION OF CONCEPTUAL FRAMEWORK

Human beings are in danger of obtaining malaria and typhoid fever infection due to factors associated with the environment, community, demographic and socio-economic status.

Usually, these contribute to disease prevalence in each community. Malaria and typhoid fever are common in areas with excessive poverty, unrestrained urbanization and terrible infrastructure that have an impact on contamination of water supplies. The dense population might also result in unlawful infrastructure development, bad sewage systems, and negative hygiene and sanitation practices leading to malaria and typhoid infection. According to Okoh, (2019), ingesting food outside, consuming vegetables and salad and water contaminated with human faeces pose a hazard of typhoid infection. Other stated risk factors encompass contact with carriers, negative hand washing and housing (Bhan et al. 2020). Factors such as indiscriminate disposal of waste, sewage spillage, lack of exact rest room facilities, insufficient sanitary services in properties and generally bad sanitation culture led to malaria and typhoid fever (WHO, 2021). Improperly cooked and hygienically handled food and nutrition are being fed on indiscriminatingly due to deteriorating socio-economic repute coupled with a lack of health education. Typhoid fever happens at any age but occurs extra typically in kids and adults. Using insecticide-treated nets (ITNs) help decrease malaria (Scott et al. 2021) Clinical element such as Blood transfusion use in the administration of Anemia can reason malaria. Malaria additionally motives the breakage of crimson blood cells which increases the iron content material in the body. Meanwhile, *Salmonella* flourishes in the presence of iron. Anemic patients are enormously inclined to *Salmonella* infection.

Lack of diagnostic gear and reagents contributes to poor prognosis early-stage main to the spread of infections and underestimation of the disorder burden. Abuse of antibiotics might also ultimately result in drug resistance, which would make contributions to having typhoid fever carriers who may additionally spread the infection. Availability of diagnostics, length of time prognosis and sensitivity of diagnostic approach can lead to misdiagnosis and mismanagement of patients.

1.9 JUSTIFICATION

Malaria and typhoid fever are common disorders that can lead to illness and death in tropical countries (Vasava et al. 2021). Even though high prevalence has been established for both infections, it is within the last two decades that reports have been made (Qureshi et al. 2019). According to the World Health Organization (WHO), malaria is responsible for nearly 90% of deaths in Africa (Udoidung & Eyoh, 2015). Every year, about 11–21 million typhoid cases are reported, with around 128,000–161,000 deaths. The load of typhoid fever in low and middle-income countries is higher than that of the developed countries due to poor sanitation and unhygienic lifestyle (Vasava et al. 2021). Transmission of both diseases are affected by the climate and lifestyle (Jalani et al. 2019). The emergence of multi-drug-resistant strains of *Salmonella typhi* and *Plasmodium falciparum* also poses a big challenge to the eradication of both diseases (Qureshi et al. 2019).

The current nature of malaria and typhoid co-infection in Ghana is not well known due to sparse data on the topic. Knowledge acquired this research will help inform stakeholders as well as educate the public on the influence of their lifestyle and environmental conditions on malaria and typhoid co-infection.

2. METHODOLOGY

2.1 STUDY DESIGN

Secondary data acquired from hospitals in the Ashanti Region will be collected and analyzed. The medical centers from which data will be acquired are Quality Health Care Limited, Mampong Government Hospital and Agona Health Center. Information on demographics and malaria and/or typhoid tests will be downloaded from the hospital's database or images will be taken from handwritten records of patients who meet the criteria. The identity of the participants will be protected. The information recorded will include data regarding the presence of malaria and/or typhoid, age, residence, and month the individual was diagnosed at the hospital.

2.2 STUDY SITE

The population of Ashanti Region is center in a few districts. The Kumasi metropolis accounts for almost one-third of the region's population. Slightly over half, 51.5 percent of the populace of the vicinity centered 43 districts. While more than 1/2 of the populace in the vicinity resides in city areas, in 15 of the 18 districts, over half of the populace live in rural areas. The excessive stage of urbanization in the area is due usually to the high awareness of the populace in the Kumasi city (which has

south about 1/3 of kilometers' population).

Males outnumber females in eleven districts. The age structure of the populace of the districts is skewed in the direction of the youth. The dependent population in the districts is high, ranging from 42.2 per cent in the Kumasi metropolis.

Sekyere South district is one of the thirty administrative districts in the Ashanti Region of Ghana; with a total land area of 584 square kilometers, about 2.4% of the total landmass of the Ashanti Region. The district lies between latitude 6° 50'N kilometers are boundaries with Ejura-Sekyedumase to the North Mampong Municipal to the East, Sekyere East and Kwabre East to the South and Afigya Kwabre to the West.

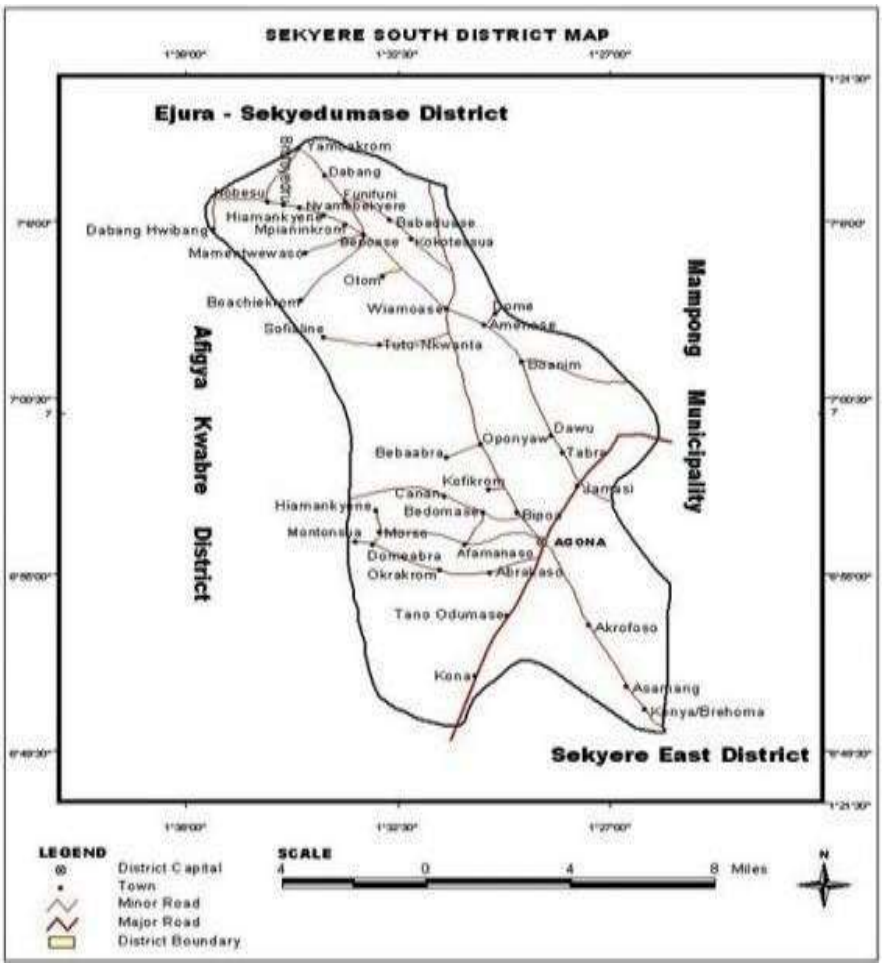

Figure 2. Map of Sekyere North district.

2.3 STUDY POPULATION

Patients who were diagnosed with malaria and/or typhoid at the hospital and live in the Ashanti Region.

SAMPLE SIZE

The minimum sample size will be determined by using the formula $n=z^2*p\ (1-p)/d^2$ (Cochran, W. G. 1977). It will be estimated from the overall prevalence of malaria in the Ashanti Region (GSS, 2015)

n = the desired sample size

z= the normal deviation is 1.96 which corresponds to a 95% confidence interval

p = proportion of the target population with desired characteristics is 0.166 which is equal to 16.6%

p = 1-p is 0.834

d = degrees of freedom is equal to 0.05

Hence n= 1.96^2 X 0.166 (0.834)/0.05^2 = 213(rounded)

Due to attrition, 10% of desired sample size will be added to obtain a final sample size of 235.

This will increase the representativeness of the sample and minimize sampling errors.

2.4 ELIGIBILITY CRITERIA

2.4.1 INCLUSION CRITERIA

- All patients who tested for both malaria and/or typhoid at the hospital.
- Only patients who stay within the Ashanti Region.

2.4.2 EXCLUSION CRITERIA

- Patients who did not test for malaria and/or typhoid at the hospital.
- Patients who do not reside within the Ashanti Region.

2.5 DATA ANALYSIS AND MANAGEMENT

The bio-data and characteristics of the study subjects collected will be managed and analyzed using Excel (2016) and IBM SPSS version 26.0. Chi-squared analysis will be carried out to ascertain the association between infections and demographics. A p-value of 0.05 will be considered statistically significant for all the tests, and at a confidence level of 95%.

3. STUDY RESULT

3.1 RESULTS

Table 1: Socio-demographic factor of patients with percentage frequency.

Parameters	Male (n)	Female (n)	Total (n)	Percentage (%)
Age (years)				
0-20	171	299	470	4.70
21-40	66	174	240	2.40
41-60	48	112	160	1.60
61 above	31	42	73	0.73
Total	316	627	943	9.43

A sample size of 943 patients was enrolled unto the study. Of this, 316 (33.51%) were males and 627 (66.49%) females. A greater proportion were within the ages less than 20 years.

Table 2: Distribution of Malaria and Typhoid Infection.

	TE	**M+**	**T+**	**MT+**
Age Group				
0-20	472	190	204	119
21-40	232	84	126	57
41-60	155	50	78	41

61 above	84	21	37	13
Total	943	345	465	230
Gender				
Males	336	115	160	101
Females	607	230	305	129
Sub-total	943	345	465	230

TE= Total Examination, M+ = Malaria positive, T+ =Typhoid positive and MT+ =both Malaria and Typhoid infection.

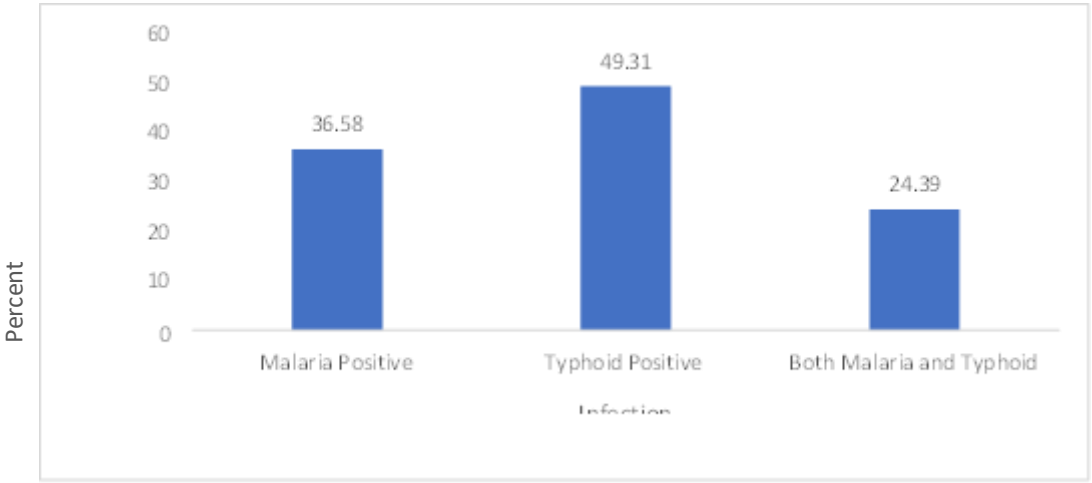

Figure 3: The prevalence of malaria, typhoid, and co-infection of malaria typhoid

Figure 3: shows that a higher proportion was infected with typhoid as compared to malaria. Almost 25 per cent were co-infected both with malaria and typhoid.

Table 3: Association between the age and sex on the infection

Variable		**Infection**		**Chi-square (p-value)**
	Malaria	**Typhoid**	**Both**	
Age Group				
0-20	472	190	204	692.345 (0.000)
21-40	232	84	126	
41-60	155	50	78	
61 above	84	21	37	
Sex				
Female	336	115	160	7.1702 (0.028)
Male	607	230	305	

From table 3 above, there is a significant association between age and infections (p- value=0.000). However, there

was no association between gender.

3.4DISCUSSION

3.4.1Prevalence of malaria and typhoid

Malaria and typhoid fever as causes of acute febrile illness. Malaria and typhoid fever infections continue to be major diseases of public health concerns, especially in the tropics and are known to present clinically similar symptoms with fever being the major presentation (Igharo et al. 2012). During the period of investigation, all the patients reported fever. Most of them also complained of headaches (68.8%) and abdominal pain (45.9%). In the current study, 36.58% of patients were found to have malaria infection and typhoid fever 49.31%. In Ethiopia, Birhanie et al. (2014) reported 73/200 (36.5%), Cameroon, malaria prevalence was 43.4% and 70.2% for microscopy and PCR among 315 patients (Achonduh-Atijegbe et al. 2016). But it is less than the reports from Calabar, 202/250 (80.8%) (Archibong et al., 2016), Nnewi, Anambra state, 202/256 (78.90 %) (Ekesiobi et al. 2008), Cameroon, malaria prevalence was 43.4% and 70.2% for microscopy and PCR among 315 patients (Achonduh-Atijegbe et al. 2016), Kumba, Cameroon ,90.3% (186/206) (Ndip et al., 2015). In India, (48/60 (80%), Sierra Leone 62.3% (Sundufu et al. 2012) and West Gojam, Ethiopia, 62% (Uneke, 2008). This finding was also higher than what was reported in Abakaliki, Ebonyi State, 33/250 (13.2%) (Nwuzo et al. 2009). The discrepancy of the results between the studies might be due to seasonal variation, the difference in geographical locations and sample size. A total of 20(13.8%) males and 31(21.4%) females had malaria, while 3(2.1%) males and 7(4.8%) females had typhoid (Moses et al., 2016). The study further found that age groups (11-30) years were mostly infected with malaria and typhoid fever (Ekesiobi et al. 2008).

3.4.2Demographics on malaria and typhoid

In this study, there is a significant association between age and infections (p-value=0.000). This finding is supported by the study in Ethiopia (Birhanie et al. 2014). In this study, children less than 10years had more of typhoid and malaria cases. A study in India, found that children between 1-5 years were more affected with typhoid (Walia et al. 2006). It is also supported by a study in France, (Desenclos et al. 1996) and in Pakistan (Graham, 2002; Brooks et al. 2005; Siddiqui et al. 2006)

4. CONCLUSION

Even though malaria and typhoid fever are common in Ghana and have a similar characteristic, most of the patients were infected with typhoid as compare to malaria among the study population. Almost 2 out of every 10 patients (24.39%) was co-infected of malaria and typhoid fever. There is a significant association between age and infections.

ACKNOWLEDGEMENT

The authors acknowledge the technical assistance provided by the Departemnt of Science Education, University of Education-Winneba College of Agriculture Education-Ashanti Mampong.

AUTHOR CONTRIBUTION

Kelvin Osei: Conceptualizing, Investigation, Methodology

Paul Antwi Boakye: Laboratory Analysis

Enoch Owusu: Data Collection, Formal Analysis

Emmanuel Effah Yeboah: Supervision, Review &Editing

CONFLICT OF INTEREST

Authors declare no conflict of interest

ETHICS STATEMENT

Ethical approval was not required for this study

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