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ASSESSMENT OF PLASMODIUM FALCIPARUM MEROZITE SURFACE PROTEIN 1 GENE ALLELIC VARIANT-K AND GLUCOSE-6-PHOSPHATE DEHYDROGENASE IN A CROSS SECTION OF CHILDREN POPULATION SOUTH SOUTHERN NIGERIA

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ABSTRACT

The recent advance in molecular biology has opened a vista for scientific community to harness understanding of merozoite surface proteins (MSPs) and their epidemiological significance for efficient research and healthcare practice regarding diagnosis and control of malaria; which still constitutes a huge health and economic challenge in developing countries. The present research focused on investigating the allelic variant – K of MSP1 within a cross section of 1 to 5 years children population of twenty-five wherein by random selection, 52% were male and 48% female. Following standard procedure, blood samples collection, determining of malaria parasites and genetic protocol for MSPs confirmation were carried out in a reputable laboratory. 36% of study subjects had MSP1 –K, among whom 44% was female and 56% male. In the same vein, 36 % of the children were positive for both MSP1-K and G6PD; with 56% male and 44% female. Whether this trend is mere coincidence when subjected to statistical test suggests that further research may buttress how allelic variant MSP1 –K is present in malaria-infected blood sample (that is also positive for G6PD) among the children population investigated.

KEYWORDS: Allelic variant – K, MSP1, age, sex, plasmodium falciparium, G6PD.

INTRODUCTION

The Merozoite surface protein 1 (MSP1) variant - K is a specific allele of the MSP1 gene carried by a Plasmodium parasite, which causes an acute febrile illness (malaria) that are spread to people through the bites of infected female Anopheles mosquitoes. Malaria is a life-threatening disease primarily found in tropical countries. It is preventable and curable, (Bennink et al, 2016; Pughikumo et al., 2024).

Although it is also known that, late or non detection and proper treatment could make non lethal malaria progress to severe stage, and fatality. Malaria is not contagious and cannot spread from one person to another (Bennink et al, 2016). Five species of parasites may potent malaria in humans and 2 of them Plasmodium falciparum and Plasmodium vivax – are of the greatest threat. There are over 400 different species of Anopheles mosquitoes and around 40, known as vector species, can transmit the disease, (Picot et al, 2020; Pughikumo et al., 2024).

Naturally malaria origin is rooted in female Anopheles mosquitoes and cyclical infection of humans. The parasites commence growth and multiplication from liver cells and in red cells of the blood; where successively they grow inside the red cells which they ultimately destroy. Daughter parasites (“merozoites”) are released and the cycle goes on through invasion of other red cells, causing the malaria symptoms. The MSP1 and the variants are relevant to understand various aspects of this disease transmission because of potential impact on public health. The aim of the investigation is to assess distribution of MSP-1 variant-k and G6PD among children of one to five years, in contributing towards understanding dynamics of malaria transmission and enhance strategies for malaria control and drug interventions.

METHOD

In this study, 25 samples of 1 to 5 years children in a cross section were selected using random sampling technique. At the standard laboratory of Tobi’s clinic in Yenagoa, Bayelsa state, blood samples collected were analyzed following recognized protocols (Pughikumo et al., 2024).

A drop of blood was placed on one end of a clean glass slide, using another slide to spread the blood into a thin film, and allowed to air dry to prepare thin blood smear. Methanol emersion was then applied for fixation; preserving cell morphology. Field staining solution was prepared by diluting Field stain in buffered water /methanol.

Slide with fixated blood smear was put in a staining dish, covered with the prepared field staining solution and incubated for about 15 minutes; after which excess stain was removed by careful rinsing under tap water and allowed complete air drying before examination by microscope; using oil immersion at high magnification (100 x), and enumerating malaria parasites (as purple-stained structures) within the red blood cells.

Standard procedure in malaria Rapid Diagnostic Test (RDT) was done using the test kit.

P**reparation, patient preparation,** blood **collection,** application **of** collected blood onto the designated area of the test cassette /strip was carried out in line with specific instructions provided in the RDT kit for the correct application technique (Pughikumo et al., 2024).

All results were read and interpreted in accordance with RDT Kit manufacturer's instructions and recorded in the patient's medical records, including the date, time, and interpretation of the test.

Polymerase chain reaction was done in line with established guidelines.

RESULTS

RDT by age and sex

Age	Total no. of male infected	Total no. of male examined	Total no. of female infected	Total no. of female examined	Total no. Infected	Total no. Examined
1	1	2	2	3	3	5
2	2	4	1	3	3	7
3	1	1	2	2	3	3
4	1	3	1	2	2	5
5	1	3	0	2	1	5
TOTAL	6	13	6	12	12	25

MSP1-K by age and sex

Age	Total no. of Male Infected	Total no. of Male Examined	Total no. of Female Infected	Total No. of Female Examined	Total No. Infected	Total no. Examined
1	0	2	1	3	1	5
2	3	4	0	2	3	6
3	1	1	2	2	3	3
4	1	3	1	2	2	5
5	0	2	0	3	0	5
TOTAL	5	12	4	12	9	24

MSP1- K and G6PD by age & sex

S/N	Sex	Age in years	MSP1 K	G6PD
1	F	4	+	+
2	M	5		+
3	M	5		+
4	M	2	+	+
5	F	4		+
6	M	1		+
7	F	2		+
8	M	3	+	+
9	M	4	+	+
10	F	2		+
11	F	5		+
12	F	1	+	+
13	M	4		+
14	M	4		+
15	M	2	+	+
16	F	5		+
17	M	2	+	+
18	F	1		+
19	F	2		+
20	M	2		+
21	F	1		+
22	M	1		+
23	M	5		+
24	F	3	+	+
25	F	3	+	+

MSP1-K and G6PG by age and sex

AGE	MALE with MSP1-K + G6PD	FEMALE with MSP1-K + G6PD
1	0	1
2	3	0
3	1	2
4	1	1
5	0	0
TOTAL		

DISCUSSION

The burden of malaria quantified health-wise and in economic impact is huge, in developing nations, particularly in sub Saharan African countries. Determinative control measures, precise treatment regimens and more frontally – research drive for potential vaccines is apparent. And understanding of the MSPs and allelic variants in developing effective

vaccines for malaria control is a glaring awareness.

In lieu of these, this research, in a cross section randomly investigated twenty-five subjects aged between 1 and 5 years. Amongst these, 52% were male while female made up 48%. Adhering to established protocols in blood sample collections, evaluation of malaria parasites and molecular procedure in confirming MSPs from standard laboratory; 36% of study subjects had MSP1 –K, among whom 44% was female and 56% male. In the same vein, 36 % of the children were positive for both MSP1-K and G6PD; with 56% male and 44% female.

It might be a conceivable concern if this trend is actually not a mere coincidence. When the observed data was subjected to statistical test, the result is suggestive that further research may buttress how allelic variant MSP1 –K is present in malaria-infected blood samples (that are also positive for G6PD) among the children population investigated.

It is however a contributory information to the search for malaria control that allelic variant MSP1 –K and G6PD are both simultaneously present in malaria-infected blood sample of children population investigated, in a ratio appearing equal across sex divide; and as continuous progress is being achieved to understand malaria parasite, merozoites surface proteins and allelic variants, this may contribute to overall quest for vaccines and control of malaria.

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