



Role of haemoglobin, G6PD and TNF α genes polymorphisms on the occurrence of malaria in children under five 5 years living in the Saponé Health District (Burkina Faso)

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- Our sincere gratitude to the parents of the study participants and to the CNRFP supporting staff.
- This study was funded by Amanet



Objectives



Primary aim

- To evaluate the role of genetic variation of haemoglobin, G6PD and TNF α genes on malaria infection in children < 5 years old.

Secondaries aims

- To measure the frequency of haemoglobin, G6PD and TNF α genotypes in children < 5 years old;
- To estimate the prevalence of malaria infection in children < 5 years old;
- To estimate the prevalence of clinical malaria in children < 5 years old.

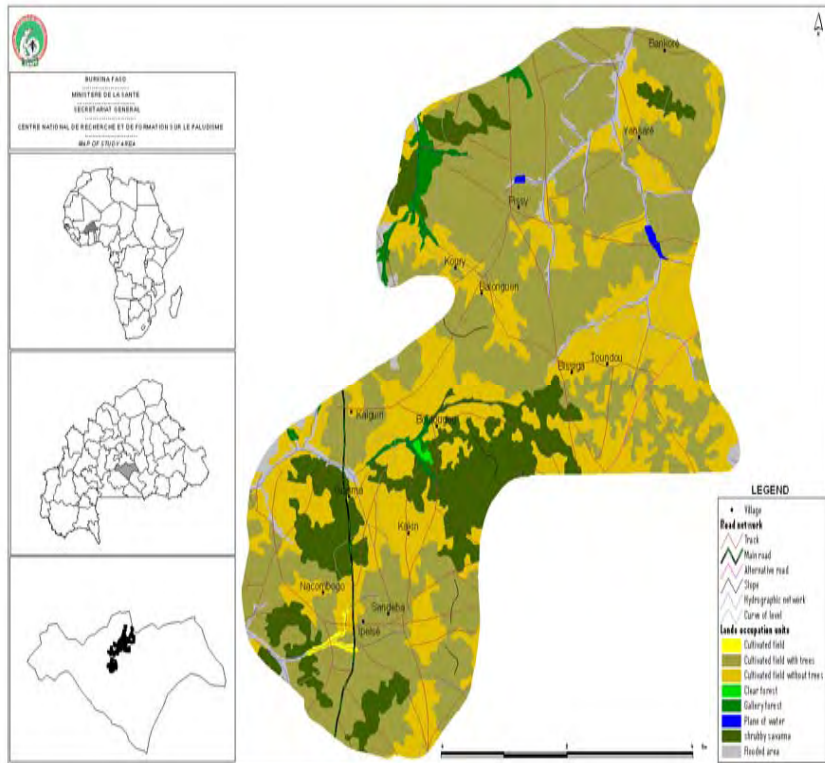


EDCTP

Methods (1)



Study site



- The study was carried out within a demographic surveillance area of the Saponé Health district in the province of Bazéga.
- The malaria transmission in the area is hyper-endemic and seasonal, with a pic during the rainy season from June to October.
- The entomological inoculation rate in the study area is estimated around 100 - 200 infective bites per person per year.



Methods (2)



Study plan

- The study received approval from the National Ethic Committee of Burkina Faso.
- During the cross sectional survey a venous blood sample of two ml has been collected from all participants in EDTA tubes for human genetic tests.
- Thick and thin blood smears have been prepared and haemoglobin titre has been measured measured by Hemocue.
- The clinical malaria episode was defined as fever (axillary $\geq 37.5^{\circ}\text{C}$) or history of fever within the preceding 24 hours plus parasitemia.
- The genotypes were identified by Polymerase chain Reaction (P.C.R.) restricted fragment length polymorphism (RFLP).





Results (1)



Table 1: Frequency Hb

Genotype Hb		N	Frequency (%)
Normal haemoglobin genotypes: AA		624	69.3
Abnormal haemoglobin genotypes	AC	174	19.3
	AS	78	8.7
	CC	17	1.9
	SC	5	0.5
	SS	3	0.3
Total		901	100

Table 2: Frequency G6PD and TNF α

Genotype G6PD & TNF α		N	Frequency (%)
G6PD	Normal	550	71.5
	Deficient (<i>G6PD202</i>)	219	28.5
	Total	769	100
TNFα	WW (<i>wide type</i>)	569	75.1
	WP (<i>heterozygous</i>)	173	22.8
	PP (<i>mutant</i>)	16	2.1
Total		758	100



Results (2)



Table3 : Malaria infection, clinical malaria

	Hemoglobin genotype					
	AA	AC	AS	CC	SC	SS
<i>Malaria infection</i>						
Plasmodic index (%)	87.7 (547/624)	90.2 (157/174)	76.9 (60/78)	94.1 (16/17)	100 (5/5)	66,7 (2/3)
Parasite density (parasites /μl)	4095.77 (2472.4-10280.2)	3578.91 (2486.1-5151.9)	1979.83 (1254.0-5009.1)	1979.83 (439.78-8912.9)	518.45 (3.8 ^e -11-7.0 ^e +15)	1160
Gametocyte carriage (%)	61.2 (52.6-71.0)	48.4 (37.7-61.9)	44.5 (37.7-61.9)	37.8 (13.2-108.1)	-	-
<i>Clinical Malaria</i>						
Prevalence	23.4 (146/624)	20.7 (36/174)	19.2 (15/78)	17.6 (3/17)	40.0 (2/5)	33.3 (1/3)



Results (3)



Table 4: Malaria infection, Clinical malaria

	G6PD and TNF α genotype				
	G6PD		TNF α		
	Normal	Deficient	WW	WP	PP
<i>Malaria infection</i>					
Plasmodic index (%)	88.4 (349/395)	86.5 (83/96)	87.7 (321/366)	87.2 (95/109)	83.3 (5/6)
Parasite density (parasites /μl)	3943.68 (3290.6-4726.97)	3352.22 (2285.3-4917.2)	6845.79 (865.8-54167.4)	2863.51 (2003.8-4092.0)	6845.79 (865.8-54167.4)
Gametocyte carriage (%)	55.53 (48.6-63.47)	49.48 (48.6-63.47)	56.52 (48.9-65.28)	48.49 (38.0-61.86)	80 (80-80)
<i>Clinical Malaria</i>					
Prevalence	24.6 (97/116)	19.8 (19/116)	23.5 (86/112)	22.9 (25/112)	16.7 (1/112)



Results (4)



Malaria infection

- During the cross survey the parasite densities was statistically difference between Normal G6PD and deficiency G6PD ($P < 0.001$) but the difference in the *P. falciparum* infection rates was not significant difference in Normal G6PD compared to deficiency G6PD ($P = 0.64$).
- The same trend was observed with TNF α . The densities was statistically difference between wide type compared to mutant and heterozygous ($P < 0,04$) . For the Infection rates the difference was not significant between wide type compared to mutant and heterozygous ($P = 0.87$).
- Infection rate was higher in the subjects with allele C than subjects with allele S. The difference was statistically significant only between AA and AS group.
- The parasitemia level was higher in the subjects with haemoglobin the difference was statistically significant between AA and AS ($p = 0.005$).

Clinical malaria

- There was no significant difference in clinical malaria between the haemoglobin, G6PD and TNF α .



Conclusions



- In the present study, our results indicate that haemoglobin conferred significant protection against malaria infection. No significant difference was observed in the G6PD and TNF α .
- We found significant differences in the parasite densities of abnormal Hb, G6PD deficiency and mutant and heterozygous TNF α to compare the normal Hb, normal G6PD and wild type TNF α .
- Also we found no significant difference in the Clinical Malaria of Hb; G6PD and TNF α .
- These findings suggest that the presence of abnormal haemoglobin positively influence malaria infection in children living in malaria endemic areas and this should be taken into account when interpreting results of clinical trial studies.



Perspectives



⇒ For the future we will investigate the role of hemoglobin and G6PD, TNF α and interleukin4 genes polymorphisms on the occurrence of malaria phenotypes (incidence of clinical malaria , prevalence of malaria infection and anemia) in a endemic rural area of Burkina Faso.

