



**MUTATIONS OF TRANSPORTER GENES  
ASSOCIATED WITH DRUG RESISTANCE IN  
*PLASMODIUM FALCIPARUM* ISOLATES FROM  
RURAL AREA OF SABAH**

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## ABSTRACT

The successful use of chloroquine(CQ) through the decades finally resulted in CQ resistant(CQR) *Plasmodium falciparum*. These drug resistant parasites led to high fatality in humans. CQR *P. falciparum* strains were spread through the world from Colombia and Cambodia-Thailand border within these decades. The ATP-binding cassette (ABC) protein plays the major role in drug resistance in *P. falciparum*. Antimalarial drug resistance was associated with single nucleotide polymorphisms (SNPs) in genes encoding ABC proteins. Three genes which are well studied include *pfcr*t (*Plasmodium falciparum* CQ-resistance transporter) *pfmdr* 1 (*Plasmodium falciparum* multidrug resistance 1) and *pfmrp* 1 (*Plasmodium falciparum* multidrug resistance protein 1) genes. All *pfcr*t alleles in CQR parasites consistently include mutations for K76T and A220S accompanied by changes in two to six other mutations. *Pfcr*t K76T SNP is the major molecular determinant of CQR *P. falciparum* strains. N86Y marker of *pfmdr* 1 gene and K76T marker of *pfcr*t gene were prevalent in CQR isolates. Another SNP which is well studied and highly prevalent in *pfmdr* 1 gene is Y184F. Five SNPs, two SNPs and 1 SNP in *pfcr*t, *pfmdr* 1 and *pfmrp* 1 genes respectively were studied by polymerase chain reaction-restriction fragment length polymorphism(PCR-RFLP) and PCR-DNA sequencing methods in the current study. SVMNT and CVIET haplotypes of *pfcr*t gene were circulating in rural areas of Sabah. The results indicate that the drug resistant markers in drug resistant *P. falciparum* isolates from rural Sabah were supposed to be *pfcr*t 76T, 220S and *pfmdr* 1 84Y. Finally, we have succeeded to identify the molecular markers for CQR *Plasmodium falciparum* for the rural areas of Sabah.

