STUDY ON GLUCOSE-6-PHOSPHATE DEHYDROGENASE (G6PD) VARIANTS AND ITS ASSOCIATION WITH HAEMOGLOBINOPATHIES AMONG THE TRIBAL POPULATION OF MALARIA ENDEMIC INDO-BHUTAN BORDER DISTRICTS OF BTR, ASSAM, INDIA.

A Thesis submitted to Bodoland University for the Degree of Doctor of Philosophy in Biotechnology in the Faculty of Science and Technology, 2023

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DECLARATION

I do hereby declare that the research work embodied in this thesis entitled **"Study on Glucose-6-Phosphate Dehydrogenase (G6PD) variants and its association with haemoglobinopathies among the tribal population of malaria endemic Indo-Bhutan border districts of BTR, Assam, India"** has been carried out by me under direct guidance and supervision of Prof. (Dr.) Jatin Sarmah, Department of Biotechnology, Bodoland University, Kokrajhar, Assam, India.

The work is original and has not been submitted in part or in full for any degree or diploma to any university.

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CERTIFICATE

This is to certify that the thesis entitled "**Study on Glucose-6-Phosphate Dehydrogenase (G6PD) variants and its association with haemoglobinopathies among the tribal population of malaria endemic Indo-Bhutan border districts of BTR, Assam, India**", which has been submitted by Miss Noymi Basumatary for the award of the degree of Doctor of Philosophy under Bodoland University is a record of original research works carried out by her under my direct guidance and supervision. She has fulfilled all the requirements for submitting the thesis.

The results embodied in the thesis have not been submitted to any other university or institution for the award of any degree or diploma.

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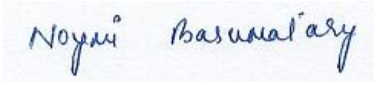

(Noymi Basumatary)

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ABBREVIATIONS

G6PD:	Glucose-6-Phosphate Dehydrogense
PPP:	Pentose Phosphate Pathway
NADPH:	Nicotinamide Adenine Dinucleotide Phosphate Hydrogen
ROS:	Reactive Oxygen Species
GSH:	Glutathione
RBC:	Red Blood Cell
WHO:	World Health Organization
P. vivax:	*Plasmodium vivax*
P. ovale:	*Plasmodium ovale*
Hb:	Haemoglobin
HbS:	Haemoglobin S
HbE :	Haemoglobin E
HbC:	Haemoglobin C
HbSS:	Haemoglobin S homozygous
HbCC:	Haemoglobin C homozygous
Hb AE:	Haemoglobin E heterozygous
Glu:	Glutamine
Lys:	Lysine
Arg:	Arginine
Trp:	Tryptophan
His:	Histidine
Met:	Methionine
Thr:	Threonine

Ala:	Alanine
Gly:	Glycine
Ile:	Isoleucine
Cys:	Cystein
Phe:	Phenylalanine
Val:	Valine
Tyr:	Tyrosine
Ser:	Serine
Pro:	Proline
Asp:	Aspartic acid
Asn:	Asparagine
NR:	Not reported
HbD:	Haemoglobin D
NHM:	National Helth Mission
HPFH:	Hereditary Persistence of Foetal Haemoglobin
HbQ:	Haemoglobin Q
HbK:	Haemoglobin K
NAC:	N-acetyl-cysteine
LC:	L-cysteine
TCA:	Tricarboxylic acid
ME1:	Malic enzyme 1
IDH1:	Isocitrate dehydrogenase 1
CADD:	Computer-aided drug design
MD:	Molecular dynamics
BTR:	Bodoland Territorial Region

CBC:	Complete Blood Count
WBC:	White Blood Cell
MCV:	Mean Corpuscular Volume
MCH:	Mean Corpuscular Haemoglobin
MCHC:	Mean Corpuscular Haemoglobin Concentration
PCV:	Packed Cell Volume
RDW:	Red Cell Distribution Width
SPSS:	Statistical Package for Social Sciences
Buffer AL:	Lysis buffer
Buffer AW1:	Wash buffer 1
Buffer AW2:	Wash buffer 2
Buffer AE:	Elution buffer
DF:	Dilution factor
bp:	Base pair
Taq:	*Thermus aquaticus*
PCR:	Polymerase Chain Reaction
HaeIII:	*Haemophilus aegyptus III*
NlaIII:	*Neisseria lactamica III*
FokI:	*Flavobacterium okeanokoites I*
HindIII:	*Haemophilus influenza III*
MboII:	*Moraxella bovis II*
BstUI:	*Bacillus stearothermophilus I*
BstXI:	*Bacillus stearothermophilus X I*
HhaI:	*Haemophilus haemolyticus I*
AflII:	*Anabaena flosaquae II*

NdeI:	*Neisseria denitrificans I*
RCSB PDB:	Research Collaboratory for Structural Bioinformatics Protein Data Bank
ADT:	AutoDock Tool
MS:	Molecular Surface
ADMET:	Absorption, Distribution, Metabolism, Excretion and Toxicity
GROMACS:	GROningen Machine for Chemical Simulations
GROMOS:	GROningen Molecular Simulation
SPCE:	Simulation Program with Integrated Circuit Emphasis
NaCl:	Sodium Chloride
NTP:	Number of particles, pressure and temperature
RMSD:	Root Mean Square Deviation
RMSF:	Root Mean Square Fluctuation
RG:	Radius of Gyration
SASA:	Solvent Accessibility Surface Area
HbA_0:	Adult haemoglobin
HbA_2:	Smaller component of adult haemoglobin
SD:	Standard deviation
TLC:	Total leucocyte count
LYM:	Lymphocytes
A_{260}:	Absorbance at 260nm
A_{280}:	Absorbance at 280nm
3D:	Three dimensional
2D:	Two dimensional
MW:	Molecular weight
TPSA:	Topological polar surface area

HbA:	Hydrogen bond acceptor
HbD:	Hydrogen bond donor
LD50:	Lethal dose
CNSHA:	Chronic non-spherocytic hemolytic anaemia
Ki:	Inhibition constant
Km:	Michaelis constant

STANDARD UNITS

km^2:	Square kilometre
mg:	Milligram
kg:	Kilogram
µl:	Microlitre
U/g:	Units per gram
g/dL:	Gram per decilitre
ml:	Millilitre
Million/Cumm:	Miilion per cubic millimetre
pg:	Picogram
Cells/Cumm :	Cells per cubic millimeter
fL:	Femtolitre
Å:	Angstrom
mM:	Millimolar
nm:	Nanomolar
µg/ml:	Microgram per millilitre
kcal/mol:	Kilocalorie per mole
Da:	Dalton
nm:	Nanometre