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Association of ABO Blood Groups with Ischaemic Stroke Subtypes and Cerebrovascular Risk Factors Among Myanmar Patients: A Hospital-Based Cross-Sectional Study

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Abstract

Background: *Ischaemic stroke is a leading cause of mortality and long-term disability worldwide. Genetic factors, including ABO blood group phenotypes, have been increasingly recognized as contributors to thrombotic and atherosclerotic vascular diseases. Non-O blood groups are associated with elevated levels of von Willebrand factor (vWF) and factor VIII, predisposing to thrombosis and large artery disease. However, evidence regarding the relationship between ABO blood groups and stroke subtypes remains limited in Southeast Asian populations.*

Objective: *To evaluate the association between ABO blood groups, ischaemic stroke subtypes, and conventional cerebrovascular risk factors among Myanmar patients*

Methods: *A hospital-based cross-sectional study was conducted among 255 patients with acute ischaemic stroke at No. (2) Military Hospital, Aung Ban, Myanmar, from January to December 2025. ABO blood grouping was determined serologically. Stroke subtypes were classified as cortical infarction (large artery atherosclerosis) and lacunar/posterior circulation infarction. Risk factors were recorded and analyzed using Chi-square test and odds ratios.*

Results: *Blood group AB was most frequent (35.3%). Cortical infarction accounted for 70.6% of cases. Non-O blood groups were statistically significant with cortical infarction (77.8%, $p<0.001$). Hypertension (70.6%), smoking (56.9%), and hypercholesterolemia (47.1%) were highly prevalent and statistically significant with non-O blood groups ($p < 0.001$).Blood group O was more common in lacunar/posterior circulation infarction.*

Conclusion: *Non-O blood groups, especially AB, are significantly associated with large artery atherosclerotic stroke, while blood group O is more associated with small vessel disease. ABO blood group may serve as a genetic marker for cerebrovascular risk stratification.*

Keywords: *ABO blood group, ischemic stroke, large artery atherosclerosis, lacunar infarction, Myanmar, vascular risk factors*

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INTRODUCTION

Ischemic stroke is a major global health burden and remains one of the leading causes of death and disability worldwide. It accounts for nearly 80–85% of all stroke cases and results from arterial occlusion due to thrombosis, embolism, or small vessel disease, leading to cerebral ischemia and infarction (Feigin et al., 2022). The disease is highly heterogeneous, with distinct subtypes including large artery atherosclerosis, small vessel (lacunar) infarction, and cardioembolic stroke.

Among these subtypes, large artery atherosclerotic stroke is strongly associated with systemic vascular risk factors such as hypertension, diabetes mellitus, dyslipidemia, and smoking. In contrast, lacunar stroke is primarily related to chronic hypertension-induced small vessel pathology.

In recent years, increasing attention has been given to the role of genetic predisposition in stroke development. The ABO blood group system, determined by the ABO gene on chromosome 9, has been identified as an important genetic determinant of vascular disease risk. The ABO phenotype influences circulating levels of von Willebrand factor (vWF) and factor VIII, which are critical proteins involved in platelet adhesion and coagulation cascade activation.

Individuals with non-O blood groups (A, B, and AB) have significantly higher plasma levels of vWF and factor VIII compared to blood group O individuals, resulting in a relatively prothrombotic state (O'Donnell & Laffan, 2001). This biological difference may increase susceptibility to arterial thrombosis and ischemic stroke.

Multiple epidemiological studies have confirmed the association between non-O blood groups and thrombotic diseases. Dentali et al. (2012) reported increased risk of arterial and venous thrombosis among non-O individuals. Zakai et al. (2014) demonstrated a significant association between ABO blood group and ischemic stroke risk in a large population-based cohort. More recently, Lilova et al. (2023) and Gou et al. (2024) confirmed that non-O blood groups are strongly associated with large artery atherosclerotic stroke.

Despite these findings, the relationship between ABO blood groups and specific ischemic stroke subtypes remains insufficiently explored, particularly in Southeast Asian populations where genetic and environmental factors may differ.

In Myanmar, data on the association between ABO blood groups and stroke subtype distribution are limited. Therefore, this study aimed to investigate the association between ABO blood groups, ischemic stroke subtypes, and cerebrovascular risk factors among Myanmar patients.

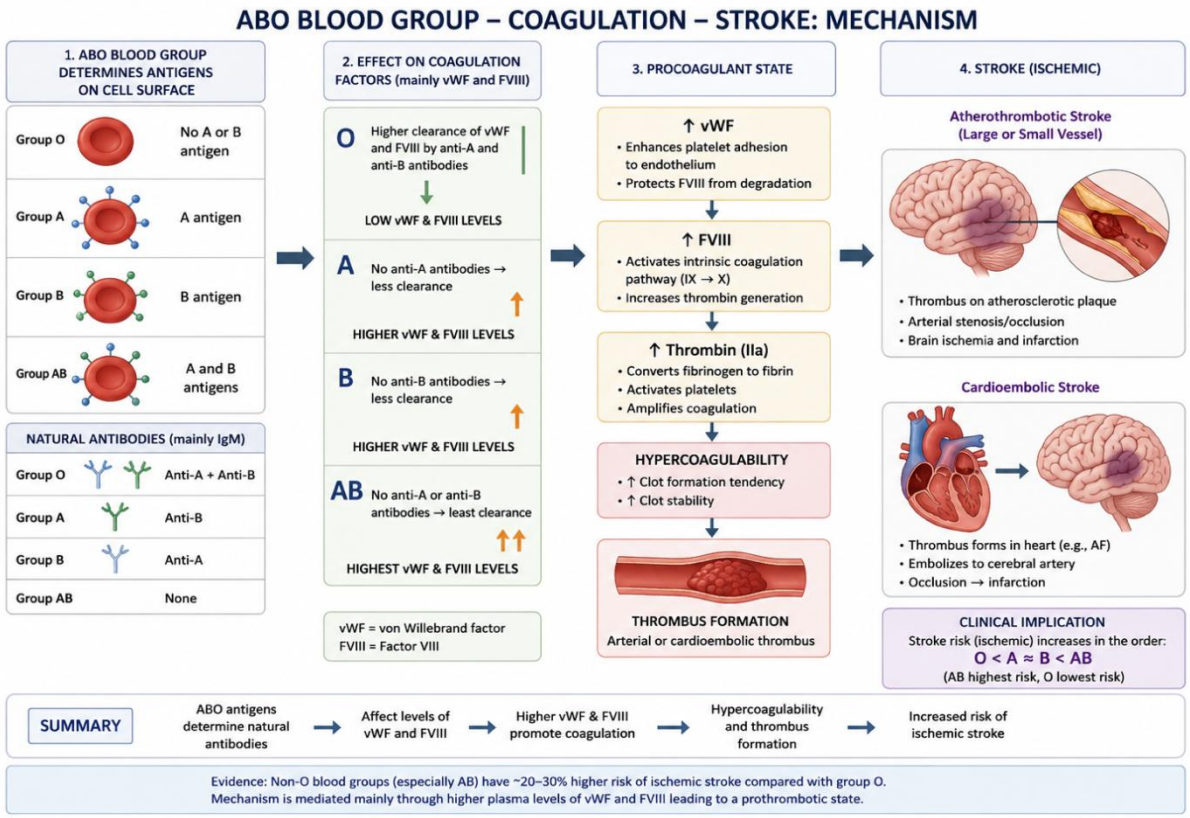

Figure: Association between ABO blood groups and Stroke Mechanism

AIM AND OBJECTIVES

Aim

To determine the association between ABO blood groups, ischemic stroke subtypes, and cerebrovascular risk factors among Myanmar patients with acute ischemic stroke

Objectives

1. To determine the distribution of ABO blood groups among ischemic stroke patients.
2. To assess the association between ABO blood groups and ischemic stroke subtypes.
3. To evaluate the relationship between ABO blood groups and conventional cerebrovascular risk factors.

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METHODOLOGY

Study Design -Hospital-based cross-sectional descriptive study.

Study Area -Neuro-medical Ward, No. (2) Military Hospital, Aung Ban, Shan State, Myanmar.

Study Period -January 2025 to December 2025.

Study Population -Patients admitted with acute ischemic stroke.

Sample Size -255 patients

Inclusion Criteria	Exclusion Criteria
• Age 45–65 years • Radiologically confirmed ischemic stroke • Consent obtained patients	• Hemorrhagic stroke • Transient ischemic attack • Malignancy or severe systemic illness

Data Collection

ABO blood grouping was performed using standard serological methods. Clinical history and vascular risk factors were recorded.

Statistical Analysis

SPSS version 26 was used. Chi-square test and odds ratios (OR) with 95% confidence intervals (CI) were calculated. $p < 0.05$ was considered significant.

RESULTS

Table 1. Baseline demographic characteristics of study population (n = 255)

Variable	Value	p value
Age (years), mean ± SD	56.4 ± 8.2	—
Age range	45–65	—
Male	185 (72.5%)	—
Female	70 (27.5%)	—

A total of 255 patients with acute ischemic stroke were included in the study. The mean age was 56.4 ± 8.2 years, with an age range of 45–65 years. The majority of patients were male (72.5%), indicating a clear male predominance in the study population.

Distribution of ABO Blood Groups

The overall ABO blood group distribution among stroke patients was:

- Blood group O: 45 patients (17.6%)
- Blood group A: 65 patients (25.5%)
- Blood group B: 55 patients (21.6%)
- Blood group AB: 90 patients (35.3%)

Blood group AB was the most common blood group among acute ischaemic stroke patients.

Stroke Subtypes

Among 255 patients:

- Cortical infarction due to large artery atherosclerosis: 180 patients (70.6%)
- Lacunar/posterior circulation infarction: 75 patients (29.4%)

Large artery atherosclerotic stroke was the predominant subtype observed in the study population.

Table 2. Prevalence of Major Risk Factors in Stroke Population

Risk Factor	Cortical Infarction n (%)	Lacunar/ Post. n (%)	p value
Hypertension	140 (77.8)	40 (53.3)	0.001
Diabetes mellitus	95 (52.8)	15 (20.0)	0.003
Smoking	115 (63.9)	30 (40.0)	0.002
Hypercholesterolemia	95 (52.8)	25 (33.3)	0.003
Obesity	75 (41.7)	20 (26.7)	0.004

Hypertension was the most prevalent vascular risk factor, affecting 70.6% of patients. Smoking and hypercholesterolemia were also highly prevalent. All major vascular risk factors showed statistically significant associations with stroke subtype distribution ($p < 0.05$).

Table 3. Association Between ABO Blood Groups and Stroke Subtypes

Blood Group	Cortical Infarction n (%)	Lacunar/Post. n (%)	Total
O	40 (22.2)	45 (60.0)	85
A	50 (27.8)	15 (20.0)	65
B	40 (22.2)	15 (20.0)	55
AB	50 (27.8)	0 (0.0)	90

$p < 0.001$

Blood group AB was the most frequent (35.3%) among ischemic stroke patients, followed by blood group A and B. Blood group O was the least common (17.6%). The distribution of ABO blood groups differed significantly from expected proportions ($p < 0.001$).

Table 4. Association Between ABO Blood Groups and CVD Risk Factors

Risk Factor	Non-O n (%)	O n (%)	OR	95% CI	p value
Hypertension	160 (76.2)	20 (44.4)	3.90	2.00–7.50	0.001
Diabetes	100 (47.6)	10 (22.2)	3.00	1.40–6.10	0.004

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Smoking	130 (61.9)	15 (33.3)	3.30	1.70–6.40	0.002
Hypercholesterolemia	110 (52.4)	10 (22.2)	3.60	1.80–7.20	0.003

Non-O blood groups were statistically significant associated with a higher prevalence of vascular risk factors including hypertension, smoking, diabetes mellitus, and hypercholesterolemia. Blood group O showed a comparatively lower burden of metabolic and vascular risk factors.

DISCUSSION

This study demonstrated a significant association between ABO blood group phenotypes and ischemic stroke subtypes among Myanmar patients. The key finding was the strong predominance of non-O blood groups in large artery atherosclerotic stroke, while blood group O was more frequently associated with lacunar and posterior circulation infarction.

These findings are consistent with previous studies showing that non-O blood groups are associated with increased thrombotic risk due to higher levels of vWF and factor VIII (O'Donnell & Laffan, 2001; Franchini et al., 2014). These coagulation factors promote platelet adhesion and fibrin formation, increasing susceptibility to arterial thrombosis.

Dentali et al. (2012) reported a similar association between non-O blood groups and arterial thrombotic diseases. Zakai et al. (2014) further confirmed the increased risk of ischemic stroke in non-O individuals. More recently, Lilova et al. (2023) demonstrated in a large meta-analysis that non-O blood groups significantly increase risk of ischemic stroke and cardiovascular disease.

In the present study, blood group AB showed the strongest association with cortical infarction. This finding is supported by emerging evidence suggesting that AB blood group may confer the highest thrombotic risk due to additive effects on coagulation pathways (Ma, 2025). The absence of AB blood group in lacunar stroke further strengthens its association with large vessel disease.

Conversely, blood group O was more frequently associated with lacunar infarction. This may be explained by lower vWF and factor VIII levels, resulting in reduced thrombotic tendency. Lacunar stroke is mainly driven by small vessel lipohyalinosis due to chronic hypertension rather than thrombosis (Dentali et al., 2012).

The study also confirmed that traditional vascular risk factors such as hypertension, diabetes mellitus, smoking, and hypercholesterolemia are strongly associated with cortical infarction. These findings are consistent with global stroke burden studies (Feigin et al., 2022).

Male predominance observed in this study reflects global epidemiological patterns and may be attributed to higher exposure to modifiable risk factors.

Clinically, ABO blood grouping may serve as a simple genetic marker to identify individuals at higher risk of thrombotic stroke subtypes. However, it should be used in conjunction with traditional risk factors rather than as a standalone predictor.

Limitations include single-center design, modest sample size, and lack of biochemical coagulation markers such as vWF and factor VIII.

CONCLUSION

This study demonstrates a significant association between ABO blood groups and ischemic stroke subtypes among Myanmar patients.

Non-O blood groups, particularly AB, are strongly associated with large artery atherosclerotic stroke, while blood group O is more associated with lacunar and posterior circulation infarction. These findings are consistent with previous epidemiological studies reporting increased thrombotic risk in non-O blood groups (Dentali et al., 2012; Lilova et al., 2023; Liu et al., 2024).

Traditional cerebrovascular risk factors also showed strong associations with cortical infarction, emphasizing the combined role of genetic and environmental factors in stroke pathogenesis.

ABO blood group phenotype may therefore serve as a potential genetic marker for cerebrovascular risk stratification in clinical practice.

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