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Prevalence of Non o Blood Group in Patients Admitted with Ischemic Stroke at Tertiary Care Center A Descriptive Cross-Sectional Study

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ABSTRACT

Introduction: Stroke is characterized as a sudden occurrence of a neurologic deficiency caused by a focal vascular reason. Stroke is classified into two types: Hemorrhagic and Ischemic. The ABO blood groups can impact thrombosis by having elevated levels of VWF and factor VIIIc (possibly affected by an O(H) antigen-related change in VWF metabolism), along with increased acquired resistance to activated protein C observed in individuals without blood type O. The objective of this research is to identify a possible connection between ABO blood group and ischemic stroke within the Nepalese population. Such a study has not been conducted in Nepal previously.

Methods: A descriptive cross-sectional study was conducted in a tertiary care center after obtaining ethical approval from the Institutional Review Board (approval number 1149).Patients admitted to the hospital with clinical symptoms indicative of stroke and confirmed neuroimaging evidence of ischemic stroke during the study period from June 2020 to July 2024 were considered as cases. Subsequently, the ABO blood groups of the patients were recorded and statistically analyzed .

Results: 317 ischemic stroke patients underwent analysis of ABO blood grouping. Among them, 84% were found to have a non-O blood group. The examination of the correlation between ABO blood groups and ischemic stroke patients yielded a significant result.

Conclusions: There is indeed a link between ABO blood grouping and ischemic stroke, with a higher prevalence in individuals with non-O blood types.

Keywords: ABO blood group; Ischemic Stroke; Non O blood type

INTRODUCTION

A stroke is described as a sudden onset of neurological impairment caused by a specific vascular issue.[1]Generally, strokes are categorized into two types: Ischemic and Hemorrhagic.[1] It stands as the second most common cause of death globally, claiming 6.2 million lives in 2015.[2] In Bir Hospital, ischemic strokes accounted for 57.62% of hospitalized cases, with hemorrhagic strokes making up

42.95%.[3] Major traditional risk factors for strokes include being male, older age, smoking, hypertension, diabetes, high cholesterol, and atrial fibrillation.[4]The potential role of blood groups as stroke risk factors remains a matter of debate. ABO antigens are found on the vascular endothelium and are associated with the levels of clotting proteins such as factor VIII and von Willebrand factor, although the exact link is unclear.[5] ABO blood groups may impact blood clotting by affecting factor levels, especially in individuals with non-O blood types. Furthermore, blood group A status may be linked to higher cholesterol levels.[6]

Despite a lack of local research, this study seeks to investigate the distribution of ABO blood groups in ischemic stroke patients in Nepal, explore potential associations between blood groups and ischemic stroke, evaluate the relationship between blood types and stroke severity, and analyze the clinical and etiological profiles of ischemic stroke patients in the Nepalese population.

Additionally, this research aims to uncover potential links between blood groups and established risk factors for ischemic strokes. This study could provide insights into a potential causal relationship between ABO blood groups, acute ischemic stroke, and stroke severity, aiding in identifying high-risk populations for tailored risk reduction strategies.

METHODS

A descriptive cross-sectional study was done after obtaining the ethical approval from IRB of National Academy Of Medical Sciences,Bir Hospital,Kathmandu.The study site is the ward of Neurology of Bir Hospital , Kathmandu. The study duration was from June 2020 to July 2024 . The retrospective data was collected from the ward of Neurology of Bir hospital.

Patients admitted to the Bir hospital exhibiting symptoms of stroke and confirmed neuroimaging evidence of ischemic stroke during the study period were included as cases after obtaining consent. Individuals aged below 18 or above 80 years,those with hemorrhagic stroke and patients in critical condition were excluded.

Based on Sabino et al.'s 2014 study, the prevalence of non-O blood group in ischemic stroke cases was 70.9%.[17] Sample size calculation was done using formula,

Sample size (n) = $Z^2_{1-\alpha/2}$ p(1-p) / e^2 where, P = prevalence of non-O blood group in stroke patients = 70.9%. $Z^2_{1-\alpha/2}$ = 1.96.e = margin of error=5%,The calculated sample size is 317.

Data was gathered using structured performa containing the demographic information and other relevant data. Questionnaires were created from scratch, tested with a sample of ten subjects, adjusted as needed for clarity, and administered to those demonstrating stroke symptoms. Following neuroimaging, eligible participants were informed about the study and provided written consent. Subsequently, detailed examinations and various blood tests were conducted to gather comprehensive information for analysis.

For all the cases NIHS stroke scale was taken out to access the severity of stroke and severity categorized as:[30]

NIHS Stroke scale	Stroke severity
0	No
1-4	Minor stroke
5-15	Moderate
16-22	Moderate to severe

23-42	Severe

Data gathered was inputted and analyzed utilizing the IBM-SPSS statistical software version 25.0 to derive the final interpretation.

Statistical techniques appropriate to the analysis were employed, resulting in the computation of all relevant statistics.

The interpreted data was then illustrated using numbers and percentages for categorical variables, presented in various formats including tables, graphs, and charts.

The P-value determined according to a predetermined significance level of 0.05, alongside the construction of a 95% confidence interval.

The Chi-square test was administered to evaluate both the alternate hypothesis, stating an association between ABO blood group and Ischemic stroke, and the null hypothesis, positing no such association.

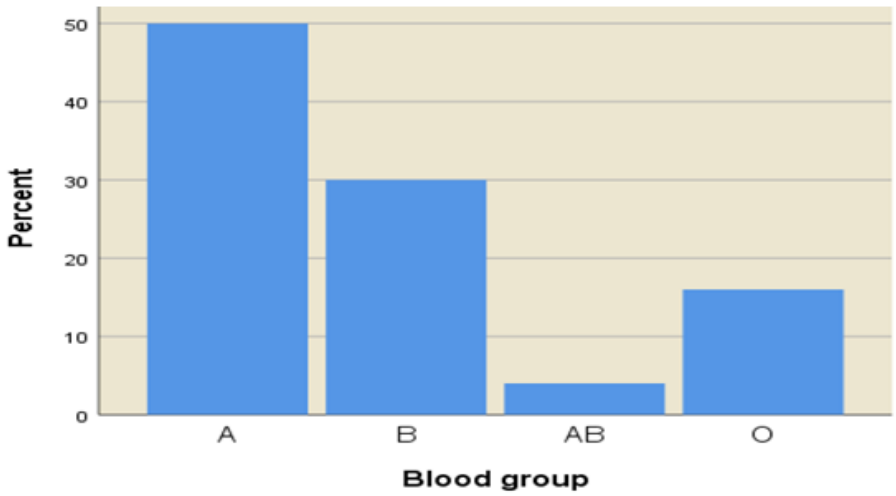
A rejection of the null hypothesis is indicated by a P-value less than 0.05.

RESULTS

1. ABO BLOOD GROUP DISTRIBUTION IN STROKE CASES

Table no.I

Blood group	Frequency(n)	%
A	159	50.0
B	95	30.0
AB	12	4.0
O	51	16.0
Total	317	100.0



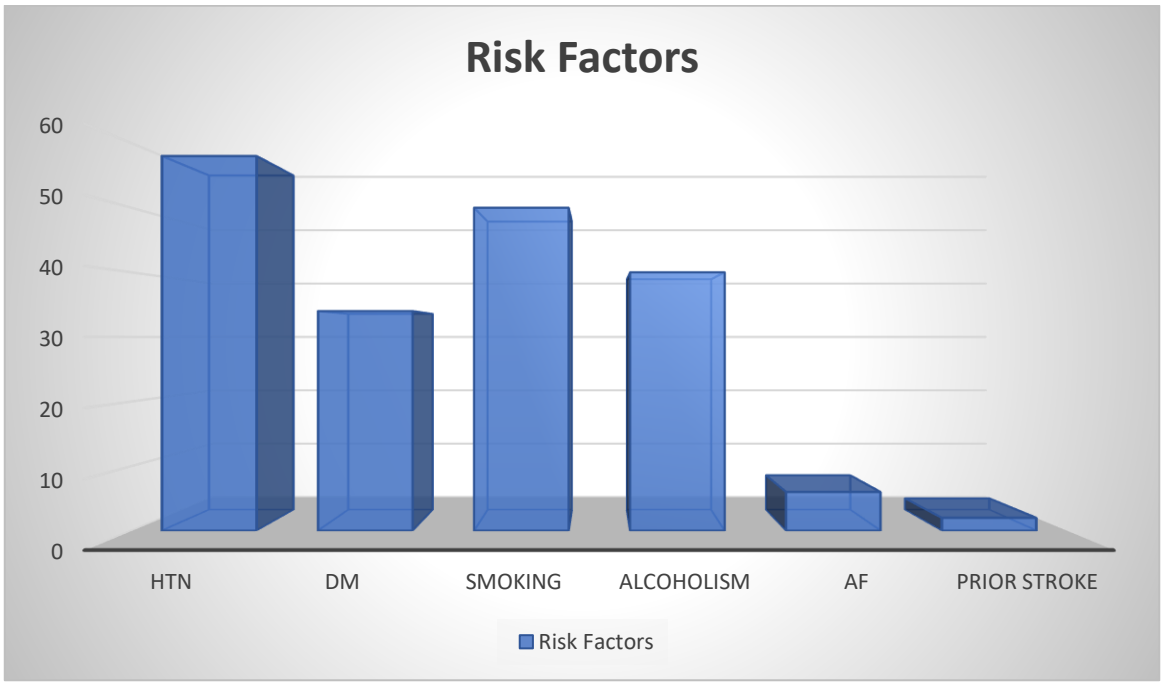
Graph no.I

84% of Ischemic stroke patients were having Non O Blood group. This shows the relationship between ABO blood group and Ischemic stroke**.**

Risk Factors Distribution

Table no.II

Risk factors	Frequency in stroke patients(n)	%
Hypertension	183	58
DM	108	34
Smoking	159	50
Alcoholism	127	40
AF	19	6
Prior stroke	6	2



Graph No.II

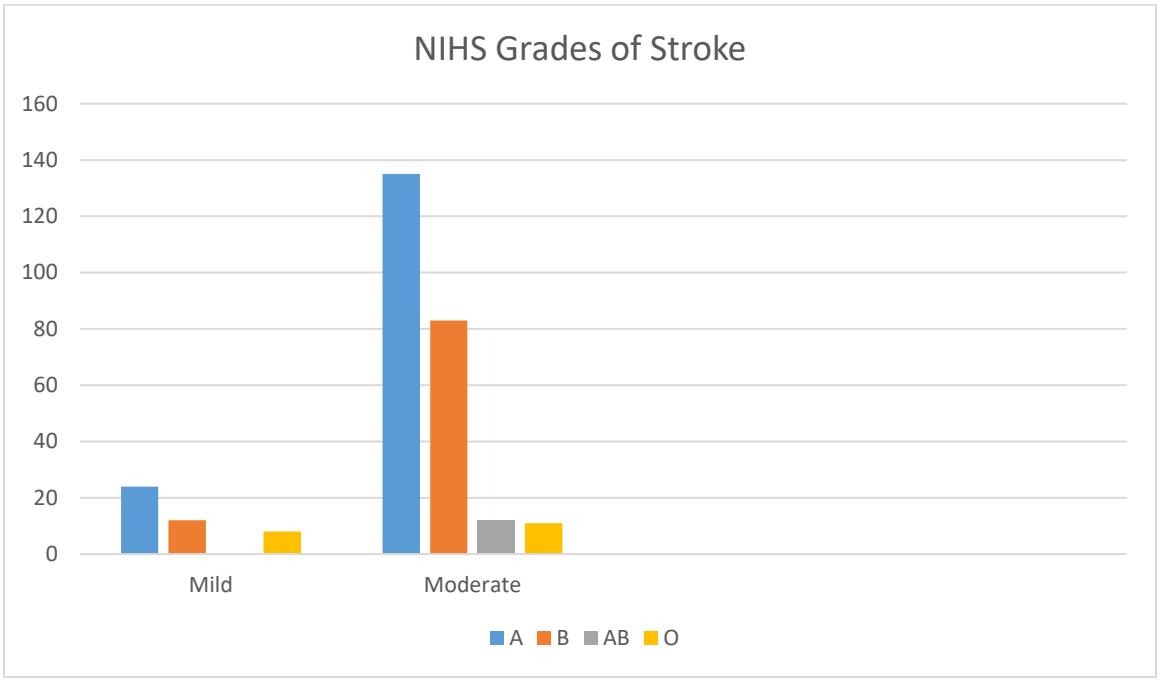
Among Risk factors in stroke patients, The most common risk factor was Systemic HTN followed by smoking.

3 . ABO blood group distribution in different grades of stroke

Table no.III

	Blood group				Total
Grades of Stroke	**A**	**B**	**AB**	**O**	
Mild	24	12	0	8	44
Moderate	135	83	12	43	273
Total	159	95	12	51	317

Patients with Blood group A had more severe stroke ,135 patients with moderate stroke had blood group A.



Graph No.III

4. AGE DISTRIBUTION

Table no.4

Age group	Frequency(n)	%
20-30	5	1.5
31-40	2	1
41-50	8	2.5
51-60	48	15
61-70	95	30
71-80	159	50
Total	317	100.0

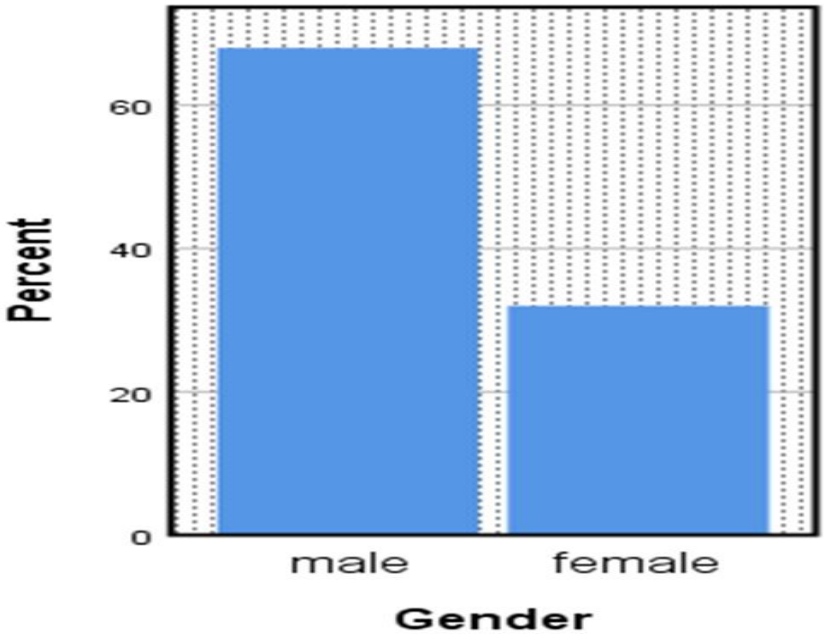
The mean age was found to be 71

5. SEX DISTRIBUTION

Table no.5

Gender	Frequency(n)	%
Male	216	68.0
Female	101	32.0
Total	317	100.0

Majority of the patients were male 68% when compared to females 32%.



DISCUSSION

ABO Blood group Distribution

In our research, the most prevalent blood group was found to be Blood group (50%), followed by Blood group B (30%), and then Blood group O (16%). This resulted in a total observation of 84% for Non O blood groups.

This discovery aligns with previous studies conducted by Dentali et al in 2014, where Non O blood groups were prevalent in 62.5% of patients with Ischemic stroke.[14]Similarly, research by Clark et al in the UK in 2004 revealed that non-O (60%) and particularly A blood groups were more frequent in those afflicted by Ischemic stroke.[25]

Further studies by various researchers across different regions, such as Franchini et al in Italy, Hanson et al in Sweden, and Herman et al in the Netherlands, consistently showed a higher occurrence of Non O blood groups in patients with Ischemic stroke. The prevalence ranged from 63% to 75% in these studies.[11,20,26]

Moreover, studies conducted by Ionescu et al in Romania, Larsen et al in Denmark, and Liumbruno et al comparing patients to blood donors indicated a considerably higher frequency of non-O blood type in patients with health issues. The prevalence of Non O blood groups ranged from 64% to 70.6%, showcasing a consistent trend.[29,28,16]

In a case-control study by Zakai et al in the USA, 43.0% of participants were blood type A, 13.5% were blood type B, 3.9% were blood type AB, and 39.6% were blood type O, reflecting a distribution similar to other studies where Non O blood groups showed a higher prevalence.[13]

"Our discovery of a higher occurrence of Non O blood group aligns with study conducted by Sabino et al in 2014 involving 471 patients, where the prevalence of non-O blood group was notably higher at 70.9%.[17]

Likewise, Vasan et al's case-control study in 2016 with 11,12,072 patients in Denmark and Sweden revealed a similar result with a prevalence of 59.9% in non-O blood group. [8]

Wiggins et al's study in 2009 with 469 patients in Washington, USA, also showed a comparable prevalence of 58% in non-O blood group.[21] In a case-control study by Wolpin et al in 2010 involving 144,082 patients in the US, the prevalence of non-O blood group in Ischemic stroke was found to be 57%.[23]

Contrary to these findings, a study by Marie et al in 2017 on African patients indicated different blood group distributions, with 30.8% having blood group A, 58.5% blood group O, 4.3% blood group B, and 6.4% blood group AB. [7]This contrast highlights the importance of considering regional and genetic factors in analyzing blood group trends.

My own findings corroborate the results of Ohira et al's study in 2007 on US patients, where 64.4% of cases and 52.5% of controls possessed a non-O blood type.[24]

These findings underline the consistent pattern of Non O blood group prevalence in patients with ischemic stroke across various studies.

ASSOCIATION OF ABO BLOOD GROUP WITH ISCHEMIC STROK

In our research, it was observed that 50% of patients who experienced Ischemic Stroke had Blood group A, 30% had Blood group B, 4% had Blood group AB, and 16% had Blood group O. Consequently, a higher prevalence of Ischemic Stroke was found in individuals with Non-O blood groups compared to those with O blood, signifying a notable connection between Non-O blood groups and Ischemic Stroke. The statistical analysis revealed a significant association between ABO blood group and Ischemic Stroke with a p-value of 0.001 ($p < 0.05$).

Our findings aligned with the 2017 study by Marie et al, where a significant statistical difference between blood group A and non-A in stroke was identified.[7] Another study by Vasan et al in 2016 demonstrated a link between ABO blood group and Ischemic Stroke, showing a higher incidence of Cerebrovascular stroke in non-O blood groups compared to blood group O.[8] Similarly, Ewald et al's study in 2016 highlighted a higher occurrence of arterial thromboembolism, ischemic stroke, and myocardial infarction in Blood Groups A, AB, B due to decreased clearance of von Willebrand factor and FVIII.[10]

A study by Boehme et al in 2017 confirmed an association of stroke with gene variants in the ABO blood type gene, affecting levels of coagulation proteins, particularly in large vessel and cardioembolic stroke subtypes.[9] Additionally, Franchini et al's study in 2015 and 2016 revealed a significant link between non-O blood type and arterial thrombosis, supporting our findings.[11,12]

In a study by Zakai et al in 2014, the association between ABO blood group and Ischemic Stroke was further emphasized, with blood type AB showing an increased risk of stroke, particularly in individuals without diabetes.[13]Consistent with this, Dentali et al in 2014 also noted a higher prevalence of non-O blood groups in patients with ischemic stroke compared to controls.[14]

Further studies by Tufano et al in 2013 and Liumbruno et al in 2013 reinforced the positive relation with ischemic stroke, emphasizing the impact of ABO blood group on stroke risk.[15,16]Sabino et al's 2014 study and He et al's 2012 research similarly found an increased relative risk of cerebrovascular disease in individuals with non-O blood groups.[17,18]

In a systematic review and meta-analysis conducted by Clark et al in 2011, it was discovered that there was a 14% increased risk of stroke associated with non-O blood group.[19] Another study by Wiggins al in the USA in 2009 revealed that the B allele was linked to a higher risk of ischemic compared to the O group .[21] Additionally, Wu et al's 2008 study highlighted a connection between ABO blood group and

ischemic stroke, with pooled odds ratios of 1.14 for cerebral arterial ischemia and 1.79 for thromboembolism.[22]

Examining a case-control study by Clark et al in 2005, it was found that individuals with a non-O phenotype were more common in those with cerebral arterial ischemic origin. The relationship persisted even after adjusting for factors like smoking, hypertension, or hyperlipidemia. In cases with the non-O phenotype, a higher prevalence of A allele carriers was observed compared to other blood groups.[25] Similarly, Whincup et al discovered an association between ABO blood group and thrombosis, showing an odds ratio of 1.22.[27]

Contrastingly, in a case-control study by Hanson et al involving 600 patients with ischemic stroke under 70 years old, no significant association was found between ABO phenotype (O vs. non-O) and overall ischemic stroke. This lack of association extended to blood group O vs. A and O vs. B, as well as ABO genotypes and ischemic stroke.[20]

Overall, the collective evidence from various studies supports the association between ABO blood group and Ischemic Stroke, highlighting the significance of blood type in assessing stroke risk."

CONCLUSION

Ischemic stroke was found more in Non O blood group patients.So, non-0 blood group may be considered as an independent risk factor in the pathogenesis of ischemic stroke .However,more studies need to be conducted in other hospitals in different parts of Nepal in larger sample size.

REFERENCES

1. Smith W. S. , Johnson S. C. & Hemphill J.C. Cerebrovascular diseases in Harrison's principles of internal medicine 20th ed.McGraw-Hill Education. 2018;3068
2. Truelsen T., Begg S. &Mathers C. The global burden of cerebrovascular disease. Geneva World Health Organ.2000.https://www.researchgate.net/publication/228551377_The_Global_Burden_of_Cerebrovascular_Disease
3. Shrestha A., Shah D. B., Adhikari S. K. K., Sapkota S. &Regmi P. R. Retrospective Analysis of Stroke and Its Risk Factors at Bir Hospital. Post-Grad. Med. J. NAMS .2011;11
4. Smith W. S. , Johnson S. C. & Hemphill J.C .Cerebrovascular diseases in Harrison's principles of internal medicine. 20th ed, McGraw-Hill Education . 2018;3083
5. Bongers TN, de Maat MP, van Goor ML, Bhagwanbali V, van Vliet HH, Gomez Garcia EB, et al .von Willebrand factor levels increase the risk of first ischemic stroke: influence of ADAMTS13, inflammation, and genetic variability.Stroke. 2006; 37: 2672–7.https://doi.org/10.1161/01.STR.0000244767.39962.f7Stroke. 2006;37:2672–2677
6. McCallum C, Peake I, Newcombe R et al .Factor VIII levels and blood group antigens. Thromb. Haemost. 1983; 50:757 .DOI: 10.1055/s-0038-1665305
7. BA DM, Sow MS, Diack A, Dia K, Mboup MC, Fall PD, et al. Cardiovascular disease and ABO blood-groups in Africans. Are blood-group A individuals at higher risk of ischemic disease?: A pilot study. Egypt Hear J [Internet]. 2017;69(4):229–34. Available from: https://doi.org/10.1016/j.ehj.2017.03.002
8. Vasan SK, Rostgaard K, Majeed A, Ullum H, Titlestad KE, Pedersen OBV, et al. ABO Blood Group and Risk of Thromboembolic and Arterial Disease: A Study of 1.5 Million Blood Donors.

Circulation. 2016;133(15):1449–57. https://doi.org/10.1161/CIRCULATIONAHA.115.017563Circulation. 2016;133:1449–1457

9. Boehme AK, Esenwa C, Elkind MSV. Stroke Risk Factors, Genetics, and Prevention. Circ Res. 2017;120(3):472–95. https://doi.org/10.1161/CIRCRESAHA.116.308398Circulation Research. 2017;120:472–495
10. Ewald, D. R., & Sumner, S. C. J. Blood type biochemistry and human disease. Wiley Interdisciplinary Reviews: Systems Biology and Medicine 2016; 8(6): 517–535. **https://doi.org/10.1002/wsbm.1355**
11. Franchini M, Bonfanti C. Evolutionary aspects of ABO blood group in humans. Clin Chim Acta . 2015;444:66–71. Available from: http://dx.doi.org/10.1016/j.cca.2015.02.016
12. Franchini M, Lippi G. Relative Risks of Thrombosis and Bleeding in Different ABO Blood Groups. Semin Thromb Hemost. 2015;42(2):112–7. DOI: 10.1055/s-0035-1564832
13. Zakai NA, Judd SE, Alexander K, Mcclure LA, Kissela BM, Howard G, et al. ABO blood type and stroke risk: The REasons for Geographic And Racial Differences in Stroke Study. J Thromb Haemost. 2014;12(4):564–70. https://doi.org/10.1111/jth.12507
14. Dentali F, Sironi A. P., Ageno W, Crestani S., Franchini M. ABO Blood Group and Vascular Disease:An Update Semin Thromb Hemost .2014;40:49–59.DOI: 10.1055/s-0033-1363460
15. Tufano A, Coppola A, Nardo A, Bonfanti C, Crestani S, Cerbone AM, et al. Non O blood group as a risk factor for cerebral vein thrombosis. Thromb Haemost 2013;110:197-9.DOI: 10.1160/TH13-02-0112
16. Liumbruno GM, Franchini M. Hemostasis, cancer, and ABO blood group: The most recent evidence of association. J Thromb Thrombolysis. 2014;38(2):160–6.https://link.springer.com/article/10.1007/s11239-013-1027-4
17. De Paula Sabino A, Ribeiro DD, Domingheti CP, Rios DRA, Dusse LMSA, Das Graças Carvalho M, et al. ABO blood group polymorphisms and risk for ischemic stroke and peripheral arterial disease. Mol Biol Rep. 2014;41(3):1771–7. https://link.springer.com/article/10.1007/s11033-014-3026-8
18. He M, Wolpin B, Rexrode K, et al. ABO blood group and risk of coronary heart disease in two prospective cohort studies. Arterioscler Thromb Vasc Biol 2012;32(9):2314–2320.https://doi.org/10.1161/ATVBAHA.112.248757
19. Clark P, Wu O. ABO blood groups and thrombosis: A causal association, but is there value in screening? Future Cardiol. 2011;7(2):191–201. https://doi.org/10.2217/fca.10.191
20. Hanson E, Karlsson S, Jood K Staffa, Nilsson , Blomstrand C , Jern C.No evidence for an association between ABO blood group and overall ischemic stroke or any of the major etiologic subtypes. Elsevier Journal ,Thrombosis Research. 2012;339–342.https://doi.org/10.1016/j.thromres.2012.03.016
21. Wiggins K. L, Smith N. L., Glazer N. L ., Rosendall F . R. , Heckbert S R., Psaty B. M. etal. ABO genotype and risk of thrombotic events and hemorrhagic stroke. Journal of Thrombosis and Haemostasis .2009;7: 263–26.https://doi.org/10.1111/j.1538-7836.2008.03243.x

22. Wu O, Bayoumi N , Vickers M. A. and Clark P. ABO(H) blood groups and vascular disease: a systematic review and meta-analysis. Journal of Thrombosis and Haemostasis.2008; 6: 62–69. https://doi.org/10.1111/j.1538-7836.2007.02818.x
23. Wolpin B.M ,Christopher K, Varraso R et al .Prospective study of ABO blood type and the risk of pulmonary embolism in two large cohort studies . Thromb Haemost 2010; 104: 962–971.DOI: 10.1160/TH10-05-0312
24. OHIRA T , CUSHMAN M, TSAI M Y et al .ABO blood group, other risk factors and incidence of venous thromboembolism: the Longitudinal Investigation of Thromboembolism Etiology (LITE) .Journal of Thrombosis and Haemostasis, 5: 1455–1461.https://doi.org/10.1111/j.1538-7836.2007.02579.x
25. Clark P, Meiklejohn D.J, Sullivan A. O,Vickers A. O and Greave M.The relationships of ABO, Lewis and Secretor blood groups with cerebral ischaemia of arterial origin. J Thromb Haemost. 2005; 3: 2105–8.https://doi.org/10.1111/j.1538-7836.2005.01535.x
26. Herman, B.Tllburg , P. I. M. Schmltz, A. C. M. Leyten, J. H. van Luijk, C. W. G. M. Frenken, A. A. W. Op de Coul and B. P. M. Schulte. Multivariate logistic analysis of risk factors for stroke In Tllburg, The Netherlands. Am J Epidemiol 1983;118: 514-25.https://doi.org/10.1093/oxfordjournals.aje.a113657
27. Whincup PH, Cook DG, Phillips AN, Shaper AG. ABO blood group and ischaemic heart disease in British men. BMJ 1990;300(6741): 1679–1682.https://doi.org/10.1136/bmj.300.6741.1679
28. Larsen s, Anthonisen b, Marquardsen j : cerebral infarction, cerebral hemorrhage, and ABO blood-groups 1977 : 1064.https://doi.org/10.1016/S0140-6736(77)91310-1
29. Ionescu DA, Bicescu E, Marcu I. CEREBRAL THROMBOSIS, CEREBRAL HEMORRHAGE, AND ABO BLOOD-GROUPS Perhaps Antigen-Antibody. Lancet 1976 :278–80. https://doi.org/10.1016/S0140-6736(76)91405-7
30. Lyden P. Using the National Institutes of Health Stroke Scale. Stroke. 2017; 48:00-00. DOI: 10.1161/STROKEAHA.116.015434
31. Shrestha L, Malla U, Mahotra NB .ABO and Rh blood groups and their ethnic distribution in a teaching hospital of Kathmandu, Nepal. JNMA J Nepal Med Assoc. 2013 Apr-Jun;52(190):311-5 .https://www.cabidigitallibrary.org/doi/full/10.5555/20133421513