A study of Relationship Between Mean Corpuscular Volume and Diagnosed Cases of Thrombotic Stroke in Young People

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ABSTRACT

After coronary illness and all malignancies stroke is the third basic reason for death on the planet. Study was aimed to determine the possible relationship between mean corpuscular volume and thrombotic stroke in young people. The study was carried out at a tertiary care hospital. The case-control study was done in 50 patients of young thrombotic cerebrovascular disease and 50 healthy age and sex-matched controls. Estimation of MCV levels was done in both the groups and compared. The mean age of cases was 41.56 ± 9.51. Total of 50 cases of young stroke, 36 (72%) was male. The mean and SD values of MCV levels for the case group were 96.78 ± 7.54, for the control group were 82.07 ± 7. Out of the 50 young stroke patients, 17 (34%) had MCV levels ≥101fL. In the control group, all the subjects had MCV levels ≤100fL. The mean haemoglobin level was 14.29, with SD ± 1.48 in cases, and the control group mean haemoglobin level was 12.41 with SD ± 1.39. Mean serum haemoglobin levels were higher in cases than controls. The Significant Macrocytosis (MCV ≥100fL) can be a new, low cost and early marker in anticipating the risk of developing thrombotic stroke in young adults who may or may not have anaemia.

INTRODUCTION

Roughly 20 million individuals every year will experience the ill effects of stroke. (Dalal et al., 2007) Developing nations represent 85% of worldwide death from a stroke. (Gupta et al., 2008) Its non-fatal sequelae are often associated with a considerable loss of quality of life. Stroke is additionally the primary source of functional disabilities with 20% of survivors requiring institutional consideration following three months and 15% 30% being forever incapacitated (Adams et al., 2008) Fruitful screening, evaluation, and the heads methods for stroke are gotten comfortable significant compensation countries, anyway, these frameworks have not been completed in India. (Dhillon, 2003) Stroke is, for the most part, viewed as an ailment that happens dominantly at more established age with an exponential ascent in frequency past the age of 65 years. Among the youthful stroke is considered generally uncommon. However, a few investigations, transcendentally acted in industrialised nations, have shown that 5 to 10% of all strokes happen before the age of 45 years. Reports from less created nations, for example, India have shown that up to 15 to 30% of all strokes happen in the youth. (Sridharan, 1992) In young subjects, the distribution of different types of stroke and the underlying causes of a stroke may be different from those in older subjects. Despite the importance of these notions for prevention, data on
stroke in the young, however, are limited. Furthermore, the burden on society of a stroke in a young subject follows not only from the costs of medical evaluation and treatment but also from the costs of rehabilitation and lost productivity, in particular when permanent physical impairment remains.

Data regarding stroke in younger patients first appeared in the literature in the 1940s and 1950s in the forms of small patient series and have grown particularly during the last two decades mostly due to improved diagnostic and patient evaluation.

The proportion of ischemic strokes in a young adult is approximately 6% of all ischemic strokes in industrialised countries.

Earlier studies define the upper age cut-off for young stroke patients generally as 40 to 45 years of age. Still, more recent and ongoing studies have applied 50 or even 55 as the upper age limit because of increased longevity in developed countries. (Mcilroy et al., 2002)

At the moment that the examination of stroke is made a cerebral imaging study is basic to pick whether the reason behind stroke is ischemia or delivery. About 85% of all first really stroke are ischemic 10% are an immediate aftereffect of central intracerebral station and about 05% are depended upon to subarachnoid discharge. Within Ischemic stroke 25% are brought about by huge supply route infection 25% by little vessel malady 20% via cardiovascular embolism 05% by other uncommon causes (Dalal et al., 2007). There are many danger factors for stroke including age sex family background of stroke hypertension smoking diabetes heftiness hyperlipidemia and atrial fibrillation. However, they just clarify some portion of cases. Nevertheless cerebrovascular occasions do happen now and again in the people with no of the recently referenced danger factors. As a result almost certainly, other danger factors exist. Thus other danger factors should be distinguished for precise estimation of individual danger for Stroke. Identification of modifiable danger factors for stroke may prompt more powerful anticipation of first and repetitive scenes of cerebrovascular sickness. Several assessments have demonstrated that raised serum homocysteine is a free danger factor for stroke. Hyperhomocysteinemia has comparatively been associated with myocardial restricted decay Alzheimer’s ailment and vascular dementia. (Mcilroy et al., 2002) Hyperhomocysteinemia is normal and is the primary prothrombotic factor related with cerebrovascular mishap. Hyperhomocysteinemia is an autonomous danger factor for blood vessel brokenness in solid moderately aged grown-ups. Raised plasma homocysteine has besides been appeared to be to begin oxidative injury to vascular endothelial cells and cause weakness of the endothelial creation of nitric oxide a solid vascular delivering up factor. Other proposed instruments incorporate improvement of platelet attachment to endothelial cells advancement of the development of vascular smooth muscle cells and relationship of expanded homocysteine with more significant levels of prothrombotic factors, for example, & thromboglobulin tissue plasminogen activator and factor VIIc. (Mojiminiyi et al., 2008) It isn’t acquired from the eating routine and is biosynthesized from methionine through multi step measure. Plasma homocysteine levels are emphatically affected by diet just as by hereditary elements.

Aim
To determine the possible relationship between mean corpuscular volume and thrombotic stroke in young people.

Objective
Evaluation of the mean corpuscular volume, a simple and reliable indicator of RBC size for stratifying cerebrovascular thrombosis risk.

MATERIALS AND METHODS

Study Design
An experimental case-control study.

Study setting
Tertiary care hospital.

Study samples
Patients diagnosed with a stroke.

Sample size
A total of 50 CASES and 50 CONTROLS were enrolled in the study.

Sampling technique
Subjects were selected randomly from people coming to the hospital outpatient clinic for a voluntary routine check-up.

Study duration
Two years.

Inclusion Criteria
Patients between the age group of 18-55 years, diagnosed patients of thrombotic stroke (Occurring for the first time proven by CT/MRI brain).

Exclusion Criteria
Patients of Hypertension, Patients of Diabetes Mellitus, Patients of Hemorrhagic stroke, Patients of
Previous history of stroke, Patients of Heart disease with embolic stroke, Patients of Anaemia of any underlying cause (Iron deficiency anaemia, Sideroblastic anaemia, Thalassemia, Haemolytic Anaemia), Patients of Hypothyroidism, Patients of Liver diseases or alcoholism, Patients of Chronic Renal Failure, Patients on Vitamin B12 or Folic acid Supplements.

Instrument used
Automated Haematology Analyser (Lab life H3D)

Statistical method
Data were analysed in Microsoft Excel 2011. P values were calculated by SPSS software. Level of significance was set at p<0.05.

Ethical Concern
The study was subjected to the ethical committee of the University.

OBSERVATION AND RESULTS

Table 1 reveals that 50 patients presenting with cerebrovascular thrombosis with age and sex-matched controls were studied. Among 50 controls, 36 (72%) were males, and 14 (28%) were females while among 50 first-ever strokes in young patients also 36 (72%) were males and 14 (28%) were females.

Table 2 showed that 5 10% cases were under 30 years old 10 20% cases were in the age gathering of 30 39 years old 22 44% cases were in the age gathering of 40 49 years old and 13 26% cases were in the age gathering of 50 55 years old. The mean and SD for age was 41.56 ± 9.51 on the off chance that gathering and for the benchmark group it was 41.66 ± 9.52. It was seen that most extreme quantities of cases were in the age gathering of 40 49 years.

Table 3 reveals that the mean and standard deviation for MCV levels were 96.78 ± 7.54 for case group and 82.07 ± 7.86 for the control group. The difference was statistically highly significant.

In Table 4 Mean and SD of MCV levels in Males were 99.59 ± 6.83, and in females, the Mean an SD level of MCV levels was 95.68 ± 7.60 in the case group.

In Table 5 study, we observed that 33 (66%) cases had MCV levels ≤ 100fL and 17 (34%) cases had MCV levels ≥ 101fL. In the control group, all the subjects had MCV levels ≤ 100fL. The difference between Case and Control group for MCV levels ≥ 101fL was statistically significant (p<0.05).

In the present study, Table 6 mean haemoglobin level and SD was 14.29 ± 1.48 in case of group and control group mean haemoglobin level and SD was 12.41 ± 1.39.

In the present study Table 7 in age group of <30 years 3 (17.65%) cases and 0 controls had MCV levels ≥ 101fL. In the age group of 30-39 years 6 (35.29%) cases and 0 controls had MCV levels ≥ 101fL. In the age group of 40-49 years 5 (29.41%) cases and 0 controls had MCV levels ≥ 101fL.

In Table 8 study out of 36 males in the case group, 26 (52%) had MCV levels ≤ 100fL and 10 (20%) had MCV levels ≥ 101fL. All 36 males in the control group had MCV levels ≤ 100fL. In case of females 7 (14%) cases had MCV levels ≤ 100fL and 7 (14%) cases had MCV levels ≥ 101fL. All 14 females in the control group had MCV levels ≤ 100fL.

DISCUSSION

Age distribution
The current investigation indicated that 5 10% cases were under 30 years old 10 20% cases were in the age gathering of 30 39 years old 22 44% cases were in the age gathering of 40 49 years old, and 13 26% cases were in the age gathering of 50 55 years old. It was seen that most significant number of cases were in the age gathering of 40 49 years. The age circulation of the patients in this investigation was in concurrence with the investigations of a case-control investigation of 109 youthful grown-ups with first-ever hospitalised ischemic stroke (Tan et al., 2002).

Sex distribution
In the present study of 50 cases of young stroke, 36 (72%) were male, and 14 (28%) were female with M: F sex ratio being 2.57:1 and it is in concordance with Dinesh Nayak et al. study where the M: F sex ratio was 3:2:1 (Nayak et al., 1997). In the study by (Tan et al., 2002) of first historically speaking ischemic stroke in quite a while had 71 6% guys.

MCV levels and thrombotic stroke
MCV levels of the entire 50 patients diagnosed as cases were estimated and compared with controls. The mean and SD values of MCV levels for the case group were 96.78 ± 7.54. For the control group, the mean and standard deviation values for MCV levels were 82.07 ± 7. The thing that matters was factually exceptionally noteworthy between both the gatherings (p<0.05).

These findings correlate well with the work done by Suely Meireles Rezende et al. (Rezende et al., 2014) where they showed a relationship between haematological variables and thrombosis in a large number of cases.
Table 1: Sex distribution in cases and controls

| Sex     | Cases | %    | Controls | %    | Total | %    |
|---------|-------|------|----------|------|-------|------|
| Male    | 36    | 72   | 36       | 72   | 72    | 72   |
| Female  | 14    | 28   | 14       | 28   | 28    | 28   |
| Total   | 50    | 100  | 50       | 100  | 100   | 100  |

Table 2: Age distribution in cases and controls

| Age groups | Cases | %    | Controls | %    | Total | %    |
|------------|-------|------|----------|------|-------|------|
| <30yrs     | 5     | 10   | 5        | 10   | 10    | 10   |
| 30-39yrs   | 10    | 20   | 10       | 20   | 20    | 20   |
| 40-49yrs   | 22    | 44   | 22       | 44   | 44    | 44   |
| 50-55yrs   | 13    | 26   | 13       | 26   | 26    | 26   |
| Total      | 50    | 100  | 50       | 100  | 100   | 100  |

Mean age: 41.56, SD age: 9.51, t-value: -0.0526, p-value: 0.9582

Table 3: Comparison of cases and control with MCV levels by t-test

| Groups    | n   | Mean | SD  | t-value | P-value |
|-----------|-----|------|-----|---------|---------|
| Cases     | 50  | 96.78| 7.54| 9.5537  | 0.00001*|
| Controls  | 50  | 82.07| 7.86|         |         |

Table 4: Sex distribution and mean MCV levels in cases

| Sex     | No. of Patients | Mean ± SD MCV levels |
|---------|-----------------|----------------------|
| Male    | 36              | 99.59 ± 6.83         |
| Female  | 14              | 95.68 ± 7.60         |
| Total   | 50              | 96.78 ± 7.54         |

Table 5: Comparison of cases and control with MCV levels ≥ 101 fl

| MCV levels | Cases | %    | Controls | %    | Total | %    |
|------------|-------|------|----------|------|-------|------|
| ≤100fl     | 33    | 66.00| 50       | 100.00| 83    |
| ≥101fl     | 17    | 34.00| 0        | 0.00  | 17    |
| Total      | 50    | 100.00| 50       | 100.00| 100   |

Chi-square with Yate's correction = 15.2424, P = 0.0001*

Table 6: Comparison of cases and control with haemoglobin levels by t-test

| Groups    | n   | Mean | SD  | t-value | P-value |
|-----------|-----|------|-----|---------|---------|
| Cases     | 50  | 14.29| 1.48| 6.5709  | 0.00001*|
| Controls  | 50  | 12.41| 1.39|         |         |
Table 7: Comparison of cases and controls with MCV levels ≥101fl in each age groups

| MCV levels | Cases | % | Controls | % |
|------------|-------|---|----------|---|
| <30 yrs    | 3     | 17.65 | 0 | 0.0 |
| 30-39 yrs  | 6     | 35.29 | 0 | 0.0 |
| 40-49 yrs  | 5     | 29.41 | 0 | 0.0 |
| 50-55 yrs  | 3     | 17.65 | 0 | 0.0 |
| Total      | 17    | 100  | 0 | 0.0 |

Table 8: Comparison of cases and controls with MCV levels in male and females

| Sex       | MCV levels | Cases | % | Controls | % | Total |
|-----------|------------|-------|---|----------|---|-------|
| Male      | ≤100fl     | 26    | 52.0 | 36 | 72.0 | 62 |
|           | ≥101fl     | 10    | 20.0 | 0  | 0.0  | 10 |
|           | Total      | 36    | 72.0 | 36 | 72.0 | 72 |
| Female    | ≤100fl     | 7     | 14.0 | 14 | 28.0 | 21 |
|           | ≥101fl     | 7     | 14.0 | 0  | 0.0  | 7  |
|           | Total      | 14    | 28.0 | 14 | 28.0 | 28 |

Significant macrocytosis (MCV ≥100 fl) and thrombotic stroke

In the present study out of the 50 young stroke patients, 33(66%) had MCV levels ≤100fl, and 17(34%) had MCV levels ≥101fl. In the control group, all the subjects had MCV levels ≤100fl. The difference between case and control group for MCV levels ≥101fl was statistically significant (p<0.05).

A study done by (Rezende et al., 2014) of the relationship between haematological variables and thrombosis observed that the odds ratios were 2.6 (95% CI 1.6-4.0) in patients with MCV levels ≥101.48fl (99th Percentiles) for developing significant thrombosis. They also found an association between high MCV (≥101.5 fl).

Hyperhomocysteinemia, Vitamin B12, Folic Acid And Thrombotic Stroke

Hyperhomocysteinemia is one of the settled modifiable clear danger factors in ischemic stroke. The nearby connection between blood MCV values and homocysteine levels is likewise known (Haltmayer et al., 2002).

In deficiencies of the vitamin B12, folic acid and vitamin B6, homocysteine levels have been discovered to be expanded. A study done by (Weng et al., 2008) shows low folate confirmation was through and through and independently associated with ischemic stroke (Robinson et al., 1998) study of risk factors for stroke showed that serum folate levels were decreased in cases than in controls [p<0.005]. Low folate concentration was associated with high homocysteine levels with an increased risk of vascular disease.

(Weikert et al., 2007) studies show decreased levels of vitamin B12 is a risk factor for cerebral ischemia and an independent risk factor for ischemic heart disease. Ischemia was because of increased homocysteine levels which damage the vascular endothelium and associated with cerebrovascular disease. Vitamin B12 deficiency may assert an effect on the cerebral white matter apart from the elevated homocysteine. Plasma levels of folate and vitamin B12 were directly correlated with homocysteine as their metabolism is linked.

Treatment Of Hyperhomocysteinemia And Decreased Risk Of Stroke

In the present study, the mean haemoglobin level was 14.29 with SD ±1.48 in cases and control group mean haemoglobin level was 12.41 with SD±1.39. Mean serum haemoglobin levels were higher in cases than controls The thing that matters was measurably huge p <0 05 Elevated Hb level was viewed as an all-around recorded danger factor for stroke Homocysteine levels have been discovered to be diminished with folate therapy alone or with a blend of folate with nutrient B12 and B6 VitaminB12 or potentially folate insufficiency hinders atomic replication and cell division during DNA union Hence it causes to the creation of megaloblasts bigger than ordinary red platelets during the arrangement of erythrocytes (Savage et al., 2000) In the light of
comparable investigations the American Heart and Stroke Association suggested day by day admission of folate nutrient B12 and nutrient B6 in patients with stroke and homocysteinemia because (Terwecoren et al., 2009). As folate is heat-labile and primarily destroyed by prolonged cooking at high temperature with Indian dishes such as curries, inadequate intake of fresh fruits and vegetables and hence low folate levels is seen Indian diet—frying of vegetables which can destroy 90% of the folate content of vegetables.

CONCLUSIONS

In developing countries like India, early detection of significant macrocytosis (MCV>100 fl) incomplete blood count at primary health care centre can be a new, low cost and an early risk marker for developing thrombotic stroke in young people. Treatment of significant macrocytosis empirically with folic acid and vitamin B12 can prevent thrombotic stroke in young adults. This would be a practical preventative approach for reducing the incidence of thrombotic stroke in young people.

Conflict of interest

The authors declare that they have no conflict of interest for this study

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