DOI: https://doi.org/10.53350/pjmhs2115113004

ORIGINAL ARTICLE

Association of Iron Deficiency Anemia with Stroke Severity in patients with Acute Ischemic Stroke

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ABSTRACT

Aim: To study the relationship of Iron Deficiency anemia (IDA) with severity of acute ischemic stroke.
Study Design: A cross-sectional descriptive study.
Place & Duration of Study: Department of Medicine, Mayo Hospital, Lahore from March 2020 to February 2021
Methods: A descriptive study of cross-sectional type was done on 200 individuals who had acute ischemic stroke (AIS) and were hospitalized at Mayo Hospital Lahore. Consecutive non-probability convenience sampling method was used to gather the data. Severity of stroke was assessed at the time of admission using the National Institute of Health Stroke Scale, (NIHSS) at the same time blood complete examination along with peripheral blood film was done to diagnose anemia in these patients. Iron studies were done to diagnose iron deficiency anemia (IDA). P-value less than 0.05 was taken as significant.
Results: About 200individuals presenting with AIS were enrolled in the research work. Anemia according to World Health Organization was seen in 80(40%) and was not present in 120(60%) patients. Among the subjects who had anemia, 16(20%) had a minor AIS, 23(28.75%) had a moderately severe AIS, and 41(51.25%) reported with a severe AIS, according to NIHSS criteria. A notable relationship was found to exist between anemia and stroke severity, (P-value 0.000).
Conclusion: Anemia was a commonly found in individuals with acute stroke due to ischemia and had direct relation with severity of stroke.
Keywords: Iron deficiency Anemia, severity, ischemic stroke.

INTRODUCTION

Stroke is as a neurological deficit due to an acute focal insult of the central nervous system by a vascular cause, including cerebral infarction, intracerebral hemorrhage and subarachnoid hemorrhage[1]. Stroke is considered to be the second leading cause of mortality and one of the major causes of pro-longed disability throughout the world[2].

The Global Burden of Disease 2016, Lifetime Risk of Stroke Collaborators, showed that the expected global lifetime risk of stroke in 2016 in individuals who are 25 years or older was 24·9%, an increase from 22·8% in 1990. The evaluation showed an approximately equal risk of stroke among men and women, and an 18·3% risk of stroke due to ischemia and 8·2% risk of hemorrhagic stroke[3]. The prevalence of stroke in Pakistan is one of the greatest in the world in contrast to other countries. A study done on community revealed the rough presence of stroke to be 19,000 per 100,000 population[4].

Multiple risk factors, with various magnitudes, are considered to be associated with increased risk of acute stroke, including age, gender, diabetes mellitus, dyslipidemia, hypertension, obesity, smoking, cardiovascular disease and previous stroke[5]. Anemia is a state in which the hemoglobin concentration or the number of red blood cells is lesser than normal. Iron deficiency anemia (IDA) is decreased production of red blood cells due to decrease iron stores in the body. Iron has an vital task in many physiological processes, which includes erythropoiesis, oxidative metabolism and immunity[6]. IDA is the most common cause of anemia globally and considered to be roughly one-half cases of anemia[7]. Anemia is a leading medical concern and a common state among elderly, with its prevalence rising as one grows[8,9]. Unfavorable end result, and reduced survival too, is related with low hemoglobin level, which has been regarded as a causative factor. Patients with acute ischemic stroke (AIS), having anemia are linked with worse outcome[10]. The accurate correlation between hemoglobin levels and prognosis after AIS is not entirely known. It is supposed that high and low levels of hemoglobin both are affiliated with poor results. Every fifth patient with AIS has low hemoglobin level, and is considered to have a worse neurological end result[11].

Numerous observational studies have found a relation between decrease level of iron and an increased risk of stroke. Chang YL[12] showed a substantial association between prior IDA and ischemic stroke.

Stroke is rampant in Pakistan[13] Pakistan shares a significant load of this devastating debility adding towards an exponential consumption of resources, community manpower, finances, services of health care workers and the economy as a whole. The reason for planning our research was to emphasize on the connection between occurrences of low hemoglobin level with stroke severity. The end result will contribute to an improved perception of the burden of stroke, which may aid in the good quality treatment of patients, causing enhanced healthcare provision and better outcome.

We planned this research work to investigate the relationship of IDA with severity of stroke in patients with AIS.

MATERIAL AND METHODS

A descriptive study of cross-sectional type was done after approval from IRB on patients who had acute ischemic stroke (AIS) and were hospitalized at Mayo Hospital Lahore from March 2020 to February 2021. Consecutive non-probability convenience sampling method was used to gather the data. Sixteen to 70 years old patients who presented with onset of symptoms within 72 hours were considered to be enrolled in the study. Patients with hemorrhagic stroke, transient ischemic attacks, prior history of cerebro-vascular accident dural sinus thrombosis leading to venous stroke, acute cardiac event, and an underlying inability due to other causes were not enrolled. Informed consent in written was taken from all patients who were included in the study. A IS were established by the CT scan brain without contrast. A detailed history and a clinical examination were conducted on all patients. Information from patients was entered on an already designed proforma. Severity of stroke was assessed at the time of admission using the National Institute of Health Stroke Scale (NIHSS). The

Received on 11-05-2021
Accepted on 27-10-2021

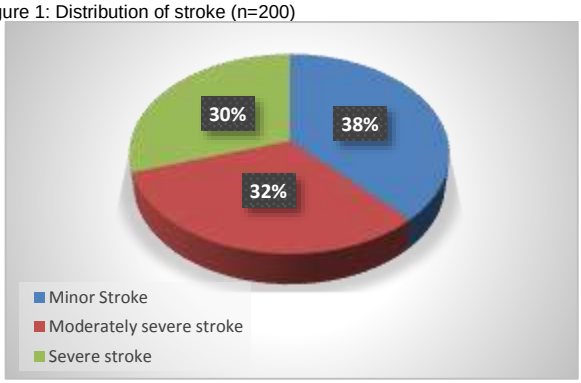
definition of NIHSS score is the sum of 15 separately evaluated elements, which range from 0 to 42. Stroke severity may be classified as no symptoms of stroke, 0; minor stroke, 1–4; moderate severity of stroke, 5–15; moderate to severe severity stroke, 16–20; and severe stroke, 21–42. Blood complete examination along with peripheral blood film was done to diagnose anemia in these patients. Iron studies were done to diagnose IDA. Patients with anemia due to causes other than IDA were excluded. Anemia was assessed with reference to the World Health Organization parameters (male <13gm/dL; female, <12gm/dL). We looked for the occurrence of anemia in patients with different severities of AIS.

RESULTS

Overall 200 subjects presenting with AIS were enrolled in our research. The mean of age was found to be 61.35±S.D 10.81 years, with an age range of 21-70 years. The patients incorporated in the study were 98(49%) males and 102(51%) females. Out of the 200 subjects one (0.5%)was in the age range of 15-25 years, three (1.5%) were in the age range of 26-35 years, 15(7.5%) were in the age group of 36-45 years, 17(8.5%) were in the age group of 46-55 years, 90(45%) were in the age range of 56-65 years, and 74 (37%) were in the group with age of greater than 65 years.

Anemia according to World Health Organization definition was seen in 80(40%) and was not present in 120(60%) patients. Among the subjects who had anemia, 16(20%) had a minor AIS, 23(28.75%) had a moderately severe AIS, and 41(51.25%) reported with a severe AIS. A noteworthy relationship was seen between anemia and stroke severity (P-value 0.000). The distribution according to stroke severity in our research work is shown in Figure 1.

Figure 1: Distribution of stroke (n=200)



- Minor AIS= 38%
- Moderately AIS: 32%
- Severe AIS: 30%

The patients with anemia were stratified according to severity of stroke (Table 1). P-value of 0.000 was revealed by Chi–square test, thus suggestive of a relationship between the two values which were statistically significant.

Table 1: Stratification of anemia based on severity of stroke

IDA	Stroke severity			Total
	Minor AIS	Moderately severe AIS	Severe AIS	
IDA positive	16	23	41	80
IDA negative	60	41	19	120
Total	76	64	60	200

P value 0.000

There were 27 males and 53 females from total 80 patients in the IDA group. Whereas, 71 males and 49 females were seen out of 120 patients who were non-anemic. Anemia was more common in women as compared to the men. The difference of presence of anemia in both genders are shown in Table 2.

P-value of 0.023, was shown by Chi-square test ,suggestive of a variation between the two genders based on IDA which were bio-statistically significant .

Table 2: Stratification of anemia based on gender

IDA	Male	Female	Total
IDA positive	27	53	80
IDA negative	71	49	120
Total	98	102	200

P value 0.023

Various age groups were compared based on the presence of anemia, displayed no statistically significant difference as P-value was found to be greater than 0.05by the Chi-square test.

DISCUSSION

Stroke can happen at any age and may be due to various causes, like cardioembolism, substance abuse, hematologic disorders, dissections, trauma, oral contraceptive use, pregnancy, connective tissue disorders, and postpartum states. However, there are other risk factors like iron deficiency which could be a cause of AIS, and it is generally considered to be associated with poor functional outcome and yet increased mortality[14].

Anemia was seen in 56.4% of the people (59% males; 56.5% females) with a mean Haemoglobin level of 11.7g/dl in a study conducted by Chang T et al[15]. Moderate to severe severity of stroke was seen in 20% of patients in his study as shown by an NIHSS of ≥16.Univariate analysis disclosed that anemia had a fundamental association with "moderate to severe" functional disability. Where as in our study moderate to severe stroke severity was seen in 32% of patients, with NIHSS of ≥16 and severe stroke is seen in 30% of patients with NIHSS of ≥21.

Study done by Haralampos Milionis[16] and colleagues showed anemia was linked with more dire manifestations of stroke. Patients with anemia had higher 7-day, 3-month and 12-month mortality, which was related with low hemoglobin level. Thus low levels of hemoglobin independently foretells about short and long-term mortality.

Hao Z[17] also carried out a meta-analysis on already published studies. He with his fellow colleagues incorporated 1176 subjects, out of which 351 individuals (29.8%) were having IDA. After modification for different confounders, anemia at the time of admission was shown to be an independent factor which predicts mortality at discharge of patients and after 12 months. Thus, result of this research demonstrated that anemia could be a cause of considerable illness and inability in AIS patients. However, further evidence and additional research is necessary which could help in the management of anemic patients with AIS.

COCLUSION

We concluded that anemia is commonly found in patients with AIS. The severity of stroke rises as the frequency of anemia rises. Healthcare providers managing patients with AIS should be more vigilant about early detection and management of anemia in order to reduce the severity of stroke and for the better outcome in these patients.

Conflict of interest: Nil

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