ORIGINAL ARTICLE

Frequency of metabolic syndrome in patients with ischemic stroke admitted at a tertiary care hospital in Pakistan

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Abstract

Introduction: Ischemic stroke is the second leading cause of death and disability worldwide. There are many modifiable risk factors for ischemic stroke including diabetes mellitus, hypertension, dyslipidemia and obesity. Metabolic syndrome is a constellation of all theserisk factors and is associated with increased risk of coronary artery disease and ischemic stroke.

Objective: To determine the frequency of metabolic syndrome in patients with ischemic stroke admitted at Dr. Ziauddin University Hospital, Karachi.

Study design: Descriptive cross-sectional study

Setting: Neurology ward of Dr. Ziauddin University Hospital, Karachi.

Study duration: This study was conducted from 01-04-2022 to 30-09-2022.

Subjects and methods: 382 patients of more than 40 and less than 80 years of age who were admitted in Neurology ward of Dr. Ziauddin University Hospital, Karachi, with symptoms and signs of ischemic stroke were enrolled after taking consent. Ischemic stroke was diagnosed based on history, physical examination and MRI brain findings. History of DM and HTN was obtained and lipid profile and blood glucose were checked after 12 hours of fasting. Waist circumference was measured in centimeters midway between lowest margin of ribs and highest point of iliac crest. BP was measured at three separate times and themean was recorded. Data was recorded in a proforma.

Results: Mean age of participants was 61±10.4 years. Out of 382 patients, 230(60.2%) were male. Mean HDL, TG, FBS and waist circumference were 38.6±13.29 mg/dL, 137.7±79.85 mg/dL, 139±57.68 mg/dL and 93.5±12.5 cm respectively. Out of 382 patients with ischemic stroke, 249(65.2%) were found to havemetabolic syndrome. Highest frequency of metabolic syndrome was seen in male patients between 61 to 70 years of age.

Conclusion: There is a high frequency of metabolic syndrome in ischemic stroke patients in our population, particularly among males between 61 to 70 years of age.

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Keywords: Ischemic stroke, Metabolic syndrome, Diabetes, Hypertension, Dyslipidemia, Obesity.

Introduction:

Stroke is a leading cause of disability and mortality worldwide and is typically characterized as neurological dysfunction resulting from acute focal injury to the central nervous system (CNS) by a vascular source, including cerebral infarction, intracerebral hemorrhage (ICH), and subarachnoid hemorrhage (SAH). Each year, 15 million people experience a stroke, of which one third pass away and one third become permanently incapacitated.[1] The estimated annual incidence of stroke in Pakistan is 250 per 100,000, translated to an estimated 350,000 new cases every year.[2] Stroke and transient ischemic attacks (TIA) are highly prevalent in Pakistan. A community-based survey suggested an estimated 21.8% prevalence of stroke and/or TIA in an urban slum of Karachi with high complication and disability rate.[3,4] The profile of major modifiable risk factors is essentially similar to

Table 1: Descriptive statistics n=382

Variable	Mean ± SD	StandardDeviation	Min-Max
Age (years)	61.77	±10.40	40-80
HDL (MG/DL)	38.62	±13.29	16-89
TG (MG/DL)	137.74	±79.85	70-584
FBS (MG/DL)	139.45	±57.68	73-379
Waist circumference (CM)	93.52	±12.51	72-133

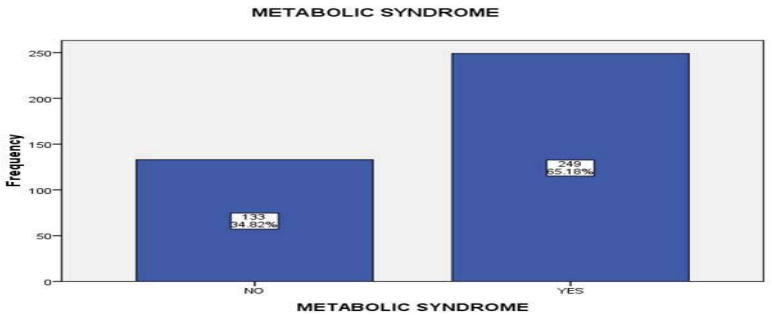

Figure 1: Metabolic syndrome distribution n=382

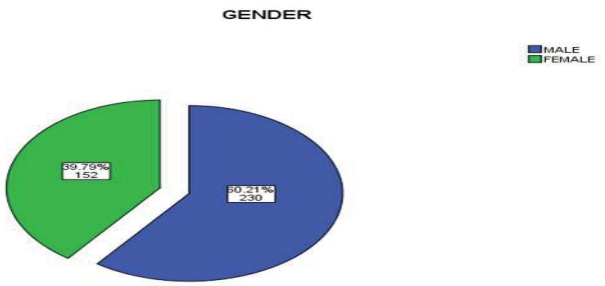

Figure-2: Gender distribution n=382

the one seen in stroke patients elsewhere in the world. Most common risk factors in ischemic stroke are diabetes mellitus and hypertension. Syed et al reported that approximately 77% of their cohort had diabetes mellitus, hypertension or both.[5] Other modifiable risk factors for stroke include atrial fibrillation, dyslipidemia, cigarette smoking, physical inactivity and carotid stenosis.[6] The probability of stroke occurrence rises with number and severity of vascular risk factors. An emerging entity that incorporates stroke risk stratification with goal of mitigating vascular risk is metabolic syndrome (MetS). Metabolic syndrome is a constellation of risk factors including dyslipidemia, hypertension, diabetes and obesity. Hydrie et al have reported that the prevalence of metabolic syndrome according to the International Diabetes Foundation (IDF) definition and modified Adult Treatment Plan (ATP) III criteria in Pakistan is 34.8% and 49%, respectively.[7] Several studies have suggested that individuals with metabolic syndrome are at high risk of experiencing first ever and recurrent stroke. John K. Ninomiya et al reported that metabolic syndrome is significantly related to stroke (OR, 2.16; 95% CI, 1.48 to 3.16).[8] Therefore, it is important to identify patients with MetS to initiate lifestyle modifications as well as drug treatment to prevent stroke.

There is lack of local data regarding frequency of metabolic syndrome in stroke patients. In one study, Sheikh Samiullah reported that frequency of MetS in ischemic stroke patients is 46.2%.[9] This study would add more data on frequency of metabolic syndrome in ischemic stroke patients which would be helpful to increase awareness about relationship of MetS and ischemic stroke among clinicians,who can help suggest life style modifications as well as drug treatment to prevent stroke.

Sample size: With estimated prevalence of 43.5% of metabolic syndrome in stroke, margin of error set as 5%, and confidence level of 95%, calculated sample size is 382.

Inclusion criteria include male and female patients, between 40 to 80 years of age. Patients with clinical and radiographic diagnosis of ischemic stroke. Patients themselves or their immediate kin who consented for participation. Exclusion criteria include patients with hemorrhagic stroke. Patients already taking lipid lowering drugs. Pregnant females. Patients with known neoplasia, renal or liver disease or thyroid dysfunction

Data collection procedure:
Study was started after approval from REU of

Table 2: Metabolic syndrome according to age n=382

	Metabolic Syndrome		
age (years)	Yes	No	**Total**
40-50	47 (18.9%)	33 (24.8%)	80 (20.9%)
51-60	74 (29.7%)	17 (12.8%)	91 (23.8%)
61-70	85 (34.1%)	32 (24.1%)	117 (30.6%)
71-80	43 (17.3%)	51 (38.3%)	94 (24.6%)
TOTAL	249 (100%)	133 (100%)	382 (100%)
P-VALUE	>0.01		

Table 3: Metabolic syndrome according to gender n=382

	Metabolic Syndrome		
Gender	Yes	No	**Total**
Male	151 (60.6%)	79 (59.4%)	230 (60.2%)
Female	98 (39.4%)	54 (40.6%)	152 (39.8%)
Total	249 (100%)	133 (100%)	382 (100%)
P-VALUE	0.44		

CPSP. All consecutive patients, both male and female, aged more than 40 years and less than 80 years presenting to emergency department of Dr. Ziauddin University Hospital, Karachi with signs and symptoms of ischemic stroke and evidence of ischemic stroke on MRI brain were asked for consent. If patient could not give consent due to neurologic deficit secondary to stroke then their immediate kin was asked for consent. After taking consent patient was enrolled in the study.

Abdominal obesity was measured by measuring waist circumference. Waist circumference was be measured by placing measuring tape midway between lowest margin of ribs and highest point of iliac crest with tape snug to skin not compressing the skin. Waist circumference was measured in centimeters. It was be labeled as positive if ≥90cm in men and ≥80cm in women. Fasting blood glucose was be checked after overnight fasting of eight hours and was recorded in mg/dl which was taken as positive if ≥110 mg/dL.

Hypertension was confirmed by recording blood pressure readings during hospital stay using digital blood pressure recorders. Three blood pressure readings were recorded at three times ten minutes apart and their mean was taken. Hypertension was labeled if systolic blood pressure ≥130 or diastolic blood pressure ≥85 mm Hg. Fasting lipid profile was checked after overnight fasting for 8 hours. Serum triglyceride was labeled positive if ≥150 mg/dL. HDL was labeled as positive if <40 mg/dL in men &<50 mg/dL in women.

Data was collected on a proforma which included demographic variables including name, age, sex and hospital medical record number. Data regarding various components of metabolic syndrome was recorded including waist circumference, fasting glucose, blood pressure recordings and fasting lipid profile results. All patients were treated as per standard treatment protocols of the institute.

Statistical analysis: Data was entered into SPSS version 17.0 and analyzed through its statistical package. Continuous variables like age, waist circumference and laboratory findings including HDL, triglycerides and fasting glucose will be calculated as mean±standard deviation. Categorical variables like gender, history of hypertension and diabetes mellitus are presented infrequencies and percentages. Frequency and percentage of outcome variable metabolic syndrome is calculated based on NCEP/ATP III criteria. Metabolic syndrome is stratified by age, sex, history of diabetes and hypertension through chi-square test to control the effect modifier. P-value ≤0.05 has been considered as statistically significant.

Results:

A total of 382 patients with ischemic stroke visiting Neurology Department of Dr. Ziauddin University Hospital, Karachiwho met the inclusion and exclusion criteria were included in this study.

Out of 382 patients minimum age of the patient was 40 while maximum age of the patients was 80 years. Mean age in study was 61.77 years with the standard deviation of ±10.40.

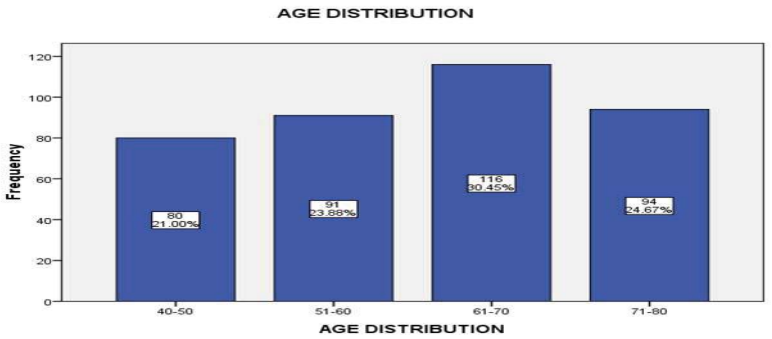

Figure-3: Age distribution n=382

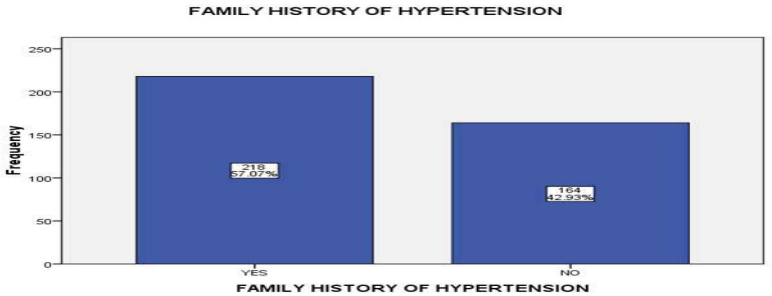

Figure-4: Family history of hypertension distribution n=382

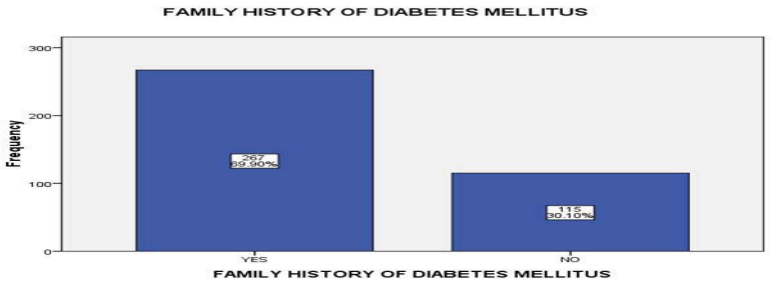

Figure-5: Family history of diabetes mellitus distribution n=382

Mean HDL, TG, FBS and Waist circumference in study was 38.62±13.29 mg/dl, 137.74±79.85 mg/dl, 139.45±57.68 mg/dl and 93.52±12.51 cm respectively. As shown in Table 1.

Out of 382 patients with ischemic stroke, 249 (65.2%) had metabolic syndrome and 133 (34.8%) did not have metabolic syndrome. As shown in Figure 1.

Out of 382 patients with ischemic stroke, 230 (60.2%) were male and 152 (39.8%) were female. As shown in Figure 2.

Frequency distribution of age showed that out of 382 patients, 80 (20.9%), 91 (23.8%), 117 (30.6%) and 94 (24.6%) patients were in age group 40-50 years, 51-60 years, 61-70 years and 71-80 years respectively. As presented in Figure 3.

Out of 382 patients with ischemic stroke, 218 (57.1%) had history of hypertension in the family and 164 (42.9%) did not have history of hypertension in the family. As shown in Figure 4.
Out of 382 patients with ischemic stroke, 267 (69.9%) had history of diabetes mellitus in the family and 115 (30.1%) did not have history of diabetes mellitus in the family. As shown in Figure 5.

Stratification for age with respect to metabolic syndrome showed that 47(18.9%), 74(29.7%), 85(34.1%) and 43(17.3%) in age group 40-50 years, 51-60 years, 61-70 years and 71-80 years developed metabolic syndrome respectively. Whereas 33(24.8%), 17(12.8%), 32(24.1%) and 51(38.3%) in age group 40-50 years, 51-60 years, 61-70 years and 71-80 years did not develop metabolic syndrome respectively. As presented in Table 2. P-value was 0.00.

Stratification for gender with respect to metabolic syndrome showed that 151 (60.6%) and 79 (59.4%) developed and did not develop metabolic syndrome in the male gender respectively. Whereas 98 (39.4%) and 54 (40.6%) developed and did not develop metabolic syndrome in the female gender respectively. As presented in Table 3. P-value was 0.44.

Stratification for family history of hypertension with respect to metabolic syndrome showed that 139(55.8%) and 79(59.4%) developed and did not develop metabolic syndrome in the patients who had family history of hypertension respectively. Whereas 110(44.2%) and 54 (40.6%) developed and did not develop metabolic syndrome in the patients who did not have family history of hypertension respectively. As presented in Table 4. P-value was 0.28.

Table 4: Metabolic syndrome according to family history of hypertension n=382

Family History of hypertension	Metabolic Syndrome		
	Yes	No	**Total**
Yes	139 (55.8%)	79 (59.4%)	218 (57.1%)
No	110 (44.2%)	54 (40.6%)	164 (42.9%)
Total	249 (100%)	133 (100%)	382 (100%)
P-VALUE	0.28		

Table 5: Metabolic syndrome according to family history of diabetes mellitus n=382

Family History of Diabetes Mellitus	Metabolic Syndrome		
	Yes	No	**Total**
Yes	179 (71.9%)	88 (66.2%)	267 (69.9%)
No	70 (28.1%)	45 (33.8%)	115 (30.1%)
Total	249 (100%)	133 (100%)	382 (100%)
P-VALUE	0.14		

Stratification for family history of diabetes mellitus with respect to metabolic syndrome showed that 179(71.9%) and 88(66.2%) developed and did not develop metabolic syndrome in the patients who had family history of diabetes mellitus respectively. Whereas 70(28.1%) and 45(33.8%) developed and did not develop metabolic syndrome in the patients who did not have family history of diabetes mellitus respectively. As presented in Table 5. P-value was 0.14.

Discussion:

Ischemic stroke is associated with significant morbidity and mortality, making primary prevention more important. Diabetes mellitus, hypertension and dyslipidemia are known risk factors of ischemic stroke amongmany others. Metabolic syndrome is a constellation of vascular risk factors like diabetes mellitus, hypertension and dyslipidemia and is associated with increased risk of cardiovascular events including coronary artery disease and ischemic stroke. Hence, early identification and treatment of metabolic syndrome can prevent from stroke.

This study found metabolic syndrome in 249(65.2%) patients with ischemic stroke which is in accordance withpresence of MetS in 71% patients with ischemic stroke in India.[10] Previously done studies from Pakistan have reported lower prevalence of MetS (46.3% and 52%) among patients with ischemic stroke as compared to our study,[9,11] which is similar to a Japanese study that reported 52.8% prevalence.[12] Our study found higher frequency of metabolic syndrome as compared to other local studies.

In this study greatest frequency (30.6%) of metabolic syndrome is seen in age group of 61 to 70 years of age. This suggests the target population for prompt identification and early treatment of this age group subjects.

In this study, male patients are in majority. Metabolic syndrome is found in 60.6% of male patients as compared to 39.4% of female patients. Two other local studies have reported frequency of metabolic syndrome in female population up to 65% and 75%.[11] Whereas study from Tokyo reported that metabolic syndrome was more frequent in male population.[12] This difference in local population studies can be due to the fact that study center is a large tertiary care center serving more populous area and receiving patients from different areas. This finding implies that metabolic syndrome is more frequent in male subjects in our local population which might be secondary to sedentary lifestyle and also due to poor control of stroke risk factors leading to stroke.

This study is done in center which covers a multi ethnic population so this study appropriately represents frequency of metabolic syndrome in multi ethnic study population.

Conclusion:

This study has shown that metabolic syndrome is present in a large number of patients with ischemic stroke. This signifies importance of early identification of patients with metabolic syndrome so that early lifestyle changes as well as appropriate pharmacotherapy can be initiated in order to prevent a large number of patients from ischemic stroke.

Conflict of interest: None

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Role and contribution of authors:

Shazma Khan, conceived, concept design and definition of intellectual content, literature search

Noman Ishaque, did write up, data acquisition and manuscript preparation.

Shua Nasir, did final review of article.

Quratulain Khan, did final layout and data entry.

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