Original Research

Dyslipidaemia in ischaemic stroke patients: results from a tertiary care teaching hospital of Pakistan

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Abstract

Introduction: Ischaemic stroke is a heterogeneous multifactorial disorder characterized by acute focal neurological deficit due to cerebrovascular disease. Considering the clinical evidence of dyslipidaemia as a risk factor for ischaemic stroke, there is a need to know the magnitude of dyslipidaemia in patients. Aim of the study was to determine the frequency of dyslipidaemia in patients of ischaemic stroke at a tertiary care teaching hospital in Larkana, Pakistan.

Methods: A cross-sectional study was conducted at the Department of Medicine, Shaheed Mohtarma Benazir Bhutto Medical University Hospital Larkana, Pakistan during the period of six months (July-December 2016). All patients between 18-75 years of age of either gender suffering from ischaemic stroke were included. All patients with intracranial haemorrhage, CNS tumour, epilepsy, multiple sclerosis, familial lipid disorders, endocrine disorders, chronic diseases, and on anti-lipid medications, cocaine or alcohol addicts were excluded. The statistical analysis was conducted by using Stata Statistical Software 14.

Results: Mean age of enrolled participants was 46.3 (SD=15.2) years. Of 85 enrolled participants, 73 (85.9%) were males and 12 (14.1%) were females, with male to female ratio of 6:1. The frequency of dyslipidaemia was 28 (32.9%), with mean LDL 100.7 (SD=18.4) mg/dl and HDL 42 (SD=11.7) mg/dl and total cholesterol 166.3 (SD=34.3) mg/dl.

Conclusions & Recommendations: Dyslipidaemia, with low HDL 13 (15.3%) was found to be the most common risk factor we observed in our patients with stroke. The importance of preventive measures for a disease which has modifiable risk factors (diabetes and hypertension) should be emphasized to reduce the burden of stroke in the country.

Keywords: Ischemic stroke, dyslipidaemia, low-density lipoproteins, Larkana, Pakistan

Introduction

Ischaemic stroke is a heterogeneous multifactorial disorder characterized by acute focal neurological deficit due to cerebrovascular disease. It is the third leading cause of death worldwide after ischaemic heart disease and cancers, and the most common cause of permanent disability (1-3). Globally, the risk of recurrence after a first stroke ranges from 1 to 4% at 1 month, from 7 to 13% at one year, and reaches up to 40% at 10 years (4). Strokes are classified as either haemorrhagic or ischaemic. Acute ischaemic stroke refers to stroke caused by thrombosis or embolism and is more common than haemorrhagic stroke.

Various risk factors are associated with stroke, which can be categorized into modifiable and non-modifiable. Non-modifiable risk factors include age, male gender and family history, while the modifiable risk factors, which remain the major area of interest to researchers are hypertension, cardiac disease, diabetes mellitus, smoking, alcohol abuse, obesity, physical inactivity and dyslipidaemia (5). Dyslipidaemia is the presence of abnormal levels of lipids or lipoproteins in blood, characterized by elevated low density lipoprotein (LDL), lowered high density lipoprotein (HDL) and elevated total cholesterol (6). The American National Education Cholesterol Programme: Adult Treatment Panel-III (NECP: ATP-III) (7) recommends that stroke patients should have LDL below 100 mg/dl and HDL above 40 mg/dl. LDL can be lowered, and HDL raised by lifestyle modifications (regular exercise, weight loss, consumption of fruits, vegetables in diet), therapeutic interventions (statins, fibrates, resin binders) and control of related risk factors as diabetes mellitus.

Most of the previous studies are from developed countries (8-12), which have a different lifestyle. Considering the clinical evidence of dyslipidaemia as a risk factor for ischaemic stroke, we conducted this study to assess the frequency of dyslipidaemia in patients of ischaemic stroke at a tertiary care teaching hospital in Larkana, Pakistan, which covers mainly the rural population of the vicinity.

Methods

A cross-sectional study was conducted at Department of Medicine, Shaheed Mohtarma Benazir Bhutto Medical University (SMBBMU) Hospital, Larkana, Pakistan (Figure 1). The study was carried out during the period of six months (July-December 2016). All patients between the ages 18-75 years of either gender diagnosed for ischaemic stroke were included. All patients with a known history of intracranial haemorrhage, CNS tumour, epilepsy, multiple sclerosis, familial lipid disorders, endocrine disorders (hypothyroidism, Cushing Syndrome and acromegaly), chronic renal disorders and on anti-lipid medications, alcohol or cocaine addicts were excluded. Additionally, the patients using drugs like beta blockers, diuretics, oral contraceptive pills and tacrolimus were excluded from the study.

Data were collected retrospectively from the departmental medical records and were reviewed. Ischaemic stroke was confirmed clinically using the World Health Organization (WHO) criteria and radiologically by cranial computed tomography (CT) scan or magnetic resonance imaging (MRI) scan. All patients fulfilling the eligibility criteria were enrolled in the study. General and clinical examination parameters including age, gender, blood pressure, body mass index (BMI), weight, height, Glasgow Coma Score, past medical and personal history for arterial hypertension, diabetes mellitus, ischaemic heart disease and cigarette smoking were collected. The laboratory investigations including fasting lipid profile were obtained from the records.

Ischaemic stroke was defined if he/she developed acute focal neurological deficit that persisted for more than 24 hours and no evidence of haemorrhage and presence of hypo-dense areas on CT brain. Acute focal neurological deficit was clinically defined if any one of the following symptoms are present (7), namely sudden loss of consciousness, weakness of one side of the body, loss of speech, sudden onset of abnormal body movements, loss of vision and weakness of one limb of the body. Patients were labelled as suffering from dyslipidaemia based on ATPII Guidelines if HDL $\leq$ 40 mg/dl in males and $\leq$

50 mg/dl in females and LDL $\geq$ 100 mg/dl (7). The data were collected on a predesigned proforma. Hypertension was defined if systolic blood pressure is >140 mmHg and diastolic blood pressure >90 mmHg.

Data analysis

The statistical analysis was conducted using Stata Statistical Software 14. The mean and standard deviation (SD) of numeric response variables were calculated. Categorical variables were expressed in frequencies and percentages. Chi-Squared test was used to observe the significance of dyslipidaemia in relation to different age categories, gender, smoking status and BMI. P value <0.05 was considered as statistically significant.

Results

A total number of 85 participants were included in the study. Mean age (SD) of the enrolled patients was

49.3 (SD=15.2) years, with an age range of 18-75 years. As shown in Table 1, 73 (85.9%) of the patients were males (male to female ratio of 6:1); 34 (40%) were smokers; and 13 (15.3%) had BMI of ≥ 30 kg/m². The mean BMI was 24.7 (SD=3) kg/m².

In our study, the hypertensive and diabetic patients were 41 (48.2%) and 24 (29.4%), respectively while 18 (21.2%) had both hypertension and diabetes mellitus. The frequency of dyslipidaemia was 28 (32.9%). Average values of the lipid profile are shown in Table 2.

We observed that three patients in the age group of 18-35 years (10.7%) had dyslipidaemia compared to 11 (39.3%) patients in the age group of 59-75 years. Among smokers, 17 (60.7%) had dyslipidaemia compared to non-smokers. Patients with dyslipidaemia (n=23; 82.2%) were either overweight (BMI=25-29.9 kg/m²) or obese (BMI ≥ 30 kg/m²). We found statistically significant results for BMI between the dyslipidaemia and non-dyslipidaemia patients ($p<0.001$).

Table 1: Demographic characteristics of the study participants

Characteristic	Dyslipidaemia, No. (%)		Total	p value
	Yes (n=28)	No (n=57)		
Age				
18-35 years	3 (10.7%)	17 (29.8%)	20 (23.5%)	0.09
36-59 years	14 (50.0%)	27 (47.4%)	41 (48.2%)	
60-75 years	11 (39.3%)	13 (22.8%)	24 (28.3%)	
Gender				
Male	26 (92.8%)	47 (82.5%)	73 (85.9%)	0.16
Female	2 (7.2%)	10 (17.5%)	12 (14.1%)	
Smoking status				
Smoker	17 (60.7%)	17 (29.8%)	34 (40.0%)	0.006
No	11 (39.3%)	40 (70.2%)	51 (60.0%)	
Body mass index (kg/m²)				
< 25	5 (17.8%)	35 (61.4%)	40 (47.1%)	0.001
25-29.9	16 (57.2%)	16 (28.1%)	32 (37.6%)	
≥ 30	7 (25.0%)	6 (10.5%)	13 (15.3%)	

Table 2: Lipid profile of ischemic stroke patients

Parameter	Mean	SD
Total Cholesterol	166.3	34.3
HDL	42.2	11.7
LDL	100.7	18.4
VLDL	26.9	8.3
Triglycerides	134.5	51.9

HDL=High Density Lipoproteins; LDL=Low Density Lipoproteins; VLDL=Very Low-Density Lipoproteins

Figure 1: Map of Pakistan (pointer showing the study district and catchment area in the dotted circle)

Discussion

This study was conducted to determine the frequency of dyslipidaemia in patients of ischaemic stroke at a tertiary care teaching hospital in Larkana, Pakistan, which covers mostly the rural population. The main finding of this study is the moderately high frequency of dyslipidaemia, which was 32.9%.

The role of gender in the stroke type is controversial. The burden of ischemic stroke is considerably impacting on populations of each race, ethnicity, age group and country (14). In our study, majority

(85.9%) of the patients were males, with male to female ratio of 6:1. Previous studies also showed that stroke is more common in males (15-17). On the other hand, it is worth noting that the severity of morbidity and mortality in previous studies was observed higher in females (18-20). The mean age of stroke in our study was 49.3 (SD=15.2) years, which is lower than in a study from South of London among patients of multi-ethnic groups of 76-80 years (21). However, we had excluded the patients above 75 years of age. Our results were consistent with the findings of a cross-sectional study by Almani et al (22) from Pakistan.

Hypertension is one of the modifiable risk factors for stroke, irrespective of ethnic group, race or geographic location. There is 3-4 times higher risk of stroke in a person with hypertension, which can be reduced by at least 38% with control of hypertension (23). The frequency of hypertension in our study was 48.2%, which is similar to another study from Pakistan (22), however lower than 72% reported by Sacco et. al (23). It further revealed that diabetes mellitus as an independent predictor of ischaemic stroke with an increase in the likelihood of ischaemic stroke by approximately four-fold (24). We observed 29.4% of the patients with diabetes mellitus in our study, which is similar to 29% by Almani et al (22), and higher than a Nigerian study by Olamoyegun et al (25) which showed 15.1%.

It is hypothesized that dyslipidaemia causes insulin resistance which results in decreased concentration of HDL, increased levels of plasma triglycerides and high LDL, as an important risk factor for peripheral vascular disease, coronary artery disease and stroke (26-27). In our study, elevated total Cholesterol (37%) was the most prevalent followed by low HDL (33%), triglycerides (9%) and elevated LDL (6%). It has been shown that low levels of HDL are associated with increased risk of ischaemic stroke, in relation to both gender (28-29). Serum HDL has anti-atherogenic properties with ability to trigger the flux of cholesterol from the peripheral cells to the liver and hence having a protective effect (30). The frequency of dyslipidaemia in our study was 32.9%, whereas other studies from Pakistan have shown it to be 18% (31) and 57.5% (32).

Stroke is quite costly for patients and their families, and therefore prevention is an important public health issue, which needs much attention. Further, high risk patients should be screened for dyslipidaemia as well as provided with lipid lowering therapy.

Strengths and limitations

Our study has strengths as well as some limitations. Cross-sectional studies are useful for description, and we chose this design for our study. The primary investigator collected all the registered data on a pre-

designed form and interviewed the subjects. The study was conducted in one district of the country and did not cover other districts where the situation may be comparatively different. Other limitations of this study included the absence of a comparative group, small sample size and the limited time. Since our results may not be generalized to the entire Pakistani population, further studies are necessary in different geographical areas.

Conclusions & Recommendations

The frequency of dyslipidaemia was 28 (32.9%) in our study. The dyslipidaemia, particularly the low HDL was the most common risk factor we observed in our patients with stroke. The importance of preventive measures for a disease which has modifiable risk factors i.e., diabetes and hypertension should be emphasized to reduce the burden of stroke in the country.

Public Health Implications

- Ischaemic stroke has become an enormous public health problem worldwide.
- Its magnitude can be reduced by effective preventive measures, the greatest effect can be achieved by a mass approach to prevention, which consists of modification of lifestyle behaviours through public education and government legislation.
- Early diagnosis, treatment of high-risk individuals and better management of risk factors may contribute further reduction.

Authors Declarations

Competing interests: None

Ethics approval and consent to participate: The study protocol was approved by Ethical Review Committee, SMBB Medical University, Larkana, Pakistan.

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