Original Article

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Assessment of Deranged Lipid Profiles and Correlated Dependent Factors in Patients with Ischemic Stroke at a Tertiary Care Setup in Islamabad

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ARTICLE INFO

ABSTRACT

The deranged lipid profile of patients is greatly associated with multiple complications hence leading towards the co morbidities and eventually been a reason of high mortalities. **Objectives:** To determine the cases of deranged lipid profiles among patients with confirmed diagnosis of ischemic stroke, dependent variables & co morbidities. **Methods:** A Descriptive, cross-sectional study was conducted at the Department of Medicine Fauji Foundation Hospital Rawalpindi from 20th March 2024 to 19th September 2024 a sample size of 110 was calculated using a WHO sample size calculator with a confirmed diagnosis of ischemic stroke from the age range of 30 years to 80 years of age were recruited in the study. A total of 5ml of the venous sample was obtained after 8 hours of fasting, and centrifuged at 40 Celsius for 15 minutes to analyze the serum lipid profile for obtaining true levels of high-density lipoproteins HDL, and low-density lipoprotein LDL using the auto analyzer machine. The collected data were assessed by data stratification using SPSS and post-stratification Chi-square test was applied and the P value of <0.05 was considered significant. **Results:** The total cholesterol was deranged in 57.27%, LDL cholesterol was deranged in 60.0%, deranged triglyceride levels in 67.27% and deranged HDL cholesterol in 32.73% of patients. **Conclusions:** The current study concluded that the frequency of dyslipidemia is significantly high among patients with ischemic stroke. The functions of HDL are dependent on certain factors such as genetics, lifestyle changes, and environmental factors.

INTRODUCTION

Stroke is a cerebrovascular disease, and remains one of the major causes of disabilities and death worldwide. It is more prevalent among the elderly population, and commonly diagnosed among individuals with lower socioeconomic status [1]. World Health Organization (WHO), in 2002 reported that approximately 5.51 million people died due to stroke, among those 20% of deaths were reported from the South Asia region [2]. The cases of strokes reported in Pakistan are no less than 350, 000 each year and the incidents have grown over the last few decades [3]. Stroke is a condition that not only worsens the cognitive impairments and pre-existing dementias but is responsible for disabilities among the elderly populations with co-morbidities, which is predicted possibly due to the absence of lack of clear diagnosis and timely management of the condition [4]. Unfortunately, the lower-income countries lack sufficient literature, and adequate database registry systems, and the clear cases, and strokes among the population are not timely managed and treated with optimal care [5]. In a conclusion made from research published in 2022, data showed the high prevalence of risk factors i.e., hypertension, and diabetes among stroke

patients along with a higher rate of complications requiring longer hospitalization periods [6]. Dyslipidemia is undoubtedly a major risk factor in vascular diseases and a prime contributor in worsening pre-existing conditions and the same way for coronary artery diseases, the dreadful burden of this disease has led us to the condition of categorizing dyslipidemia as a major factor behind disabilities and mortalities among vascular disease patients. While some other associated contributors also participate in the occurrence of stroke [7-8]. The extrapolative role of lipid profile has been studied by various researchers and continues to be the topic of discussion similar to myocardial infarction, hypertension, and other independent factors. Many previous researches have investigated serum cholesterol levels as a dependent factor in stroke, but few studies have indicated that hyper-cholesterolemia is a major risk factor for intra-cerebral hemorrhage (ICH) [9]. WHO defines stroke as an old term and a "neurological deficit" of the cerebrovascular system and it may persist for more than 24 hours and may cause a death or permanent disability among patients. This definition was proposed for the permanent neural tissue damage and reversible symptoms diagnosed among individuals [10]. The symptoms may subside upon timely management and availability of treatment, and resolve over the period. The time duration of 24 hours was chosen to distinguish the stroke from "transient ischemic attacks" [11]. Various research has shown that a stroke association exists between the lipid profile and the risk of developing cardiovascular and neural diseases. The high cholesterol levels specifically low-density lipoproteins (LDL) and High-density lipoproteins (HDL) are associated with ischemic strokes [12]. Lowering the Serum lipid profiles by adopting preventive strategies reduces the risks of developing serious diseases and in strokes, patients prevent the recurrence of strokes from coronary heart diseases [13]. A stroke is clinically diagnosed as the loss of neurological functioning that may persist up to certain days due to the loss of blood supply in the brain however hemorrhagic strokes result from the rapturing of certain blood vessels and irregular vascular structure, from classification, the 87% of strokes are ischemic and remain 13% are of hemorrhagic type [14]. The development of hemorrhagic strokes that might develop in the ischemic area. The cases of ischemic strokes rise with considerable disabilities every year, approximately 795,0000 people suffer strokes in the United States, however, the strokes vary among different individuals based on gender, ethnicity, race, and other lifestyle factors [15]. It was assessed from previous scientific literature that an inverse relation exists It was found from the previous literature that there exists an inverse relation between lipid profile and death from stroke [16]. Stroke subtypes also vary greatly in different parts of

the world. For example, the proportion of hemorrhagic strokes may be even higher in certain populations. The different clinical investigations showed a remarkable number of individuals suffering each year from strokes and other associated complications, the number of studies mentioned the factors and predictors however, the frequency of such cases is high among the developing countries like Pakistan, where only a limited number of studies are conducted. The assessment of lipid profiles among stroke patients may help predict the national burden and overall status of the healthcare system with the evident data.

This study aimed to determine the frequency of deranged lipid profile in patients with ischemic stroke at a tertiary care Hospital in Islamabad.

METHODS

A descriptive, cross-sectional study was conducted at the Department of Medicine, Fauji Foundation Hospital, Rawalpindi. 20th March 2024 to 19th September 2024. After getting ethical approval from the hospital research committee & Research Evaluation Unit of College of Physicians & Surgeons, Pakistan (CPSP/REU/MED-2021-122-17817). A total of 110 patients were enrolled after calculating the sample by using the WHO sample size calculator based on rate of prevalence at 95% of the confidence interval and the margin of error kept at 8% the expected percentage for HDL was assumed 24% [17]. Patients from the age range of 30-80 years of both genders were diagnosed with ischemic stroke and admitted at the Department of Medicines, Fauji Foundation Hospital Rawalpindi fulfilling the criteria of consecutive sampling and agreed to the informed consent were included in the study. However, the patients. Assessed based on history patients with past head injuries, hematomas, and unaccepting to sign the informed consent were excluded from the study. The blood samples were collected from patients after 8 hours of fasting centrifuged at 40 Celsius for 15 minutes and analyzed for estimated serum lipid profile including the total cholesterol, triglycerides HDL, and LDL, by automatic analyzer. Data were obtained in a structured format; all the dependent variables were assessed using SPSS version 23. Qualitative variables like gender, diabetes mellitus (yes/no), hypertension (yes/no), smoking (yes/no), place of living (rural/urban), lifestyle (simple/sedentary), monthly income (<25000/25000-50000/>50000) and deranged lipid profile i.e. total cholesterol, triglycerides, high-density lipoprotein and low-density lipoprotein (yes/no) presented as frequency and percentage. Effect modifiers like age, gender, duration of a stroke, BMI, diabetes mellitus (yes/no), hypertension (yes/no), smoking (yes/no), place of living (rural/urban), lifestyle (simple/sedentary) and monthly

Ghafoor A et al.,

income (<25000/25000-50000/>50000) assess by data stratification. The post-stratification Chi-square test was applied and the P value of <0.05 was considered significant.

RESULTS

The result of the study showed a mean age of 54.53 ± 12.47 years. The percentages were calculated for the age ranges 56 (50.91%) between 30 to 55 years of age as shown below (Figure 1).

Distribution of patients according to Age (n=110).

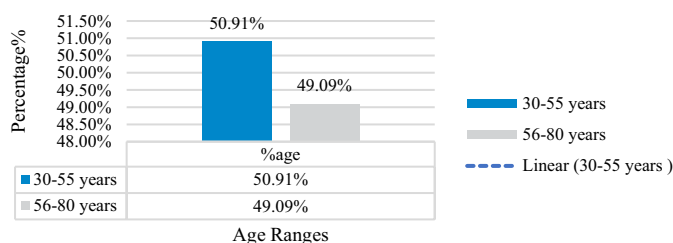|	%age
30-55 years	50.91%
56-80 years	49.09%

Figure 1: Age Ranges among study participants (Mean ± SD = 54.53 ± 12.47)

Out of 110 patients, 63 (57.27%) were male and 47 (42.73%) were female with male to female ratio of 1.3:1. The Mean duration of disease in our study was 5.84 ± 2.57 hours. Mean BMI was 27.47 ± 2.95 kg/m^2. The distribution of patients with the status of other confounding variables was shown in Table 1.

Table 1: Dependent Variables among Patients (n=110)

Confounding variables		Frequency (%)
Gender	Male	63 (57.27%)
	Female	47 (42.73%)
Duration (hours)	≤6	75 (68.18%)
	>6	35 (31.82%)
BMI (kg/m^2)	≤27.5	56 (50.91%)
	>27.5	54 (49.09%)
DM	Yes	52 (47.27%)
	No	58 (52.73%)
HTN	Yes	70 (63.64%)
	No	40 (36.36%)
Smoking	Yes	28 (25.45%)
	No	82 (74.55%)
Place of living	Rural	41 (37.27%)
	Urban	69 (62.73%)
Monthly income	<25000	14 (12.73%)
	25000-50000	52 (47.27%)
	>50000	44 (40.0%)
Lifestyle	Simple	43 (39.09%)
	Sedentary	67 (60.91%)

In this study, the frequency of deranged lipid profile in patients with ischemic stroke was as follows; total cholesterol was deranged in 57.27%, LDL cholesterol was deranged in 60.0%, deranged triglyceride levels in 67.27% and deranged HDL cholesterol in 32.73% of patients (Figure 2).

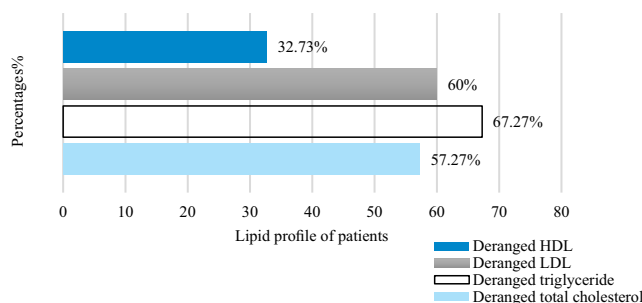Frequency of deranged lipid profile in patients with ischemic stroke n=110

Figure 2: Lipid Profile Presented Among Ischemic Stroke Patients

Stratification of deranged lipid profile concerning age, gender, duration of stroke, BMI, diabetes mellitus, hypertension, and smoking, place of living, lifestyle, and monthly income was described (Table 2).

Table 2: Stratification Data of Deranged Total Cholesterol with Multiple Dependent Variables

Variables		Yes (n=63)	No (n=47)	P-value
Age (year)	30-55	36 (64.29%)	20 (35.71%)	0.130
	56-80	27 (50.0%)	27 (50.0%)	
Gender	Male	40 (63.49%)	23 (36.51%)	0.127
	Female	23 (48.94%)	24 (51.06%)	
Duration (hours)	≤6	39 (52.0%)	36 (48.0%)	0.102
	>6	24 (68.57%)	11 (31.43%)	
BMI (kg/m^2)	≤27.5	34 (60.71%)	22 (39.29%)	0.457
	>27.5	29 (53.70%)	25 (46.30%)	
Diabetes Mellitus	Yes	32 (61.54%)	20 (38.46%)	0.392
	No	31 (53.45%)	27 (46.55%)	
Hypertension	Yes	39 (55.71%)	31 (44.29%)	0.662
	No	24 (60.0%)	16 (40.0%)	
Smoking	Yes	15 (53.57%)	13 (46.43%)	0.647
	No	48 (58.54%)	34 (41.46%)	
Place of living	Rural	24 (58.54%)	17 (41.46%)	0.836
	Urban	39 (56.52%)	30 (43.48%)	
Monthly income	<25000	07 (50.0%)	07 (50.0%)	0.457
	25000-50000	33 (63.46%)	19 (36.54%)	
	>50000	23 (52.27%)	21 (47.73%)	
Lifestyle	Simple	21 (48.84%)	22 (51.16%)	0.152
	Sedentary	42 (62.69%)	25 (37.31%)	

Stratification of deranged lipid profile concerning age, gender, duration of stroke, BMI, diabetes mellitus, hypertension, and smoking, place of living, lifestyle, and monthly income is described in Table 3.

Table 3: Stratification of Deranged Triglyceride Concerning Multiple Variables

Dependent variables		Yes (n=74)	No (n=36)	P-value
Age (year)	30-55	37 (66.07%)	19 (33.93%)	0.785
	56-80	37 (68.52%)	17 (31.48%)	
Gender	Male	47 (74.60%)	16 (25.40%)	0.058
	Female	27 (57.45%)	20 (42.55%)	

Duration (hours)	≤6	47 (62.67%)	28 (37.33%)	0.132
	>6	27 (77.14%)	08 (22.86%)	
BMI (kg/m²)	≤27.5	40 (71.43%)	16 (28.57%)	0.344
	>27.5	34 (62.96%)	20 (37.04%)	
DM	Yes	38 (73.08%)	14 (26.92%)	0.219
	No	36 (62.07%)	22 (37.93%)	
HTN	Yes	43 (61.43%)	27 (38.57%)	0.046
	No	31 (77.50%)	09 (22.50%)	
Smoking	Yes	21 (75.0%)	07 (25.0%)	0.313
	No	53 (64.63%)	29 (35.37%)	
Place of living	Rural	27 (65.85%)	14 (34.15%)	0.807
	Urban	47 (68.12%)	22 (31.88%)	
Monthly income	<25000	08 (57.14%)	06 (42.86%)	0.017
	25000-50000	42 (80.77%)	10 (19.23%)	
	>50000	24 (54.55%)	20 (45.45%)	
Lifestyle	Simple	27 (62.79%)	16 (37.21%)	0.422
	Sedentary	47 (70.15%)	20 (29.85%)	

DISCUSSION

The current study assessed the possible risk factors associated with ischemic stroke patients, the possible dependent factors were analyzed such as smoking, hypertension, coronary heart diseases, and dyslipidemias. The role of coronary heart disease is convincing evidence among patients with ischemic stroke patients. The burden of diabetes and hypertension has been a controversial and important one. The dyslipidemia has always been a topic of discussion in cardiovascular diseases [18]. Current study determined the frequency of deranged-lipid profiles of ischemic stroke patients and among 110 patients with a confirmed diagnosis of ischemic stroke profile of 30- 80 years of age, the mean age was 54.53±12.47 years, the majority of patients were among the age group of 30–55 years which is similar to the pattern of age ranges observed in a study conducted by Li X *et al.*, on the same theme [19]. Han Y *et al.*, conducted a study in 2022 also confirmed the findings and associated risk factors studied, the mean age noticed in the study was 63.42 similarly found in our study [20]. The gender distribution was assessed among the patients which showed 52.27% were male however 42.73% were female, similarly found in the study conducted by Chen Y *et al.*, showing the majority of male patients with ischemic stroke diagnosis, several studies confirmed the high ratio of male compared to female [21]. Ammad *et al.*, conducted a study on ischemic stroke patients assessed the high cholesterol and deranged lipid profiles among the ischemic stroke high cholesterol was 57.27%, and LDL cholesterol was 32.7% which has a similar pattern of deranged lipid profiles in a previous study 60% of patients showed deranged triglycerides and high-density lipoprotein (HDL) profile with 32.73% of cases [22].

However, in contrast to another similar pattern study found 1,008 ischemic stroke patients with 60% of dyslipidemia cases, 39% of patients with hypertension, and 44% cases of smoking. A study conducted by Ammad et al. 2023, on ischemic stroke patients showed the data of patients with the registry confirmed the cases of smoking as a major depending factor and dyslipidemia 41% which agrees with the results of our study [22]. Lee SH *et al.*, indicated that the consecutive involvement of risk factors may aggravate the disease conditions and develop complications [23]. The association of dyslipidemia and stroke has been studied multiple times yet it has been declared as a complex one. Everest S *et al.*, 2020 studied the levels of high cholesterol and dyslipidemia conditions that may aggravate the evidence of cholesterol leading to strokes and relevant complications similar to our study [24]. Han Y *et al.*, showed in the study the elevated high-density lipoproteins and evidence of high triglyceride levels are still conflicting; however, the risks seem to be leading toward ischemic strokes stroke subtypes meanwhile these risk factors are inversely associated with the hemorrhagic strokes found in the observational studies [20]. A study by Everest *et al.*, confirmed that the risk of developing ischemic strokes rises as the HDL and LDL cholesterol levels rise among patients [24]. The study also showed an inverse relationship between hemorrhagic strokes and high cholesterol levels, however, the results of the study confirmed that cholesterol levels of patients exceedingly similarly by Taimuri *et al.*, more than 200mg/dl surely developed ischemic strokes later in life, the risks of developing ischemic strokes and other vascular complications doubles for the serum cholesterol levels of 289mg/dl [25].

CONCLUSIONS

The current study concluded the frequency of deranged lipid profiles among patients with ischemic stroke. The high frequency of dyslipidemia has been seen among ischemic stroke patients. The study based on findings also recommends the early detection of disease through various new advancement techniques and awareness programs on cerebrovascular events (CVE) which will impart a true impact on lowering the disease burden which is essential among countries like Pakistan where health care services are limited.

Authors Contribution

Conceptualization: AR
Methodology: AG, AR, DAJ
Formal analysis: SB, NH
Writing, review and editing: AG, MS

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