Research Journal of Pharmaceutical, Biological and Chemical Sciences

Prevalence of Hypertension and Diabetes in Ischemic Stroke Patients in South Indian Population

Binu Mathew[1]*, Abhilash Thomas[2], and Suchandra Sen[2]

[1] Department of Pharmacy Practice, NET Pharmacy College, Raichur -584103, Karnataka, India
[2] Department of Pharmacy Practice, KMCH College of Pharmacy, Coimbatore -641 035, Tamil Nadu, India.

ABSTRACT

In India, the burden of stroke is growing with increasing urbanization. The present study was carried out to assess the prevalence of hypertension and diabetes in stroke patients at a multispecialty corporate hospital in South India. A prospective observational study was conducted over a period of six months with sample size of 35 subjects of both female and male patients of acute ischemic stroke within the age group of 30-70years.The prevalence of metabolic syndrome in the study population was found to be 60% (21/35). The prevalence of remarkable risk factors such as hypertension and diabetes was found in the total study population .It was noted that rather than hypertension or diabetes alone, the metabolic syndrome subjects showed a higher frequency of hypertension plus diabetes (47.61%)   . Dividing the study population on the basis of hypertension and diabetes it was found that maximum number of patients had hypertension alone (n=15) or hypertension with diabetes (n=15). In the presence of metabolic syndrome, hypertension, diabetes, abdominal obesity and altered lipid profile were strongly associated with ischemic stroke, high triglyceride levels and low high density lipoprotein levels are strong predictors of metabolic syndrome and ischemic stroke in this population.

Key words: Diabetes, Hypertension, Ischemic Stroke, Metabolic syndrome, Prevalence

*Corresponding author

INTRODUCTION

The World Health Organization (WHO) defines stroke as 'a clinical syndrome characterized by rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin' [1,2]

In India, the burden of stroke is growing with increasing urbanization, a pattern common in other Asian countries too [3]. The estimated deaths due to stoke account for 1.2% of all the deaths in India [4]. The demographic trends suggest that the population of India will survive through the peak years of occurrence of stroke (age 55-65years), and stroke survivors in elderly with varying degree of residual disability become a major health burden[5]. The risk of stroke doubles for each successive decade after age 55 years [6].

Risk factors are attributes associated with the occurrence of a disease. [7] Observational studies have revealed a large number of risk factors for stroke, which can be divided into four groups. They are: inherent biological traits including old age, male gender, ethnic origin (Afro-caribbean) and family history; abnormal physiological variables including atrial fibrillation (AF), hypertension, diabetes mellitus, hyperfibrinogenaemia, hypercholosterolemia, homocysteinaemia, obesity, behaviors including smoking, excessive alcohol consumption, diet (low vitamin C and potassium intake), sedentary life style, and use of oral contraceptives; and social characteristics including low social class[8]. Others include previous stroke or transient ischemic attack (TIA), left ventricular hypertrophy, valvular heart disease, peripheral vascular disease, carotid stenosis, warfarin treatment and migraine [9-12].

With large-scale urbanization and high stress lifestyles of modern Indians, the metabolic syndrome appears to be set to become an epidemic. The present study was carried out to assess the prevalence of hypertension and diabetes in a population of stroke patients at a multispeciality corporate hospital in South India.

MATERIALS AND METHODS

Study Design

A prospective observational study

Study Site

The study was conducted in the department of neurology, Kovai Medical Center and Hospital, a multispecialty hospital in Coimbatore, South India. For obtaining the clearance certificate, an application along with study protocol was submitted to the Chairman of the KMCH Ethics Committee, Kovai Medical Centre and Hospital, The study was approved by Committee by issuing ethical clearance certificate

Study Period

The study was conducted over a period of six months from June 2007 to December 2007.

Study Population

A total of 35 subjects were included in this study.

Study Criteria

The following are the inclusion and exclusion criteria for the study:

Inclusion Criteria

- Both female and male patients of acute ischemic stroke within the age group of 30-70years.
- Patients with no evidence of intracranial or subarachnoid hemorrhage.

Exclusion Criteria

- Patients with hemorrhagic stroke.
- Patients who diagnosed as Transient Ischemic Attack (TIA).

Sources of Data

The data was collected from various sources such as patients' case reports, treatment charts, and laboratory reports and also through direct patient interview.

Patients who met the study criteria were included in the study. The diagnosis of ischemic stroke was supported in every patient by axial CT and/or MRI. The study was explained to the patients and their relatives and oral consent were taken. Patient demographics include weight, height, waist-hip ratio, social and dietary habits, past medical history etc were collected through patient interview. The other necessary findings like laboratory investigations, prescribed drugs were collected from the patient case reports and treatment charts.

Statistical Analysis

The incidence of metabolic syndrome was ascertained by Adult Treatment Panel (ATP) III criteria.[13]Individual variables were expressed as percentages. Significance of the differences between the means of different groups was assessed by the Students't' test Significance was set at the $p < 0.05$ level.

RESULTS AND DISCUSSION

In this population based prospective study, potentially modifiable risk factors for ischemic stroke and metabolic syndrome were evaluated among a total of 36 subjects with ischemic stroke during the period of June 2007 to December 2007. One patient was excluded from the study population. Even though she was admitted for ischemic stroke, she had no complaints of hypertension or diabetes. However, she had a past medication history of anti psychotic treatment for the past 20 years.

On the basis of National Cholesterol Education Program (NCEP) definition, the prevalence of metabolic syndrome in the study population was found to be 60% (21/35). (Table.1) among the population identified with the metabolic syndrome, 76.19% were men and 23.8% were women. (fig.1) On the basis of age, the metabolic syndrome was found to be more prevalent in the 60-69 years age group.

Table 1 .Prevalence of Metabolic Syndrome among the Study Population: Values are expressed as numbers and percentages (n=35)

	Number of subjects (n=35)	Percentage (%)
Metabolic syndrome	21	60
Without metabolic syndrome	14	40

The prevalence of remarkable risk factors such as hypertension and diabetes was also found in the total study population (Table .1, 2&3). It was noted that rather than hypertension or diabetes alone, the metabolic syndrome subjects showed a higher frequency of hypertension plus diabetes (47.61%) (fig.2). In the presence of metabolic syndrome, hypertension, diabetes, abdominal obesity and altered lipid profile were strongly associated with ischemic stroke, high triglyceride levels and low high density lipoprotein levels are strong predictors of metabolic syndrome and ischemic stroke in this population. Dividing the study population on the basis of hypertension and diabetes it was found that maximum number of patients had hypertension alone (n=15) or hypertension with diabetes (n=15). Comparison of mean values indicated higher values for fasting blood sugar and dyslipidemia for the group of diabetes alone or along with hypertension. (fig .3)

The metabolic syndrome includes measures of general obesity (Body mass index), central obesity (waist circumference or waist-hip ratio), dyslipidaemia, high blood pressure and resistance to the action of insulin or dysglycaemia. The clustering of these factors increases the risk of cardiovascular and cerebrovascular diseases and therefore necessitates the measurement and treatment of the individual factors to reduce the incidence of occlusive disorders.

Convincing evidence has emerged in the last decade that there are important ethnic differences in the prevalence of the metabolic syndrome and researches show a higher prevalence of the metabolic syndrome in south Asians, Black African – Caribbeans and Hispanics,[14]. In our study, the prevalence of metabolic syndrome in the ischemic stroke population, was high (60%), corroborating the above fact.

The metabolic syndrome has been found to be prevalent more in men than in women [15]. However there have been instances where the trend has been reversed [16]. Our results show a higher prevalence in males.

Obesity is an important factor influencing prevalence of the metabolic syndrome. Central obesity, measured as the waist circumference or the waist hip ratio (WHR) are good indictors of central obesity. Excess accumulation of visceral abdominal fat is associated with a higher prevalence of metabolic syndrome, particularly in those with normal body weight [17]. South Asians showed a pronounced tendency to central obesity [18]. In our study population the mean WHR was 0.96±0.02 cm and individually for men it was 0.96±0.12cm and for women it was 0.97±0.04. The waist circumference for men was 90.75 ± 4.58cm and women 84.20 ± 4.27cm. The WHR vales are indicative of central obesity.

Dyslipidemia is another factor common among South Asians . They had lower HDL and higher triglycerides than Europeans. Results in our study further corroborate this fact with high triglyceride levels and low HDL levels. Women were found to have lower HDL levels than men (33.20± 6.46mg/dl Vs 47.60 ± 5.32).
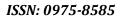
It is commonly agreed upon and widely accepted that hypertension and diabetes were significantly associated with greater hazards on cerebrovascular accidents, and is found in high frequency among metabolic syndrome patients[19,20]. However, metabolic syndrome is almost more prevalent than hypertension and diabetes, the population impact of metabolic syndrome is greater, accounting for stroke [20]

Out results further confirm that hypertension and diabetes together are more prevalent than alone, and thereby pose as risk factors for metabolic syndrome and thereby vascular occlusive diseases.

Table 2. Baseline characteristics of subjects under hypertension in the total study population: Values are expressed as mean ± S.D

Parameters	Control Group Mean ± SD (n=10)	Hypertension Group Mean ± SD (n=15)
Age (Yrs)	42.90±6.87	50.20 ± 12.87
Blood pressure (mm/Hg)	94.1±11.1	107.2 ±19.4*
Body mass index (BMI) (Kg/cm^2)	21.3±1.8	25.3±2.1*
Waist – Hip Ratio (WHR)	0.74 ±0.034	0.95 ±0.035*
Fasting blood sugar (mg/dl)	84.4 ±9.3	116 ±32.1*
Random blood pressure (mg/dl)	98.9 ±9.8	124.2 ±70.6
Total serum cholesterol (mg/dl)	157.7 ±10.9	181.4 ±76.4
Triglycerides (mg/dl)	117 ± 46.2	172.2 ±101.2
High density lipoprotein (mg/dl)	50.1±4.6	39 ± 10.5*
Low density lipoprotein (mg/dl)	85.1 ±6.8	117.2 ± 48.6*
Very low density lipoproteins (mg/dl)	24.9± 6.08	24.4 ±10.2

* p = <0.001

Table 3.Baseline characteristics of subjects under diabetes in the total study population: Values are expressed as mean ± S.D

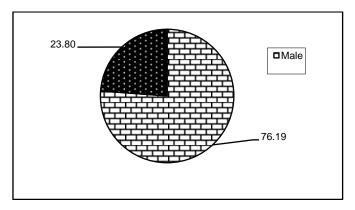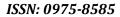| Parameters	Control Group Mean ± SD (n=10)	Diabetes Group Mean ± SD (n=5)
Age (Yrs)	42.90±6.87	63.60±14.48
Blood pressure (mm/Hg)	94.1±11.1	112.4±10.5*
Body mass index (BMI) (Kg/cm^2)	21.3±1.8	25.4±2.3*
Waist – Hip Ratio (WHR)	0.74±0.039	0.96±0.0008*
Fasting blood sugar (mg/dl)	84.4±9.3	171.2±70.8*
Random blood pressure (mg/dl)	98.9±9.8	190.8±53.5*
Total serum cholesterol (mg/dl)	157.7±10.9	191.6±29.9*
Triglycerides (mg/dl)	117±46.2	212.8±87.9*
High density lipoprotein (mg/dl)	50.1±4.6	35.4±8.08*
Low density lipoprotein (mg/dl)	85.1±6.08	100.5±24.3*
Very low density lipoproteins (mg/dl)	24.9±6.08	36.8±16.06*

* p <0.001

Table 4.Baseline characteristics of subjects under hypertension and diabetes group in the total study population: Values are expressed as mean ± S.D

Parameters	Control group Mean ± SD (n=10)	Hypertension with Diabetes Group Mean ± SD(n=15)
Age (Yrs)	42.90±6.87	55.73±19.07
Blood pressure	94.1±11.1	112.6±14.3*
Body mass index (BMI)	21.3±1.8	26.6±2.4*
Waist – Hip Ratio (WHR)	0.74±0.03	0.96±0.02*
Fasting blood sugar (mg/dl)	84.4±9.3	148.4±68.3*
Random blood pressure (mg/dl)	98.9±9.8	155.4±62.9*
Total serum cholesterol (mg/dl)	157.7±10.9	205.4±45.8*
Triglycerides (mg/dl)	117±46.2	196.2±45.1*
High density lipoprotein (mg/dl)	50.1±4.6	35.2±14.05*
Low density lipoprotein (mg/dl)	85.1±6.8	113.5±36.5*
Very low density lipoproteins (mg/dl)	24.9±6.08	31.6±9.1*

* p <0.001

Figure 1.Gender wise distribution of the study population under metabolic syndrome: Values are expressed as percentages

Figure 2.Prevalence of hypertension and diabetes among the metabolic syndrome group: Values are expressed as percentages
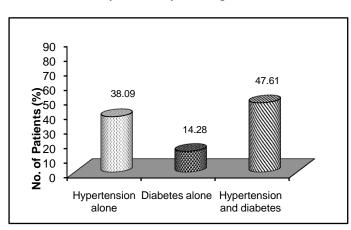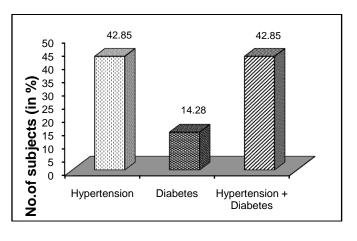

Figure 3. **Prevalence of Hypertension and Diabetes among the total study population: Values are expressed as percentages**

CONCLUSION

The strong association between occlusive cerebrovascular disease like stroke and metabolic syndrome make it a great burden for societies and a challenge to health care in developing countries including India.

Triglyceride levels were increased in metabolic syndrome population, whereas high density lipoproteins were low. The blood pressure values in this group were not high but that was because of antihypertensive treatment. Antihypertensive treatment also happens to be a factor, to be considered in the ATP III criteria.

In our study, the prevalence of hypertension and diabetes was analyzed. Among these, the coexistence of hypertension with diabetes was more prevalent.Although cardiovascular disease mortality is declining; it is uncertain whether increasing diabetes prevalence may reverse this trend. Hence lifestyle and diet modifications with an increased awareness of the fall out of the metabolic syndrome, diabetes, hypertension and related risk factors are necessary to reduce the incidence of occlusive vascular diseases.

ACKNOWLEDGEMENT

Author's contribution

Both Abhilash Thomas and Suchandra Sen designed the research. Abhilash Thomas carried out the work and analysed the data .Binu Mathew wrote the manuscript.

Conflicts of interest

We declare no conflicts of interest

REFERENCES

[1]   World Health Organisation , Stroke 1989, Recommendations on stroke   prevention, Diagnosis, and therapy, Report of WTO Task Force on stroke another cerebro-Vascular disorder, Stroke, 1989, 20:1407.
[2]   Sudlow CL, Waslow C. Stroke, 1996, 27:550.
[3]   Thammaraj J , Subramanian V , Bhattacharya J. Neuroimaging Clin 2005;15 :273.
[4]   Anand K , Chowdhary D , Singh KB , Pandeav C S, Kapoor SR. Neuro Epidemiol 2001; 20:208.
[5]   Dalal PM. Indian J Med Res 1997;106:325.
[6]   Wolf PAD, Agostino RB, Belanger AJ, Kannel WB. Stroke 1992;24:312.
[7]   Thompson DW, Furlan AJ . Neurosury Clin 1997;8:265.
[8]   Kwan J . J Geriatr Med 2001;3:94.
[9]   Marmot MG, Poulter NR. Lancet 1992;339:344.
[10]   Ebrahim S, Harwood R. Stroke Epidemiology, evidence and clinical practice, Oxford, Oxford University Press, 1999,40:147.
[11]   Epidemiology of stroke. Cerebrovasc Dis 1999;9:7.
[12]   Goldstein LB, Adams R, Alberts GM, Appel LJ. American Heart Assoc 2006;75:1583.
[13]   National Cholesterol Education Program (NCEP) expert panel on Detection: JAMA 2001;285:2486.
[14]   Forouchi LA, Newmann BA, Kritchevsky SR. Arch Intern Med 2005;165:777.
[15]   Hu RV , McNeil JJ, O'Malley HN. Am J Epidemiol 2003;157:176.
[16]   Gupta S , Zimmet PZ , Sridharan R. N Engl Med,2003, 27 :701.
[17]   Krishnaswamy S ,Goodpaster BH ,Harris TB ,Katsiaras A, Kritchevsky SB, Simonsick M, Nevi HM, Holvoet P, Newman AB. Arch Intern Med 2005;165:777.
[18]   McKeigue PM, Shah B, Marmot MG. Lancet 1991;337(8738):382-6.
[19]   Lavy RA, Nishanen LK, Charles MA. N Engl J   Med,2007,54 :251.
[20]   Najariyan RM, Sullivan LM,   Kannel WB, Wilson PWF, D'Agonisto RB, Wolf PA, Arch Intern Med,2006,166 :106.