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PREVALENCE OF CEREBROVASCULAR ACCIDENTS (CVA) IN OBESE HYPERTENSIVES – IS OBESITY AN ADDED RISK? A PHARMACOEPIDEMIOLOGICAL ANALYSIS

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ABSTRACT

Aim: A clinical study to evaluate the prevalence of cerebrovascular accident in obese individuals. **Objectives:** To document prevalence of CVA in obese hypertensive's and to evaluate obesity as an individual risk factor for CVA. **Methods:** A Non-experimental prospective observational study was carried out in a tertiary care teaching hospital for a period of six months. A total number of 202 subjects who were inpatients of all age groups with Cerebrovascular accident were included and evaluated. The patient demographics and the case details were collected based on the data collection form designed for the study. **Results:** Of total 202 CVA subjects, 74 were found to be obese among which the ratio of women is greater than men. The most prevalent co-morbidity along with obesity was found to be hypertension i.e., +38% (28 of 74 obese subjects) followed by Hypertension with Diabetes 28% (21 of 74), Diabetes which is 6% (4 of 74) and only obese subjects were found to be 28% (21 of 74). **Conclusion:** 36.6% of the total CVA patients were found to be obese and the prevalence of obese hypertensive's in patients with CVA was found to be 13.8%. The results were indicating that obesity play a key role as an added risk

factor in the considered population. Though the findings were showing a new trend, in order to establish them more substantially the study needs to be done on much larger population.

KEYWORDS: Cerebrovascular accident, obesity, hypertension.

INTRODUCTION

Cerebrovascular diseases are a heterogeneous group of disorders with a variable natural history. It is the leading cause of disability and in the community the category of elderly is more prone to CVA.[1] Cerebrovascular accident or Stroke is known as the abrupt onset of neurological deficit that is attributable to a focal vascular cause.[2] Stroke can be either Ischemic that are resulted from a local thrombus formation or by embolic phenomenon that leads to occlusion of a cerebral artery or Hemorrhagic that include subarachnoid haemorrhage, intracerebral haemorrhage and subdural hematomas which are resulted from a blood vessel rupture due to high blood pressure or an arteriovenous malformation (AVMs) or an intracranial aneurysm rupture.[3] Though hemorrhagic stroke is less common than ischemic stroke it is more lethal with a 30-day case-fatality rates that are two to six times higher.[4,10] Stroke has been found to be associated with hypertension, diabetes, hyperlipidemias and many metabolic syndromes.[5] Presence of hypertension increases the risk of CVA by three times.[11] The increase in both systolic and diastolic blood pressure increases the incidence of stroke and the risk is reduced by 30% by treating the blood pressure.[1,12] Although a direct relationship has been established between obesity and coronary artery disease (CAD), obesity has yet not been proven to be associated with cerebrovascular disease substantially.

OBJECTIVE: To document prevalence of CVA in obese hypertensive's and to evaluate obesity as an individual risk factor for CVA.

MATERIALS AND METHODS

A Non-experimental prospective observational study was conducted for over a 6 months from April to September of 2014 in the department of general medicine, Government General Hospital, Guntur, Andhra Pradesh. Ethical approval was obtained from the institution before the initiation of the study. Patient was informed about the purpose of the study and written consent was taken prior to their participation in the study. Patient consent form was prepared in the vernacular language, Telugu. Patients admitted to general medicine ward as inpatients with CVA were evaluated. Family history of CVA or the risk factors was collected. CT was done in all patients for assessing the type of stroke. Patients were screened for obesity by

anthropometry, taking height in metres and weight in kilograms as parameters to calculate the BMI. The revised BMI cut-off points to define obesity were as follows.[6]

Table 1: Revised BMI cut-off points

CATEGORY	BODY MASS INDEX
Over weight	23.0 - 24.9 kg/m^2
Obesity	> 25 kg/m^2

The weight of immobilized patients is calculated by using the formula given[7]

Weight (kg) = 0.5759 x (arm circumference, cm) + 0.5263 x (abdominal circumference, cm) + 1.2452 x (calf circumference, cm) -4.8689 x (Sex, male = 1 and female = 2) -32.9241 (r = 0.94).

INCLUSION CRITERIA: All inpatients of CVA admitted in General Medicine.

EXCLUSION CRITERIA: The Patients who are critically ill and unable to participate in the study are excluded.

RESULTS

A total of 202 CVA patients were observed in the wards of general medicine during the study period. Of total, Ischemic stroke was 78% (n=158) which was way greater than Hemorrhagic stroke (n=22). Out of the total patients 52% (n=105) were men. The weight distribution among the total patients elucidated that 74 were Obese among which 49 were both Obese and Hypertensive. The onset was found to be higher in 61-70 years age group (n=63) in case of CVA and 51-60 years age group (n=27) in case of Obese CVA. Most of the patients i.e., 87% (n=176) doesn't have a significant family history of CVA or other co-morbidities. Further information is given in table 2.

Table 2: Demographic and Disease related details of patients

	Variables	**Total number of patients N=202 n (%)**	
Sex wise distribution	Male	105 (52)	
	Female	97 (48)	
Stroke categorization	Ischemic stroke	158 (78)	
	Hemorrhagic stroke	44 (22)	
Age wise distribution		**CVA**	**Obese CVA**
	21-30 years	8 (4)	1 (1.4)
	31-40 years	12 (6)	4 (5.6)
	41-50 years	32 (16)	11 (15)
	51-60 years	56 (27)	27 (36)

	61-70 years	63 (31)	22 (30)
	>70 years	31 (16)	9 (12)
Co morbidities	Hypertension	36 (24)	
	Obesity	25 (17)	
	Obesity with hypertension	49 (33)	
	Diabetes mellitus	14 (10)	
	Both hypertension and diabetes	23 (16)	
Modifiable Risk factors		**CVA**	**Obese CVA**
	Both smoking and alcohol	48 (23.7)	21 (28.3)
	Smoking	23 (11.3)	6 (8)
	Alcohol	8 (4)	5 (6.7)
	Tobacco chewing	7 (3.5)	3 (4)
Family history	No history	176 (87)	
	Hypertension	12 (6)	
	CVA	8 (4)	
	CVA and Hypertension	4 (2)	
	Diabetes mellitus	2 (1)	

Of the total 202 patients – 41% (n=84) were found to fall in the category of normal weight followed by 37% (n=74) who were found to be obese. 16% (n=32) were found be overweight and 6% (n=12) were found to be under weight. The data is graphically represented in fig 1.

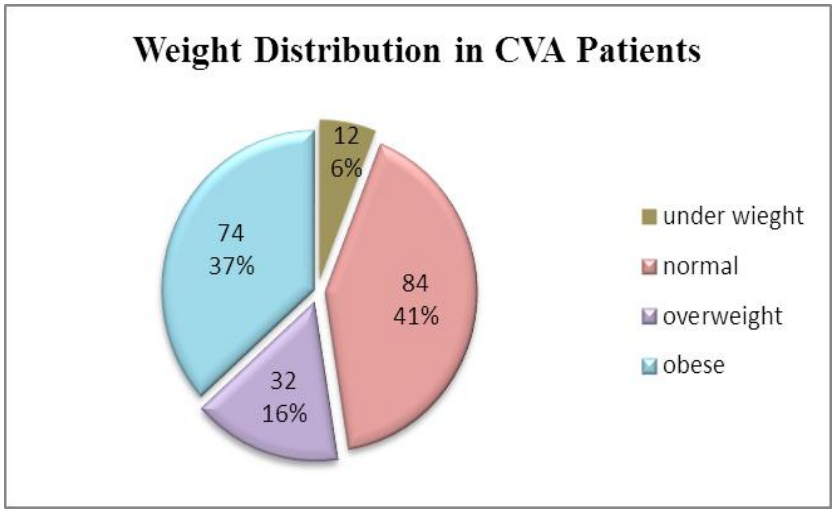

Fig 1: Weight Distribution in CVA Patients

Of 158 ischemic patients – Underweight patients were 12% (n=19) whereas Normal weight patients were 42% (n=66) and Overweight patients were 13% (n=21). The Obese patients were found to be 33% (n=52). The data is represented in fig 2.

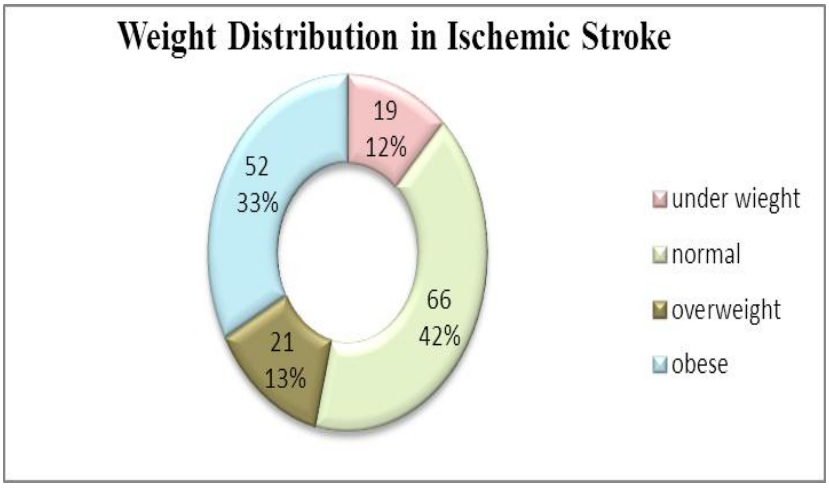

Fig 2: Weight Distribution in Ischemic Stroke

Table 3: Distribution of Men and Women in Obese Subjects with Ischemic Stroke

	No. of Men	No. of Women
Ischemic Stroke	26	26

Of the total 44 Hemorrhagic Patients – 3 were in the category of underweight**;** 15 patients were found to be having normal weight whereas 8 patients have fallen in to the category of overweight and 18 were found to be obese. The graphical representation is in fig 3.

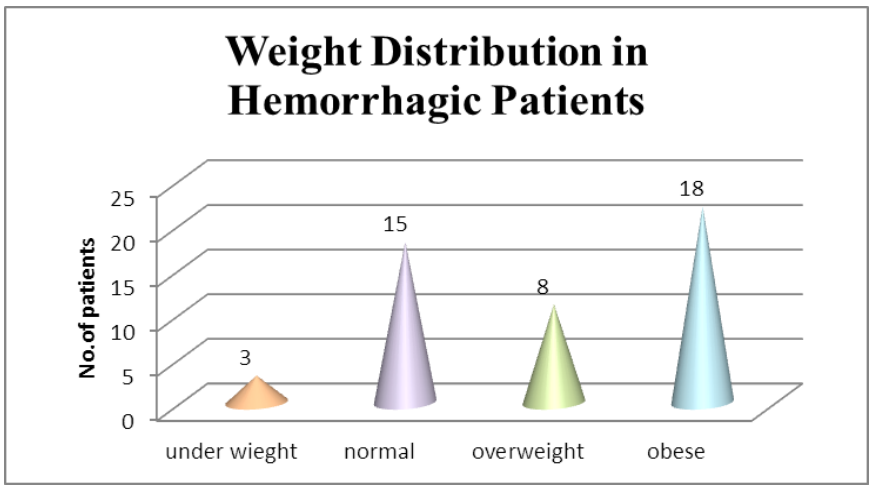

Fig 3: Weight Distribution in Hemorrhagic Patients

Table 4: Distribution of Men and Women in Obese Subjects with Hemorrhagic Stroke

	No. of Men	No. of Women
Hemorrhagic Stroke	10	12

Obesity with Hypertension was highly prevalent 34% (49) than other risk factors like Hypertension 25% (n=36); Obesity 15% (n=21); Diabetes with Hypertension 16% (n=23) and

Diabetes 10% (n=14) among the total CVA patients. The data has been graphically illustrated in the fig 4.

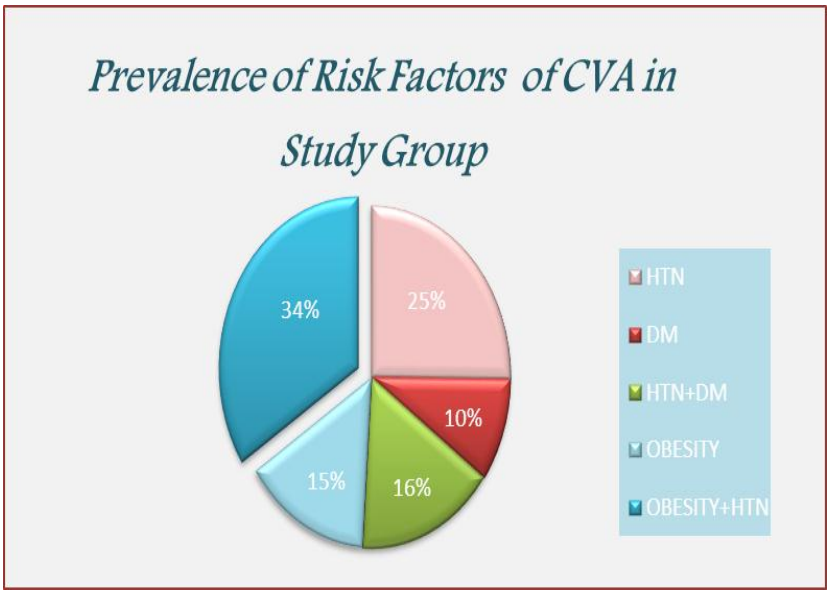

Fig 4: Prevalence of Risk Factors of CVA in Study Group

Of total 49 obese hypertensives – 34 were found to be diagnosed with Ischemic Stroke and 15 with Hemorrhagic Stroke. The data is graphically represented in fig 5.

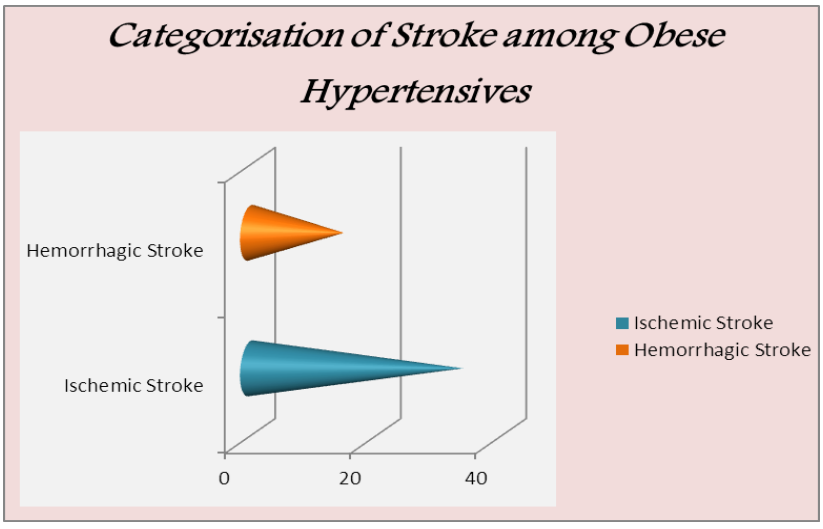

Fig 5: Categorisation of Stroke among Obese Hypertensives

Table 5: Sex Distribution of Obese Hypertensives in Ischemic and Hemorrhagic Strokes

	No. of Men	No. of Women
Ischemic Stroke	12	22
Hemorrhagic Stroke	6	9

Among the total 202 CVA patients the highest prevalence was found in the age group of 61-70 years and the least prevalence was observed in the age group of 81-90 years followed by 21-30 years. Even in case of Ischemic stroke the highest prevalence was seen in the age group of 61-70 years whereas in Hemorrhagic stroke the highest was observed in 51-60 years age group. The prevalence of both ischemic and haemorrhagic was found to be least in 21-30 years age group. The peak prevalence of CVA in obese subjects was found to be in 51-60 years age group and the least was found in 18-30 years. Further details of mean ages were given in table 6.

Table 6: Mean Age Distribution of Men and Women

	No. of Men (Mean Age)	No. of Women (Mean Age)
CVA	105 (56.71±13.34)	97 (62.64±13.16)
Ischemic Stroke	22(57.26±8.03)	30 (66.19±10.61)
Hemorrhagic Stroke	10 (53.6±18.16)	12 (57.75±9.97)
Obese	11 (67.6±12)	14 (52.8±11.3)
Obese Hypertensives	31 (61.6±9.5)	18 (58.1±11.9)

DISCUSSION

Cerebrovascular Accident or Stroke is a neurological deficit of cerebrovascular cause that persists beyond 24 hours or is interrupted by death within 24 hours which is the leading cause of disability and the second leading killer worldwide.[8] It has been found to be associated with hypertension, diabetes, hyperlipidemias and many metabolic syndromes [5] among which Hypertension increases the risk by 3 times and treating it can reduce the risk by 30%.[1,13] Although a direct relationship has been established between obesity and coronary artery disease (CAD), obesity has yet not been proven to be associated with cerebrovascular disease substantially. Not many studies were done to evaluate the prevalence of CVA in obese hypertensives and to conclude obesity as an added risk. Few studies that are considered to conduct our study are by Aaron R. Folsom et.al, and other studies stated the relation between obesity and stroke suggesting that the higher a person's degree of obesity, the higher their risk of stroke -- regardless of sex or race[17]; RB Singh et.al, who demonstrated Hypertension as a major cause of stroke that is associated with cerebral infarction.[18]

In the present study the categorization of stroke exhibited that out of 202 subjects admitted with CVA, 158 were Ischemic and 44 were Hemorrhagic indicating that Ischemic was relatively three folds greater than Hemorrhagic as in other study.[9]

The prevalence of CVA in men was found to be 52% (105) and in women it was 48% (97) suggesting that the prevalence was nearly same in both the genders with a slight increase in men (Table 3). The sex distribution in the 74 obese subjects shows that women have a greater prevalence of CVA i.e., 55% (41 of 74 obese subjects) than men which is 45% (33 of 74 obese subjects). Table 5 shows that the distribution of men and women in obese subjects with ischemic stroke is equal. The weight distribution in Hemorrhagic stroke indicated that out of 44 patients the obese population was high with a number of 22.

The distribution of risk factors among the 202 CVA subjects exhibited that Obesity was predominantly seen. It is 38% of total subjects compared to other risk factors like Hypertension (34%), Diabetes (7%) and Diabetes with Hypertension (21%). The prevalence of co-morbidities among the obese CVA subjects showed that Hypertension is associated with obesity greatly, which is +38% (28 of 74 obese subjects) which is similar with other studies[14,15,16], followed by Hypertension with Diabetes 28% (21 of 74), Diabetes which is 6% (4 of 74) and only obese subjects were found to be 28% (21 of 74).

The categorization of stroke among obese hypertensives flaunted that out of 49 obese hypertensives 34 were found to be ischemic and 15 were found to be hemorrhagic. Table 4 suggests that the distribution of women in obese hypertensive subjects of both ischemic and hemorrhagic strokes are greater than men.

The age wise distribution of CVA in the total period of 6 months indicated a peak prevalence in the age group of 61-70 years which is 31% (63 patients of that age group were admitted) and the least was found in the age group of 81-90 years which is 2.9% (6 patients of that age group were admitted). Table 6, gives information regarding the mean age distribution of men and women in both ischemic and hemorrhagic strokes. The mean age of men in ischemic stroke was found to be 58.14 with a standard deviation of 13.61 and of women it is 64.97±12.22. The mean ages of men and women in hemorrhagic stroke are 50.91±15.32 and 56.85±10.52 respectively.

Of the total 202 subjects 74 were found to be Obese in whom the prevalence of CVA was found to be greater in the age group of 51-60 years which is 36.4% (27 of 74 obese subjects) and least in 18-30 years of age group which is 1.35% (1 of 74). Table 9 represents mean age distribution of men and women in obese and obese hypertensives. The mean age of men and

women in obese subjects is 67.6±12 and 52.8±11.3 respectively. The mean age distribution of men and women in obese hypertensives is 61.6±9.5 and 58.1±11.9 respectively.

The peak prevalence of ischemic stroke was found in the age group of 61-70 years whereas the least prevalence was seen in 21-30 and 81-90 years.

The peak prevalence of hemorrhagic stroke was found in the age group of 51-60 years where as the least prevalence was seen in 21-30 years age group. Table 11 & 13 indicates the mean age distribution of men and women in obese subjects with ischemic and hemorrhagic strokes. The mean ages of men and women in obese subjects with ischemic stroke are found to be 57.26±8.03 and 66.19±10.61 respectively. The mean age of men in obese subjects with hemorrhagic stroke was found to be 53.6±18.16 and in women the mean age was found to be 57.75±9.97.

The modifiable risk factors of CVA subjects indicated that both smokers and alcoholics were high among total 202 CVA subjects which is 23.7% (48) followed by smokers 11.3% (23), alcoholics 4% (8) and tobacco chewing 3.5% (7).

The modifiable risk factors among the obese subjects showed that smokers with alcoholism were 21 of 74 obese patients followed by smoking (6), alcoholics (5), and tobacco chewing(3).

The family history in CVA subjects suggested that 87% doesn't have a significant family history. 6% of patients have a family history of hypertension followed by 4% of CVA family history, 2% of both CVA and Hypertension family history and 1% of Diabetic family history.

CONCLUSION

Cerebrovascular accident (CVA) is the leading cause of disability with variant risk factors which includes hypertension, dislipidemia, diabetes mellitus, metabolic syndrome and obesity. Though hypertension was known to be the highest risk factor for causing CVA but its association with obesity for causing CVA was not yet clearly demonstrated. In this study, on tabulation of result, ischemic stroke is more prevalent than hemorrhagic stroke. Amongst the patients with ischemic stroke hypertension appears to play a major role in the disease process. Amongst hypertensive's half of are obese. Till today obesity has found to be contributing the morbidity of the disease. However in the patients who are non-hypertensive, the significant population is obese. The mechanisms require to elucidate the onset of stroke

has to be fully studied. Overall, men seem to be effected more than women in the pathogenesis of the stroke with an exception of greater obese population in women. Though the results are showing a new trend, in order to establish the findings more substantially the study needs to be done on much larger scale and multiple centers all over the world.

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