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TITLE: RISK FACTORS AMONG HAEMORRHAGIC AND ISCHEMIC STROKE: A CROSS SECTIONAL STUDY IN TERTIARY CARE HOSPITAL, BERHAMPUR, ODISHA.

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INTRODUCTION: Cardiovascular diseases account for most NCD (Non-communicable disease) deaths. Of these deaths, 85% are due to heart attack and stroke. Stroke is a devastating and disabling cerebrovascular disease with significant amount of residual deficit leading to economic loss. NPCDCS is an effort by Government of India for control and prevention of Non-Communicable Diseases along with creating awareness among the general public.This study was conducted to assess the socio-demographic profile and associated risk factors among haemorrhagic and ischemic stroke patients.

METHODOLOGY: The study was conducted over aperiod of 2 years(October 2017 to September 2019). Study population were stroke patients admitted in the in-patient department (IPD) of Medicine Ward of M.K.C.G Medical College and Hospital.The sampling method was convenient sampling and sample size was292. The questionnaire was prepared by adopting both WHO STEPS questionnaire and WHO STEPS stroke manual.Collection of data and analysis was done by using IBM SPSS version16.0. Proportions were calculated for categorical variables and Pearson's chi- square test was used to test association.

RESULT: About 54.79% of study population belonged to ≥ 60 years age group. Majority (62.33%) were males.The most common risk factors were hypertension (62.7%) followed

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

bydyslipidemia (52.40%), diabetes mellitus (47.26%), tobacco consumption (44.86%), andalcohol intake (28.76%). Hypertension, family history of stroke and alcohol intake were associatedwith haemorrhagic stroke whereas diabetes was associated with ischemic stroke. Hypertension and dyslipidaemia were found in more than 60 years age group.Tobacco consumption, alcohol intake and abdominal obesity were identified in males while dyslipidaemiawas mostly found in females.

CONCLUSION AND RECOMMENDATION: Identification of risk factors done at periodic intervals in the regional level will help in establishing priorities for prevention strategies

KEY WARDS: NCD, NPCDCS,Risk factors

INTRODUCTION:

Most of the NCD deaths occur because of cardiovascular diseases. Around 85% of these deaths are due to heart attack and stroke[1]. Stroke is a major public health problem among the adult population. Stroke contributes significantly to morbidity, mortality, and disability in developed as well as developing countries[2]. Stroke is a devastating and disabling cerebrovascular disease with significant amount of residual deficit leading to economic loss[3].

Most non-communicable diseases are a result of four behaviorsthat is tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol which lead to four major metabolic/physiological changes - raised blood pressure, overweight/obesity, raised blood glucose and raised cholesterol[4].

National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) was initiated in India in 2010 with an emphasis on strengthening of infrastructure and human resource development, health promotion, early diagnosis, treatment and referral.The focus of NPCDCS is to promote healthy lifestyles, early diagnosis and management of diabetes, hypertension, cardiovascular diseases and common cancers.Various epidemiological studies and clinical trials have shown that stroke is preventableto a large extent[5.]
Regional level data is essential for planning strategies for prevention and management of Stroke. There are not many studies on this important public health issue in the state of Odisha and more so in southern Odisha. This study was conducted to assess the socio-demographic profile and associated risk factors among haemorrhagic and ischemic stroke patients.

METHODOLOGY:

This study was a hospital based cross-sectional study, conducted in the in-patient department (IPD) of Medicine of M.K.C.G Medical College and Hospital over a period of 2 years (October 2017 to September 2019).Convenient sampling was used to select the study subjects. Taking the prevalence of ischemic strokeas 80.2%[6], absolute error as 5% and confidence interval as 95%, sample size was calculated using the formula $n = Z^2 P (1 – P)/ d^2$ which came to be 244. Considering a nonresponse rate of 20% the final sample size was calculated to be 292.

Study population:
Inclusion criteria –

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

i) Those fulfilling the WHO definition of stroke and diagnosis confirmed by radiological investigations (CT or MRI)
ii) Recurrent stroke cases who were admitted for the first time in the hospital

Exclusion criteria-

i) Unwilling or uncooperative patients/attendants
ii) Patients with TIA/Patients with head injury, primary or secondary brain tumour

Study instrument:

The questionnaire was prepared by adopting both WHO STEPS questionnaire and WHO STEPS stroke manual. It was pretested with 20 samples in order to test the feasibility, reliability and validity of the questions. Necessary modifications were made accordingly in the questionnaireand the final questionnaire was prepared for the study.

Data collection and analysis:

Data was collected using the study instrument from the stroke patients admitted to Medicine ward of MKCG Medical College and Hospital and fulfilling the inclusion criteria. After explaining the purpose of study, informed consent was obtained from either the patient or his/her close relative in case of unconscious patients.

Data wasanalyzedusing IBM SPSS version16.0.Proportions were calculated for categorical variables and Pearson's chi- square test was used to test association. All analysis was done at a pre-set alpha error of 5% and results expressed at confidence levels of 95%.

RESULT:

A total of 292 stroke patients were included in the study. Of them, 77.05%(225)were patients of ischemic stroke and 22.95% (67) were haemorrhagic. Around 54.79% of the study population were in the age group of ≥ 60 years and8.57% were in the age group of < 40 years (young stroke).About 62.33% were males, 95.55% were Hindus, 76.71% were from rural areas and 31.85% illiterate.(Table-1)

Table-1: Socio-demographic profile of study participants (n=292)

Socio-demographic profile	Total participants	Ischemic stroke(225)	Haemorrhagic stroke(67)
Age(years)			
<40	25(8.57%)	19(8.44%)	6(8.96%)
40-49	37(12.67%)	28(12.44%)	9(13.43%)
50-59	70(23.97%)	52(23.11%)	18(26.86%)
≥60	160(54.79%)	126(56%)	34(50.75%)
Sex			
Male	182 (62.33%)	143(63.56%)	39(58.21%)
Female	110(37.67%)	82(36.44%)	28(41.79%)
Residence			
Rural	224(76.71%)	175(77.78%)	49(73.13%)
Urban	68(23.29%)	50(22.22%)	18(26.87%)

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

Marital status			
Married	238(81.51%)	187(83.11%)	51(76.12%)
others	54(18.49%)	38(16.89%)	16(23.88%)
Religion			
Hindu	279(95.55%)	213(94.67%)	66(98.51%)
Others	13 (4.45%)	12 (5 .33%)	1(1.49%)
Caste			
General	97 (33.22%)	71(31.56%)	26(38.81%)
OBC	57(19.52%)	47(20.89%)	10(14.92%)
SC	86(29.45%)	62(27.56%)	24(35.82%)
ST	52(17.81%)	45(20%)	7(10.45%)
Education			
Illiterate	93(31.85%)	71(31.56%)	22(32.84%)
<Primary	61(20.89%)	47(20.89%)	14(20.89%)
Primary	55(18.84%)	45(20%)	10(14.9%)
Secondary	34(11.64%)	25(11.11%)	9(13.43%)
≥Higher secondary	49(16.78%)	37(16.44%)	12(17.91%)
Occupation			
Government employee	26(8.9%)	21 (9.33%)	5 (7.46%)
Non-government Employee	30(10.27%)	23(10.22%)	7(10.45%)
Others	236(80.82%)	181(80.44%)	55(80.09%)
SES			
Upper	17 (5.82%)	12 (5.34%)	5 (7.46%)
Upper middle	21 (7.19%)	11 (4.89%)	10 (14.92%)
Middle	126 (43.15%)	102 (45.34%)	24 (35.82%)
Lower middle	83 (28.42%)	66 (29.34%)	17 (25.37%)
lower	45 (15.41%)	34 (15.11%)	11 (16.42%)

The common risk factors in the present study were hypertension (62.67%) and dyslipidemia (52.40%).Other risk factors were diabetes mellitus (47.26%), tobacco consumption (44.86%), alcohol intake (28.76%), past H/O TIA & stroke (20.89%), abdominal obesity (13.69%), cardiac disease (11.30%) and family H/O stroke (4.79%). Among all stroke patients 19.86% were known diabetic and hypertensive. (Table-2)

Table-2: Distribution of study participants according to frequency of risk factors (n=292)

Risk factors	**Number (N)**	**Percentage (%)**
Hypertension	183	62.67
Diabetes	138	47.26
Hypertension & Diabetes	58	19.86
Cardiac Diseases	33	11.30

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

Dyslipidaemia	153	52.40
Alcohol	84	28.76
Tobacco Consumption	131	44.86
Abdominal Obesity	40	13.69
Family H/O Stroke	14	4.79
Past H/O TIA & Stroke	61	20.89

Hypertension, family history of stroke and history of alcohol consumption was significantly associated with haemorrhagic stroke as compared to ischaemic stroke.Diabetes mellitus was more commonly found in ischemic cases (52.45%) as compared to haemorrhagic (29.85%) and the difference was statistically significant.Other risk factors like abdominal obesity, dyslipidaemia, tobacco consumption, presence of CVD and previous history of TIA & stroke were observed with both subtypes of stroke but the difference was not statistically significant.

Table-3: Association between the risk factors with subtypes of stroke (n=292)

Variables	**Ischemic (225)**	**Haemorrhagic(67)**	**Total(292)**	**Chi square & p Value**
Hypertension				
Present	124(55.11%)	59(88.06%)	183(62.68%)	$\chi2$ =23.95 p = **<0.001**
Absent	101(44.89%)	8(11.94%)	109(37.32 %)	
Diabetes Mellitus				
Present	118(52.45%)	20(29.85%)	138(47.26%)	$\chi2$ =10.573 p = **0.001**
Absent	107(47.55%)	47(70.14%)	154(52.74%)	
Abdominal Obesity				
Present	33(14.67%)	7(10.44%)	40(13.69%)	$\chi2$ = 0.773 p = 0.37
Absent	192(85.33%)	60(89.56%)	252(86.31%)	
Dyslipidaemia				
Present	120 (53.33%)	33 (49.25%)	153 (52.40%)	$\chi2$ = 0.3445 p = 0.55
Absent	105 (46.67%)	34 (50.75%)	139 (47.60%)	
CVD				
Present	25 (11.11%)	8 (11.94%)	33 (11.3%)	$\chi2$ = 0.035

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

Absent	200 (88.89%)	59 (88.06%)	259 (88.7%)	p = 0.85
P/H TIA and Stroke				
Present	49 (21.78%)	12 (17.91%)	61 (20.89%)	$\chi2$ = 0.467 p = 0.49
Absent	176 (78.22%)	55 (82.09%)	231 (79.11%)	
Family H/O Stroke				
Present	5 (2.22%)	9 (13.43%)	14 (4.8%)	$\chi2$ =14.21 p = **0.0001**
Absent	220 (97.78%)	58 (86.57%)	278 (95.2%)	
Tobacco Consumption				
Present	106 (47.12%)	25 (37.32%)	131 (44.86%)	$\chi2$ =2.0035 p=0.156
Absent	119 (52.88%)	42 (62.68%)	161 (55.14%)	
Alcohol				
Present	50(22.22%)	34(50.75%)	84(28.76%)	$\chi2$=20.49 p= **0.00001**
Absent	175(77.78%)	33(49.25%)	208(71.24%)	
Physical inactivity				
Present	90(40%)	27(40.29)	117(40.07%)	$\chi2$=0.0019 p=0.965
Absent	135(60%)	40(59.71%)	175(59.93%)	

Significant association was observed with Hypertension, diabetes mellitus, dyslipidemiaand the occurrence of stroke among patients ≥ 60 years of age.Therewas no association between tobacco, alcohol and abdominal obesity with respect to age. (Table-4)

Table-4: **Age-wise distribution of risk factors in the study population (n=292)**

Risk factors		**< 60 years n= 135, N (%)**	**≥ 60 years n= 157, N (%)**	**Chi square & P Value**
Hypertension	Yes	72 (24.66%)	111 (38.01%)	$\chi2$ = 9.35 p = **0.002**
	No	63 (21.58%)	46 (15.75%)	
Diabetes mellitus	Yes	78 (26.71%)	60 (20.54%)	$\chi2$ = 11.14 p = **0.0008**
	No	57 (19.52%)	97 (33.21%)	
Tobacco	Yes	54 (18.49%)	77 (26.36%)	$\chi2$ =2.4005

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

	No	81 (27.74%)	80 (27.4%)	p = 0.121
Alcohol	Yes	45 (15.41%)	39 (13.35%)	$\chi2$ = 2.554
	No	90 (30.82%)	118 (40.41%)	p = 0.109
Dyslipidaemia	Yes	59 (20.21%)	94 (32.19%)	$\chi2$ =7.608
	No	76 (26.02%)	63 (21.58%)	p = **0.005**
Abdominal obesity	Yes	17 (5.82%)	23 (7.87%)	$\chi2$ = 0.259
	No	118 (40.41%)	134 (45.89%)	p = 0.61

About 31.16% of males and 13.69% of femaleshad history of tobacco addictionand the difference was statically significant. ($\chi2$=5.154, p value=0.023). Alcohol, dyslipidaemia and abdominal obesity were found to be significantly associatedwith the incidence of stroke with respect to sex. Dyslipidaemia was mostly found in females as compared to males. There is no significant difference in the association of Hypertension and Diabetes, in the incidence of stroke with respect to sex. (Table-5)

Table-5:Sex wise distribution of risk factors in stroke patients (n=292)

Risk factors		**Male n=182, N (%)**	**Female n=110, N (%)**	**Chi square &p Value**
Hypertension	Yes	112 (38.35%)	71 (24.31%)	$\chi2$ = 0.265
	No	70 (23.97%)	39 (13.35%)	p = 0.606
Diabetes	Yes	79 (27.05%)	59 (20.21%)	$\chi2$ = 2.87
	No	103 (35.27%)	51 (17.47%)	p = 0.089
Tobacco	Yes	91 (31.16%)	40 (13.69%)	$\chi2$ = 5.154
	No	91 (31.16%)	70 (23.98%)	p **= 0.023**
Alcohol	Yes	84 (28.76%)	0	$\chi2$ = 20.1
	No	98 (33.56%)	110 (37.68%)	p = **<0.001**
Dyslipidaemia	Yes	72 (24.66%)	81 (27.74%)	$\chi2$ = 31.9
	No	110 (37.67%)	29 (9.93%)	p **= <0.001**
Abdominal obesity	Yes	16 (5.48%)	24 (8.22%)	$\chi2$=9.84
	No	166 (56.8%)	86 (29.45%)	p = **0.0017**

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

DISCUSSION:

The burden of stroke is increasing day by day which is becoming an increasing cause of poverty and hindering the economic development of a country[1]. Stroke usually affects the elderly people.In this study majority of the study population (53.76%) were in the age group of ≥ 60 years. However, 8.57% were in the age group of < 40 years(young stroke), the most productive age group. Around 15% of the participants belonged to age group of less than 40 years in a retrospective study of clinical profile of stroke patients from GMERS Medical College and Hospital, Gandhinagar byC. V. Vaidya et al[7].Stroke is more common among males as compared to females worldwide. The male to female ratio in this study is 1.65:1. Male preponderance was also observed by C. Kuriakose et al[8], Zhao et al[9] and Behera et al[10]. The higher incidence of stroke in males could be due to smoking, alcoholism and abdominal obesity which were identified in males.

Majority of the study population were from rural areas.Around 66.7% of the participants were from rural areas and rest 26.2% and 7.1% were from semi-urban and urban area respectively in a Clinico-epidemiological study conducted by Mahanta et al [11] whereas 59.6% were from urban area in a study byD.Huliyappa et al[12] in Karnataka.

There are many risk factors for stroke both modifiable (eg. Cigarette smoking, high blood pressure, elevated serum cholesterol, diabetes, obesity, diet, sedentary habits, stress) and non-modifiable risk factors(eg. age, sex, family history, genetic factors). Identification of risk factors and taking measures to control them will help in reducing the burden of stroke. Most common risk factors in the present study were hypertension and dyslipidaemia.Nagaraja et al[13], Behera et al[10] and S. V.Patneet al[14] also reported the same.
Hypertension was the most prevalent risk factor for stroke. Hypertension was significantly associated with haemorrhagic stroke.This was also observed by Behera et al[10]. However, hypertension was significantly associated with ischemic stroke according to Kumar et al [15].Hypertension was a major risk factor for both ischemic and haemorrhagic stroke according toKoolaee et al[16].Diabetes is an independent risk factor of Ischemic stroke.Similar findingswerefound in studies by Deljavan et al[17] and N.N.Tun et al[18].Family history of stroke was significantly associated with hemorrhagic stroke. This was also observed by C.Kuriakose et al.

Alcohol consumption was associated withhaemorrhagicstroke.Behera et al[10],Mahanta et al[11] and Andersen et al[19] have also found the association of alcohol consumption with haemorrhagic stroke.However, alcohol intake was significantly associated with ischemic stroke in a study by Kumar et al[15].
Hypertension and dyslipidaemia played a major role in the incidence of stroke as age increases. There is no association between tobacco, alcohol and abdominal obesity with respect to age. Hypertension, diabetes mellitus, and dyslipidaemia were significantly associated with stroke in more than 45 years of age in a study conducted by D.Hulliyappa et al[12] at Karnataka .
Alcohol, dyslipidaemia and abdominal obesity were found to be significantly associated with the incidence of stroke with respect to sex. The higher incidence of stroke in males could be due to smoking, alcoholism and abdominal obesity.Dyslipidaemia was mostly found in females as compared to males. Deljavan et al[17] also reported dyslipidemia among females.

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

LIMITATION OF THE STUDY:

- The findings of the study cannot be generalised, as it is a hospital-based study.

CONCLUSION AND RECOMMENDATIONS:

Though a number of modifiable and non-modifiable risk factors are responsible for the occurrence of stroke, the most common ones found in our study was hypertension, dyslipidaemia, diabetes mellitus and alcohol intake. Hypertension, alcohol intake and family history of stroke were associated with haemorrhagic stroke whereas diabetes mellitus with ischaemic stroke.

Identification of risk factors at periodic intervals in the regional level will help in establishing priorities for prevention strategies. Prevention, control and treatment of hypertension, diabetes mellitus, dyslipidaemia through health education, dietary modification, behavioral and life style modification in all age groups, screening and medical management at the community level will help in reducing the occurrence of stroke to a large extent**.**

DECLARATIONS

Source of support: Nil

Conflict of interest: Nil

Ethical approval: Ethical clearance was taken prior to the study from Institutional Ethical Committee.

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