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Prevalence of Metabolic Syndrome in Stroke Patients in A Tertiary Hospital in Eastern India

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Abstract:
Metabolic syndrome (MetS), a clustering of cardiovascular risk factors, has been conclusively linked to an increased risk of cardiovascular disease. However, the relationship between MetS and ischemic stroke remains understudied, particularly in the Pakistani context. This project aims to bridge this knowledge gap by examining the association between MetS and ischemic stroke in a Indian population. The study's objectives include estimating the prevalence of MetS among stroke patients, determining the odds ratio of MetS components on ischemic stroke risk, and identifying predictive factors for recurrent stroke in MetS patients. The findings of this study will contribute to a better understanding of the burden of MetS on stroke risk and outcomes in India, informing strategies for early detection, prevention, and management of ischemic stroke in this high-risk population.

INTRODUCTION

Metabolic syndrome (MetS) is defined as a syndrome of truncal obesity, insulin resistance, hypertension, hypertriglyceridemia, and dyslipidemia. It is well known that MetS increases the risk of cardiovascular disease and adverse events. Each of its components is associated with an increased risk of cardiovascular disease, but data on the association with ischemic stroke are scarce. At the international level, a significant body of research has been conducted on this issue. Very little data are present on the subject matter. A recent community-based survey suggested an estimated 21.8% prevalence of stroke in an urban slum of Karachi, Pakistan. Stroke-specific fatality has been reported between 7% and 20% in studies, with similar studies from China reporting mortality rates between 3% to 25%. The overall risk of recurrent stroke, fatal or nonfatal, is about 20% at five years.

Stroke is one of the leading causes of chronic disability and death worldwide, and its incidence progressively increases with age. In Pakistan, the estimated stroke incidence is close to 250 per 100,000 population, which means that there are 350,000 new stroke patients every year in the country. The metabolic syndrome (MetS) is defined as a syndrome of truncal obesity, insulin resistance, hypertension, hypertriglyceridemia, and dyslipidemia. The prevalence of MetS has been increasing at an alarming rate throughout the world. In the United States, the current prevalence is estimated to be at 27%; in Europe, it is 15.7% in men and 14.2% in women; and in China, it is 13.7%. The presence of MetS is strongly associated with the development of hyperuricemia, diabetes, hypertension, cardiovascular disease, and all-cause mortality.

The metabolic syndrome (MetS), characterized by a constellation of multiple interrelated cardio metabolic risk factors, has become a major concern for public health. Currently, several criteria are proposed to define MetS such as the US National Cholesterol Education Program (NCEP) criteria, the International Diabetes Federation (IDF) criteria, and the Chinese Diabetes Society (CDS) criteria. Thus, the prevalence of MetS varies across studies, and even in the same population, depending on the defining criteria. The

associations between MetS and cardiovascular diseases have been well studied in the general population. A systematic review and meta-analysis of 87 population-based prospective studies showed that MetS was associated with an increased risk of cardiovascular disease (myocardial infarction, stroke) and cardiovascular mortality. They previously reported that MetS was associated with coronary heart disease (CHD), stroke, and cardiovascular multimorbidity among Chinese older adults living in a rural area. So far, data are sparse with regard to the relationship between MetS and CHD among patients with ischemic stroke.

Ischemic stroke and CHD are common circulatory disorders among adults and share major common etiological factors (e.g., smoking, hypertension, diabetes, and high cholesterol) and pathophysiological mechanisms (e.g., atherosclerosis). However, evidence also suggests that the two entities show differences in risk factors, pathophysiologies, incidence, mortality, and prognosis in the general population. As the worldwide leading causes of disability and death, CHD and ischemic stroke together have a great impact on public health. A meta-analysis suggested that coronary stenosis was highly prevalent in patients with ischemic stroke and that CHD was the leading cause of death following the occurrence of acute ischemic stroke. A large-scale register-based study in Sweden showed that ~ 50% of the men with both stroke and coronary disease died from coronary heart disease (e.g., myocardial infarction and sudden coronary death). Similarly, a recent large-scale retrospective cohort study also revealed the poor prognosis and an increased risk of cardiovascular complications following the onset of an ischemic stroke. Thus, identifying risk factors for CHD among stroke patients is crucial to reduce the risk of coronary events and improve the prognosis.

It is a prediabetes aggregation of symptoms and a more prevalent risk factor than is type2 diabetes mellitus .India is already the diabetic capital of the world. Subsequently, epidemiological studies have confirmed that this syndrome is a common variety in a wide variety of ethnic groups.

Abdominal obesity-most strongly associated with the metabolic syndrome. It presents clinically as increased waist circumference. Leptin deficiency or resistance leads to tissue deposition of fat.

Atherogenic dyslipidaemia -Increased Triglycerides, decreased HDL are implicated independently in being atherogenic. Elevated Blood pressure strongly associated with obesity and occurs in insulin resistant persons. Insulin resistance is a physiological change in insulin action manifesting as resistance to insulin mediated glucose disposal .It is the fundamental defect in linking individual components of metabolic syndrome. Patients with longstanding insulin resistance frequently manifest glucose intolerance, which itself is an independent risk factor for CVD.

AIMS & OBJECTIVES

AIM: PREVALENCE OF METABOLIC SYNDROME IN STROKE PATIENTS IN A TERTIARY HOSPITAL IN EASTERN INDIA

Objective:

1. To study the prevalence of metabolic syndrome in 100 stroke patients.
2. To study the role of various components of metabolic syndrome(modified ATP III criteria) in causation of stroke.
3. To assess the association between the metabolic syndrome and cerebrovascular accidents.

Review of literature

1. Anum Amir et. al, conducted a study on Frequency and Characteristics of Metabolic Syndrome in Patients With Ischemic Stroke Admitted to a Tertiary Care Hospital in Karachi. Metabolic syndrome (MetS) is defined as a syndrome of truncal obesity, insulin resistance, hypertension, hypertriglyceridemia, and dyslipidemia. It is well known that MetS increases the risk of cardiovascular disease and adverse events. Each of its components is associated with an increased risk of cardiovascular disease, but data on the association with ischemic stroke are scarce. At the international level, a significant body of research has been conducted on this issue, but the situation is very different in Pakistan. Very little data are present on the subject matter. This study is an endeavor in this direction, generating data, that can be used in early identification and developing treatment services for patients with ischemic stroke having MetS. The main aim of the study was to determine the frequency of MetS in ischemic stroke patients admitted to a tertiary care hospital in Karachi, Pakistan.
   In this six-month observational and cross-sectional study, they conducted at Medical Unit I, Jinnah Postgraduate Medical Centre from July 1, 2019, to December 31, 2019. Patients with a diagnosis of acute ischemic stroke were enrolled. Detailed history, physical examination, and biochemical measurements were noted. The presence of MetS was defined in accordance with the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III)/American Heart Association (AHA) guidelines.
   Post analysis, they found that a total of 224 patients fulfilling the inclusion criteria were inducted into this study. The mean age of presentation was 61.04 ± 14.72 years, and more than two-thirds of the patients were ≥60 years of age. A total of 150 (66.96%) patients with ischemic stroke also had MetS. The male-to-female ratio in this group was 2:1. The most common variables constituting the MetS were truncal obesity, hypertension, and dyslipidemia. The median MetS score was found to be 3.
   Hence, they concluded that MetS is highly prevalent in patients presenting with ischemic stroke irrespective of age or gender. The three most deranged and common components of MetS in these patients are truncal obesity, hypertension, and dyslipidaemia.
2. Yun Luo et. al, conducted a study on Low HDL cholesterol is correlated to the acute ischemic stroke with diabetes mellitus. The main aim of the study was to clarify the role of lipid composition in the occurrence of acute ischemic stroke (AIS) with diabetes mellitus (DM) and its influence factors. In this study, data was collected from the patients hospitalization in Affiliated Drum Tower Hospital of Nanjing University Medical School from October 2008 to May 2012, which included AIS and non-AIS consist of transient ischemic attack (TIA) and Vertigo or dizzy. Lipid and other risk factors including blood glucose (BG), uric acid (UA), hypertension, DM and atrial fibrillation (AF) were investigated in relation to occurrence of AIS.
   Post analysis they found that the level of high density lipoprotein (HDL) cholesterol was decreased obviously in the DM group compared to the non-DM group and low level of HDL cholesterol was prevalent in the AIS patients with DM. logistic regression demonstrated that decreased HDL cholesterol was correlated to the AIS with DM, not all AIS, and the relative risk of ischemic stroke in low HDL cholesterol level group was 2.113 (95% CI = 1.191-3.749, P = 0.011) compared to the high level group. Furthermore, age has the obviously impact on it. HDL cholesterol was correlated to the AIS with DM just in the populations of aged ≦70 years (OR = 0.192, P = 0.000), low level of HDL

cholesterol had more high risk of ischemic stroke than that in the high level group (OR = 6.818, P = 0.002).

Hence, they concluded that decreased HDL cholesterol was correlated to the occurrence of AIS with DM, especially in the populations of aged ≦70 years.

3. Sudhir Kurl et. al, conducted a study on Metabolic syndrome and the risk of stroke in middle-aged men. The main aim of this study was to examine the relationship of metabolic syndrome, as defined by National Cholesterol Education Program (NCEP) and World Health Organization (WHO) criteria, with the risk for stroke. In this study, population-based cohort study with an average follow-up of 14.3 years from eastern Finland. A total of 1131 men with no history of cardiovascular disease and diabetes at baseline participated. Sixty-five strokes occurred, of which 47 were ischemic strokes.

   Post analysis, they found that men with the metabolic syndrome as defined by the NCEP criteria had a 2.05-fold (95% CI, 1.03 to 4.11; P=0.042) risk for all strokes and 2.41-fold (95% CI, 1.12 to 5.32; P=0.025) risk for ischemic stroke, after adjusting for socioeconomic status, smoking, alcohol, and family history of coronary heart disease. Additional adjustment for ischemic changes during exercise test, serum low-density lipoprotein cholesterol, plasma fibrinogen, energy intake for saturated fats, energy expenditure of leisure time physical activity, and white blood cell count, the results remained significant. The risk ratios among men with metabolic syndrome as defined by the WHO criteria were 1.82 (95% CI, 1.01 to 3.26; P=0.046) for all strokes and 2.16 (95% CI, 1.11 to 4.19; P=0.022) for ischemic stroke. After further adjustment, the respective risks were 2.08 (95% CI, 1.12 to 3.87; P=0.020) and 2.47 (95% CI, 1.21 to 5.07; P=0.013).

   Hence, they concluded that the risk of any stroke is increased in men with metabolic syndrome, in the absence of stroke, diabetes and cardiovascular disease at baseline. Prevention of the metabolic syndrome presents a great challenge for clinicians with respect to stroke.

4. Hanna-Maaria Lakka et. al, conducted a study on the metabolic syndrome and total and cardiovascular disease mortality in middle-aged men. The metabolic syndrome, a concurrence of disturbed glucose and insulin metabolism, overweight and abdominal fat distribution, mild dyslipidemia, and hypertension, is associated with subsequent development of type 2 diabetes mellitus and cardiovascular disease (CVD). Despite its high prevalence, little is known of the prospective association of the metabolic syndrome with cardiovascular and overall mortality. The main objective of this study is to assess the association of the metabolic syndrome with cardiovascular and overall mortality using recently proposed definitions and factor analysis. The Kuopio Ischaemic Heart Disease Risk Factor Study, a population-based, prospective cohort study of 1209 Finnish men aged 42 to 60 years at baseline (1984-1989) who were initially without CVD, cancer, or diabetes. Follow-up continued through December 1998.

   Post analysis, they found that the prevalence of the metabolic syndrome ranged from 8.8% to 14.3%, depending on the definition. There were 109 deaths during the approximately 11.4-year follow-up, of which 46 and 27 were due to CVD and CHD, respectively. Men with the metabolic syndrome as defined by the NCEP were 2.9 (95% confidence interval [CI], 1.2-7.2) to 4.2 (95% CI, 1.6-10.8) times more likely and, as defined by the WHO, 2.9 (95% CI, 1.2-6.8) to 3.3 (95% CI, 1.4-7.7) times more likely to die of CHD after adjustment for conventional cardiovascular risk factors. The metabolic syndrome as defined by the WHO was associated with 2.6 (95% CI, 1.4-5.1) to 3.0 (95% CI, 1.5-5.7) times higher CVD mortality and 1.9 (95% CI, 1.2-3.0) to 2.1 (95% CI, 1.3-3.3) times higher all-cause

mortality. The NCEP definition less consistently predicted CVD and all-cause mortality. Factor analysis using 13 variables associated with metabolic or cardiovascular risk yielded a metabolic syndrome factor that explained 18% of total variance. Men with loadings on the metabolic factor in the highest quarter were 3.6 (95% CI, 1.7-7.9), 3.2 (95% CI, 1.7-5.8), and 2.3 (95% CI, 1.5-3.4) times more likely to die of CHD, CVD, and any cause, respectively.

Hence, they concluded that cardiovascular disease and all-cause mortality are increased in men with the metabolic syndrome, even in the absence of baseline CVD and diabetes. Early identification, treatment, and prevention of the metabolic syndrome present a major challenge for health care professionals facing an epidemic of overweight and sedentary lifestyle.

5. Jianjun Wang et. al, conducted a study on the metabolic syndrome predicts cardiovascular mortality (a 13-year follow-up study in elderly non-diabetic Finns). The metabolic syndrome (MetS) is defined as a clustering of cardiovascular risk factors characterized by insulin resistance. In this study, they investigated the relationship of the MetS and its single components, defined by all six different criteria, with coronary heart disease (CHD), cardiovascular disease (CVD), and all-cause mortality in a prospective population-based study. The MetS was defined according to the World Health Organization (WHO), the European Group for the Study of Insulin Resistance (EGIR), the National Cholesterol Education Program (NCEP), the American College of Endocrinology (ACE), the International Diabetes Federation (IDF), and the American Heart Association (updated NCEP) criteria. They investgated the relationship of the MetS defined by aforementioned six criteria with CHD, CVD, and all-cause mortality with Cox regression analyses in a non-diabetic Finnish population of 1025 subjects, aged 65-74 years, during the 13-year follow-up. The MetS defined by all aforementioned criteria was associated with a statistically significant risk for CVD mortality when adjusted for all confounding variables (Hazards Ratios, HRs from 1.31 to 1.51). The MetS defined by the WHO, ACE, and IDF criteria was associated with an increased risk of CHD mortality (HRs from 1.42 to 1.58). There was no association between the MetS by any criteria and all-cause mortality. Of the single components of the MetS, the following predicted CVD mortality in multivariable models: impaired fasting glucose by the WHO, NCEP, and ACE criteria (HR 1.34) and by the IDF and updated NCEP criteria (HR 1.29); impaired glucose tolerance by the WHO and ACE criteria (HR 1.55); low HDL cholesterol by the EGIR criteria (HR 1.50) and by the NCEP, IDF, and updated NCEP criteria (HR 1.29); and microalbuminuria according to the WHO definition (HR 1.86).

   Post analysis, they concluded that the MetS defined by all six current criteria predicts CVD mortality in elderly subjects. However, of the single components of the MetS, IFG, IGT, low HDL cholesterol, and microalbuminuria predicted CVD mortality with equal or higher HRs when compared with the different definitions of the MetS. Therefore, our study suggests that the MetS is a marker of CVD risk, but not above and beyond the risk associated with its individual components.
6. Shaista Malik et. al, conducted a study on impact of the metabolic syndrome on mortality from coronary heart disease, cardiovascular disease, and all causes in United States adults. Mortality resulting from coronary heart disease (CHD), cardiovascular disease (CVD), and all causes in persons with diabetes and pre-existing CVD is high; however, these risks compared with those with metabolic syndrome (MetS) are unclear. In this study, they examined the impact of MetS on CHD, CVD, and overall mortality among US adults.

In this prospective cohort study, 6255 subjects 30 to 75 years of age (54% female) (representative of 64 million adults in the United States) from the Second National Health and Nutrition Examination Survey were followed for a mean+/-SD of 13.3+/-3.8 years. MetS was defined by modified National Cholesterol Education Program criteria. From sample-weighted multivariable Cox proportional-hazards regression, compared with those with neither MetS nor prior CVD, age-, gender-, and risk factor-adjusted hazard ratios (HRs) for CHD mortality were 2.02 (95% CI, 1.42 to 2.89) for those with MetS and 4.19 (95% CI, 3.04 to 5.79) for those with pre-existing CVD. For CVD mortality, HRs were 1.82 (95% CI, 1.40 to 2.37) and 3.14 (95% CI, 2.49 to 3.96), respectively; for overall mortality, HRs were 1.40 (95% CI, 1.19 to 1.66) and 1.87 (95% CI, 1.60 to 2.17), respectively. In persons with MetS but without diabetes, risks of CHD and CVD mortality remained elevated. Diabetes predicted all mortality end points. Those with even 1 to 2 MetS risk factors were at increased risk for mortality from CHD and CVD. Moreover, MetS more strongly predicts CHD, CVD, and total mortality than its individual components.

Post analysis, they concluded that CHD, CVD, and total mortality are significantly higher in US adults with than in those without MetS.

7. N Koren-Morag et. a, conducted a study regarding relation between the metabolic syndrome and ischemic stroke or transient ischemic attack (a prospective cohort study in patients with atherosclerotic cardiovascular disease). In this study, they explored the relation of metabolic syndrome versus frank diabetes with first-ever ischemic stroke or transient ischemic attack (TIA) in a large cohort of patients with atherosclerotic cardiovascular disease.

   For this study, patients with coronary heart disease, were screened for a clinical trial, underwent an extensive medical evaluation and follow-up for cerebrovascular disease over 4.8 to 8.1 years. National Cholesterol Education Program Adult Treatment Panel III criteria were used to define the metabolic syndrome, with body mass index substituted for waist circumference. Patients with previously diagnosed diabetes or with a fasting plasma glucose level >125 mg/dL (> or =7.0 mmol/L) were considered diabetic. The study sample comprised 14,284 patients, of which 3703 (26%) fulfilled the criteria for the metabolic syndrome without diabetes and 3500 others (25%) the criteria for diabetes.

   Post analysis, they found that adjusting for stroke risk factors, patients with the metabolic syndrome without diabetes exhibited a 1.49-fold increased odds for ischemic stroke or TIA (95% confidence interval [CI], 1.20 to 1.84), whereas those with frank diabetes had a 2.29-fold increased odds (95% CI, 1.88 to 2.78). The relative odds for ischemic stroke or TIA, associated with presence of the metabolic syndrome per se, were 1.39 (95% CI, 1.10 to 1.77) in men but 2.10 (95% CI, 1.26 to 3.51) in women. Although all components of the metabolic syndrome were associated with increased risk for ischemic stroke or TIA, impaired fasting glucose and hypertension were the strongest predictors of risk.

   Hence, they concluded that the presence of the metabolic syndrome, even without diabetes, in patients with pre-existing atherosclerotic vascular disease identifies patients at increased risk for ischemic stroke or TIA. The suggestion of more pronounced risk associated with the metabolic syndrome in women deserves further assessment in other cohorts.

8. Walter N Kernan et. al, conducted a study on prevalence of abnormal glucose tolerance following a transient ischemic attack or ischemic stroke. Despite current preventive therapies, patients with transient ischemic attack (TIA) and ischemic stroke remain at high risk for recurrent brain disease and cardiovascular events. In an effort to develop new therapies, abnormal glucose tolerance has recently

been proposed as an interventional target. Among persons not otherwise known to be diabetic, impaired glucose tolerance (IGT) and diabetic glucose tolerance (DGT) are each associated with an increased risk for incident vascular disease, vascular disease mortality, and all-cause mortality. In this study, they wanted to determine if IGT and DGT are sufficiently common among patients with TIA and ischemic stroke to warrant therapeutic trials of antihyperglycemic agents.

For this study, men and women older than 45 years were recruited from 3 hospitals in south central Connecticut. Eligibility criteria included a recent TIA or nondisabling ischemic stroke, no history of physician-diagnosed diabetes mellitus, and a fasting plasma glucose level less than 126 mg/dL (<7.0 mmol / L). After an overnight fast, subjects were admitted to a clinical research center for a standard 75-g oral glucose tolerance test. Impaired glucose tolerance was defined by a 2-hour plasma glucose value of 140 to 199 mg/dL (7.8-11.0 mmol / L) and DGT by a value of 200 mg/dL or greater (> or =11.1 mmol/L).

Post analysis, they found that between June 2000 and August 2003, we enrolled 98 eligible patients. The average time from TIA or stroke to measurement of glucose tolerance was 105 days (range, 24-180 days) and the median age was 71 years. Twenty-seven subjects (28%) had IGT and 24 (24%) had diabetes. In a forward stepwise logistic regression model, only a fasting plasma glucose level of 110 mg/dL or greater (> or =6.1 mmol / L) and lower waist circumference were associated with an increased risk for IGT or DGT.

Hence, they concluded that Impaired glucose tolerance and DGT are present in most persons with a recent TIA or ischemic stroke who have no history of diabetes and a fasting plasma glucose level less than 126 mg/dL (<7.0 mmol / L). Our findings bring new urgency to the initiation of research to examine the effectiveness of antihyperglycemic therapies among patients with cerebrovascular disease and abnormal glucose tolerance.

9. Hiroyasu Iso et. al, conducted a study on metabolic syndrome and the risk of ischemic heart disease and stroke among Japanese men and women. The main objective of this study is to examine the association of the metabolic syndrome and risk of ischemic cardiovascular disease in Japanese men and women.

   In this study, they conducted an 18-year prospective study of 9087 Japanese people aged 40 to 69 years (3595 men and 5492 women), initially free of ischemic heart disease or stroke. During follow-up, there were 116 (74 men and 42 women) cases of ischemic heart disease and 256 (144 men and 112 women) ischemic strokes. Metabolic syndrome was defined by the modified criteria of the National Cholesterol Education Program Adult Treatment Panel III (NCEP/ATPIII), with the presence of >/=3 of the following factors: (1) serum triglycerides >/=1.69 mmol/L (150 mg/dL); (2) HDL-cholesterol <1.03 mmol/L (40 mg/dL) for men and <1.29 mmol/L (50 mg/dL) for women; (3) glucose >/=6.11 mmol/L (110 mg/dL) fasting or >/=7.77 mmol/L (140 mg/dL) nonfasting, or on treatment; (4) blood pressure > or =130/85 mm Hg or medication use, and (5) body mass index >/=25.0 kg/m(2).

   Post analysis they found that for both sexes, high blood pressure, high triglycerides and low HDL cholesterol were associated with increased risks of ischemic heart disease or stroke after adjustment for cardiovascular risk factors. A dose-response relationship was found between the number of metabolic risk factors and incidence of these cardiovascular end points. The multivariable hazard ratio (95% CI) associated with metabolic syndrome was 2.4 (1.4 to 4.0) in men and 2.3 (1.2 to 4.3) in women for ischemic heart disease, and 2.0 (1.3 to 3.1) and 1.5 (1.0 to 2.3), respectively, for ischemic stroke.

The contribution of metabolic syndrome to the risks was independent of serum total cholesterol levels but stronger among smokers.

Hence, they concluded that the metabolic syndrome is a major determinant of ischemic cardiovascular disease among middle-aged Japanese men and women, in particular among smokers.

10. Ayeesha Kamran Kamal et. al, conducted a study on The burden of stroke and transient ischemic attack in Pakistan (a community-based prevalence study). The burden of cerebrovascular disease in developing countries is rising sharply. The prevalence of established risk factors of stroke is exceptionally high in Pakistan. However, there is limited data on the burden of stroke and transient ischemic attack (TIA) in South Asia.

    In this study, Individuals 35 years of age or older were invited for participation in this investigation through simple random sampling. A structured face-to-face interview was conducted using a pre-tested stroke symptom questionnaire in each participant to screen for past stroke or TIA followed by neurological examination of suspected cases. Anthropometric measurements and random blood glucose levels were recorded. Multivariable logistic regression was used to determine the association of vascular risk factors with prevalence of stroke.

    Post analysis, they found that five hundred and forty five individuals (49.4% females) participated in the study with a response rate of 90.8%. One hundred and four individuals (19.1%) were observed to have a prior stroke while TIA was found in 53 individuals (9.7%). Overall, 119 individuals (21.8% with 66.4% females) had stroke and/or TIA. Female gender, old age, raised random blood glucose level and use of chewable tobacco were significantly associated with the prevalence of cerebrovascular disease.

    Hence, they concluded that this study demonstrated an alarmingly high life-time prevalence of cerebrovascular disease in Pakistan. Individual and public health interventions in Pakistan to increase awareness about stroke, its prevention and therapy are warranted.

11. Wenzhi Wang et. al, conducted a study on prevalence, Incidence, and Mortality of Stroke in China: Results from a Nationwide Population-Based Survey of 480 687 Adults. China bears the biggest stroke burden in the world. However, little is known about the current prevalence, incidence, and mortality of stroke at the national level, and the trend in the past 30 years. In this study, in 2013, a nationally representative door-to-door survey was conducted in 155 urban and rural centers in 31 provinces in China, totaling 480 687 adults aged ≥20 years. All stroke survivors were considered as prevalent stroke cases at the prevalent time (August 31, 2013). First-ever strokes that occurred during 1 year preceding the survey point-prevalent time were considered as incident cases. According to computed tomography/MRI/autopsy findings, strokes were categorized into ischemic stroke, intracerebral hemorrhage, subarachnoid hemorrhage, and stroke of undetermined type.

    Post analysis, they found that of 480 687 participants, 7672 were diagnosed with a prevalent stroke (1596.0/100 000 people) and 1643 with incident strokes (345.1/100 000 person-years). The age-standardized prevalence, incidence, and mortality rates were 1114.8/100 000 people, 246.8 and 114.8/100 000 person-years, respectively. Pathological type of stroke was documented by computed tomography/MRI brain scanning in 90% of prevalent and 83% of incident stroke cases. Among incident and prevalent strokes, ischemic stroke constituted 69.6% and 77.8%, intracerebral hemorrhage 23.8% and 15.8%, subarachnoid hemorrhage 4.4% and 4.4%, and undetermined type 2.1% and 2.0%, respectively. Age-specific stroke prevalence in men aged ≥40 years was significantly

greater than the prevalence in women (P<0.001). The most prevalent risk factors among stroke survivors were hypertension (88%), smoking (48%), and alcohol use (44%). Stroke prevalence estimates in 2013 were statistically greater than those reported in China 3 decades ago, especially among rural residents (P=0.017). The highest annual incidence and mortality of stroke was in Northeast (365 and 159/100 000 person-years), then Central areas (326 and 154/100 000 person-years), and the lowest incidence was in Southwest China (154/100 000 person-years), and the lowest mortality was in South China (65/100 000 person-years) (P<0.002).

Hence, they concluded that stroke burden in China has increased over the past 30 years, and remains particularly high in rural areas. There is a north-to-south gradient in stroke in China, with the greatest stroke burden observed in the northern and central regions.

12. Bin Li et. al, conducted a study on Trends in Incidence of Stroke and Transition of Stroke Subtypes in Rural Tianjin China (A Population-Based Study from 1992 to 2012). In this study, they mainly aimed to explore the secular trends in incidence and transition of stroke subtypes among rural Chinese. This study was basically a population-based stroke surveillance through the Tianjin Brain Study. A total of 14,538 residents in a township of Ji County in Tianjin, China participated in the study since 1985. We investigated the age-standardized stroke incidence (sex-specific, type-specific, and age-specific), the annual proportion of change in the incidence of stroke, and the proportion of intracerebral hemorrhage in the periods 1992-1998, 1999-2005, and 2006-2012, because the neuroimaging technique was available since 1992 in this area.

    Post analysis, they found that the age-standardized incidence per 100,000 person-years increased significantly for both intracerebral hemorrhage (37.8 in 1992-1998, 46.5 in 1999-2005, and 76.5 in 2006-2012) and ischemic stroke (83.9 in 1992-1998, 135.3 in 1999-2005, and 238.0 in 2006-2012). The age-standardized incidence of first-ever stroke increased annually by 4.9% for intracerebral hemorrhage and by 7.3% for ischemic stroke. The greatest increase was observed in men aged 45-64 years for both stroke types (P < 0.001). The proportion of intracerebral hemorrhage was stable overall, increased among men aged 45-64 years, and decreased among men aged ≥65 years. The average age of intracerebral hemorrhage in men reduced by 7.5 years from 1992 to 2012.

    Hence, they concluded that the age-standardized incidence of main stroke subtypes increased significantly in rural China over the past 21 years; the overall proportion of intracerebral hemorrhage was stable, but the incidence increased significantly among middle-aged men. These findings imply that it is crucial to control stroke risk factors in middle-aged men for stroke prevention in future decades.

13. Joshua A Beckman et. al, conducted a study on Diabetes and atherosclerosis (epidemiology, pathophysiology, and management). Complications of atherosclerosis cause most morbidity and mortality in patients with diabetes mellitus. Despite the frequency and severity of disease, proven medical therapy remains incompletely understood and underused. The main of this study was to review the epidemiology, pathophysiology, and medical and invasive treatment of atherosclerosis in patients with diabetes mellitus.

    In this study, they selected original investigations and reviews of the epidemiology, pathophysiology, and therapy of atherosclerosis in diabetes. We selected randomized, double-blind, controlled studies, when available, to support therapeutic recommendations. Criteria for data inclusion (168 of 396) included publication in a peer-reviewed journal or presentation at a national cardiovascular society-

sponsored meeting. Data quality was determined by publication in peer-reviewed literature. Data extraction was performed by one of the authors.

Post analysis, they found that diabetes mellitus markedly increases the risk of myocardial infarction, stroke, amputation, and death. The metabolic abnormalities caused by diabetes induce vascular dysfunction that predisposes this patient population to atherosclerosis. Blood pressure control, lipid-lowering therapy, angiotensin-converting enzyme inhibition, and antiplatelet drugs significantly reduce the risk of cardiovascular events. Although diabetic patients undergo revascularization procedures because of acute coronary syndromes or critical limb ischemia, the outcomes are less favourable than in nondiabetic cohorts.

Hence, they concluded that since most patients with diabetes die from complications of atherosclerosis, they should receive intensive preventive interventions proven to reduce their cardiovascular risk.

14. Jonathan Hewitt conducted a study on Diabetes and stroke prevention (a review). Stroke and diabetes mellitus are two separate conditions which share multiple common threads. Both are increasing in prevalence, both are diseases which affect blood vessels, and both are associated with other vascular risk factors, such as hypertension and dyslipidemia. Abnormal glucose regulation, of which diabetes is one manifestation, is seen in up to two-thirds of people suffering from an acute stroke. Surprisingly, aggressive management of glucose after an acute stroke has not been shown to improve outcome or reduce the incidence of further strokes. More encouragingly, active management of other cardiovascular risk factors has been demonstrated to prevent stroke disease and improve outcome following a stroke in the diabetic person. Hypertension should be treated with a target of 140/80 mmHg, as a maximum. The drug of choice would be an ACE inhibitor, although the priority is blood pressure reduction regardless of the medication chosen. Lipids should be treated with a statin whatever the starting cholesterol. Antiplatelet treatment is also essential but there are no specific recommendations for the diabetic person. As these conditions become more prevalent it is imperative that the right treatment is offered for both primary and secondary prevention in diabetic people, in order to prevent disease and minimize disability.
15. Clara Hjalmarsson et. al, conducted a study on the effect of statins on acute and long-term outcome after ischemic stroke in the elderly. Although treatment with statins has produced beneficial effects when used as secondary prevention, its primary protective role is still somewhat controversial. Moreover, few studies have evaluated the effect of statins in older patients with stroke. The main aim of the study was to investigate whether treatment with statins decreases stroke severity and/or improves survival and outcome after stroke in an older population.

    In this study, they investigated the association between previous statin use and stroke severity (National Institutes of Health Stroke Scale [NIHSS]), as well as the effect of poststroke statin treatment on 12-month functional outcome (modified Rankin Scale [mRS] score) in 799 patients (mean age, 78 years), with acute ischemic stroke. The effect of statin treatment on survival was examined using the Cox proportional hazard model, after adjusting for relevant covariates.

    Post analysis, they found that statins did not decrease stroke severity and did not improve 30-day survival. However, both the 12-month survival (hazard ratio = 0.33; 95% CI, 0.20-to 0.54; $P < 0.001$) and the 12-month functional outcome (odds ratio = 2.09; 95% CI, 1.25-3.52; $P = 0.005$) were significantly better in the group treated with statins.

Hence, they concluded that significantly better survival and functional outcome were noted with poststroke statins at the end of the 12-month follow-up period. Statins seem to provide beneficial effects for the long-term functional outcome and survival in the elderly.

Method & Materials:

It is a cross-sectional study. It will be done on patient who will be attending out patient department and also will be admitted in General Medicine ward of NRS MEDICAL COLLEGE AND HOSPITAL and diagnosed as a patient of CEREBROVASCULAR ACCIDENT. Patients with neuroradiological features of stroke(clinically and CT proven, including major and minor stroke).

After informed consent, venous blood will be send for all routine and other relevant investigations.

METHEDOLOGY:

1. **STUDY AREA:** The present work will be conducted in the N.R.S. Medical College and Hospital Kolkata (Department of GENERAL MEDICINE – Out Patient department and indoor ward).
2. **STUDY PERIOD:** Study will be done from February 2021 to September 2022 i.e., through one and half year period.
3. **SAMPLE SIZE:** Sample size determined by the following method $4*p*(100-p)/L^2$ Where p=prevalence(from previous study),L= error Calculated sample size= 100 (p=40,L=10)
4. **SAMPLE DESIGN:** Diagnosed Stroke patients presenting in OPD and also admitting in General Medicine ward.
5. **STUDY DESIGN :** It will be cross sectional , hospital based, single Centre study.

INCLUSION CRITERIA :

The Inclusion criteria were

1) Both male and female patients presenting with neuro-radiological features of stroke (clinically and CT proven, including major and minor stroke).

The criteria used in the clinical diagnosis of stroke were those setforth by the Adhoc Committee of National Institute of Neurological diseases and blindness.

The clinical diagnosis was made by

a) eliciting a detailed history from the patient or from their relatives,

regarding the nature of illness with special emphasis on the following:

- mode of onset – sudden or gradual
- time of onset – during early morning hours soon after getting up or
- during day time activities.
- associated symptoms – headache, vomiting, convulsion, past history
- of Transient Ischemic attack (TIA), Diabetes mellitus, Ischemic

heart disease, personal habits like cigarette smoking and alcohol drinking in both sexes and intake of oral contraceptive pills in the past in females.

b) Physical examination which included :

i) General examination with special regards to obesity, carotid and peripheral pulsation, blood pressure, polycythaemia, dehydration as predisposing factors and acanthosis nigricans as a marker of hyper insulinemia.
ii) Central nervous system examination for evidence of unconsciousness, hemiplegia or paresis, cranial nerve dysfunction, speech disturbance, sensory deficits, meningeal and cerebellar involvement and optic fundus examination.
iii) Cardio vascular respiratory and abdominal examination. In all these patients, clinical diagnosis was confirmed by CT scan of the brain for designation of stroke as a) Ischemic - patients with cerebrovascular thrombosis
b) Haemorrhagic – patients with cerebral haemorrhage
c) Unclassified – patients who were CT wise normal but had clinical evidence of stroke i.e. patients with minor stroke (Transient Ischemic Attack (TIA), Reversible Ischemic Neurological Deficit & Brain Stem stroke).
When there was suspicion of tumour or other etiology, the diagnosis was confirmed by MRI scan, Carotid Doppler, four vessel angiogram to rule out embolism, serum VDRL for syphilis, blood examination for anaemia, renal failure, polycythaemia, coagulation profile to rule out bleeding/coagulation defects as cause of cerebral haemorrhage. ECG, Xray Chest and ECHO were done in relevant cases to rule out cardiovascular etiology.

2) The patients with age ranging from 30 years to 90 years were divided into 3 groups:
- up to 40 years (≤ 40 years)
- 41- 59 years
- ≥ 60 years.

3) Patients presenting at the time of data collection.

EXCLUTION CRITERIA:
1. Patients with age less than 30 years.
2. Patients with embolic stroke, as there are no significant changes in the lipid profile in them.
3. Neurological deficit not fitting into above clinical/radiological criteria for cerebrovascular disease.

STUDY TOOLS
All patients will be subjected to following laboratory investigation-
1. Fasting Blood Glucose->110mg/dl or drug treatment for elevated glucose. It is measured by oxidase-peroxidase method .This test is specific ,reproducible ,sensitive and rapid.
2. Triglyceride:>150mg/dl in both sexes is taken as fulfilling criteria for metabolic syndrome. It is measured by enzymatic method(Foster and Dunn) Hantzsh reaction.
3. HDL cholesterol :In this procedure, VLDL, chylomicrons and LDL were precipitated by phosphotungstate in the presence of magnesium ions and HDL cholesterol was estimated from supernatant. All measurements are taken using highly sophisticated modular system of Boheinger knoll, West Germany.
4. Waist Circumference-It is measured halfway between highest level of iliac crest and lower rib margin during minimal inspiration.

5. Blood Pressure-3 Blood pressure readings are to be taken at 2minute intervals in lying posture and highest value is taken into consideration, using a standard Sphygmomanometer.

STUDY TECHNIQUES:

Patients will be selected based on the inclusion criteria from General medicine OPD and ward of N.R.S Medical College and Hospital. Data will be collected by pretested semi-structured questionnaire, clinical examination and investigation.

WORK PLAN:

Study will be done from February 2021 to September 2022, i.e., through one and half year period.

Observations

(Result & Analysis)

Statistical Analysis

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. One-way analysis of variance (one-way ANOVA) was a technique used to

compare means of three or more samples for numerical data (using the F distribution). A chi-squared test ($\chi 2$ test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as

short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. Explicit expressions that can be used to carry out various *t*-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a *t*-distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one-tailed test or a two-tailed test.

Once a *p* value is determined, a *p*-value can be found using a table of values from Student's t-distribution. If the calculated *p*-value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favour of the alternative hypothesis.

P-value ≤ 0.05 was considered for statistically significant.

STROKE PATTERNS IN 100 PATIENTS-PIE CHART OF % HEMORRHAGIC/THROMBOTIC/UNCLASSIFIED

	No. of PTS	Percentage (%)
Thrombotic	80	80
Haemorrhage	12	12
Unclassified	8	8

Thrombotic stroke were 80% , Haemorrhage 12 % , Unclassified 8% .

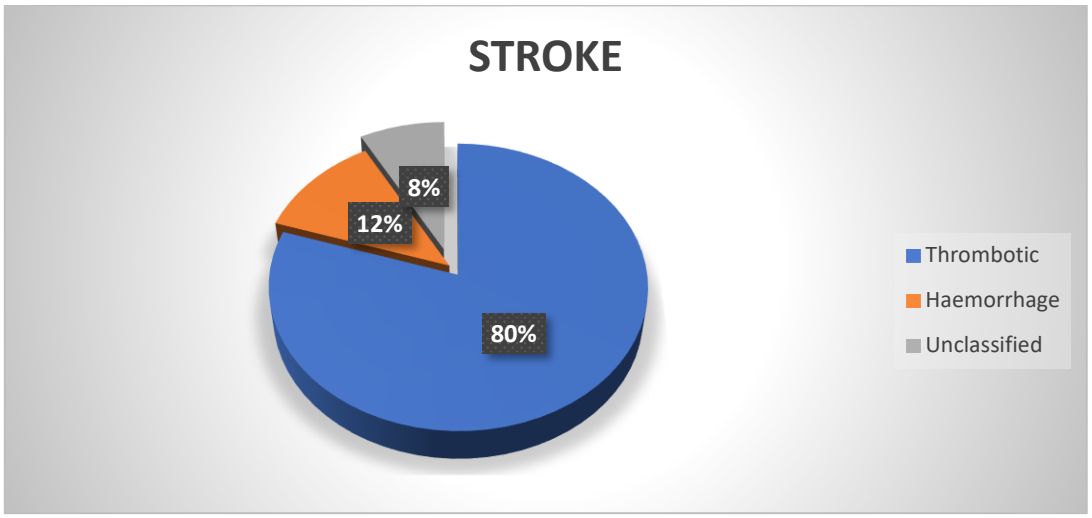

Fig 1 : Pie diagram shows the distribution of stroke .

Gender Wise Distribution Of Stroke Patterns-Male/Female (Of Each Patterns)

Type of stroke * Gender Cross tabulation				
Count				
		Gender		
		Female	Male	Total
Type of stroke	Haemorrhage	1	11	12
	Thrombotic	27	53	80
	Unclassified	2	6	8
Total		30	70	100

Chi square value = 3.313 p-value = 0.191

Inference: - In gender female , maximum stroke patients were Thrombotic 27 and in male it was 53 in Thrombotic stroke .

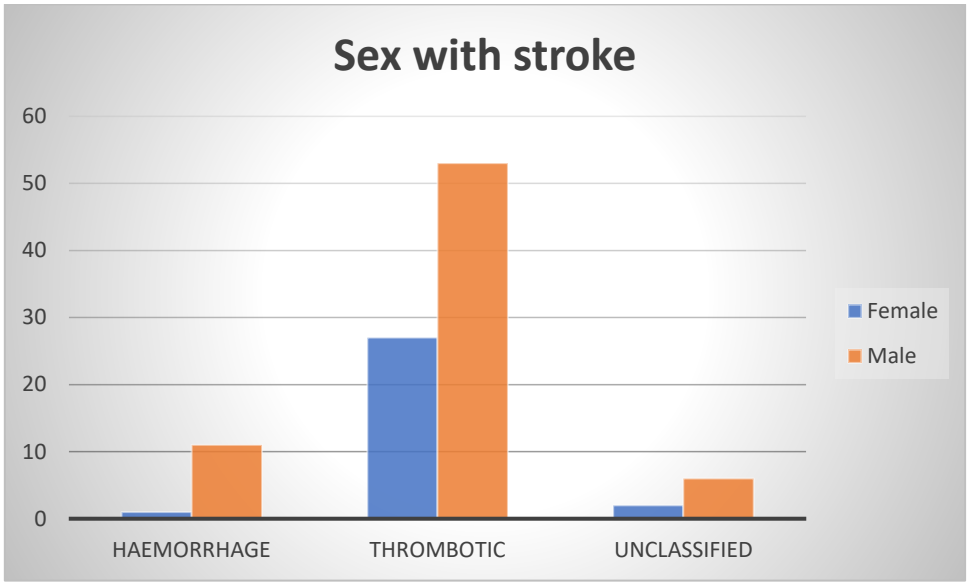

Fig 2 : Multiple Bar diagram shows the distribution of Gender with stroke ..

TERRITRRY DISTRIBUTION OF STROKE-ACA-ANTERIOR CEREBRAL ARTERY,PCA-POSTERIOR CEREBRAL ARTERY,MCA-MIDDLE CEREBRAL ARTERY.(WITH NUMNBER OF PATIENTS IN EACH CATEGORY)RESULT-WHICH TERRITORY IS MOST COMMONLY INVOLVED IN STROKE.

Type of stroke * Territory Distribution Cross tabulation						
Count						
		Territory Distribution				
		0	ACA	MCA	PCA	Total
Type of stroke	Haemorrhage	0	0	10	2	12
	Thrombotic	0	3	68	9	80
	Unclassified	8	0	0	0	8
Total		8	3	78	11	100

Chi square value = 100.771 p-value < 0.001

Inference: - In Territory Distribution MCA, maximum stroke patients were Thrombotic 68 , in PCA it was 9 in Thrombotic stroke and in ACA it was 3.

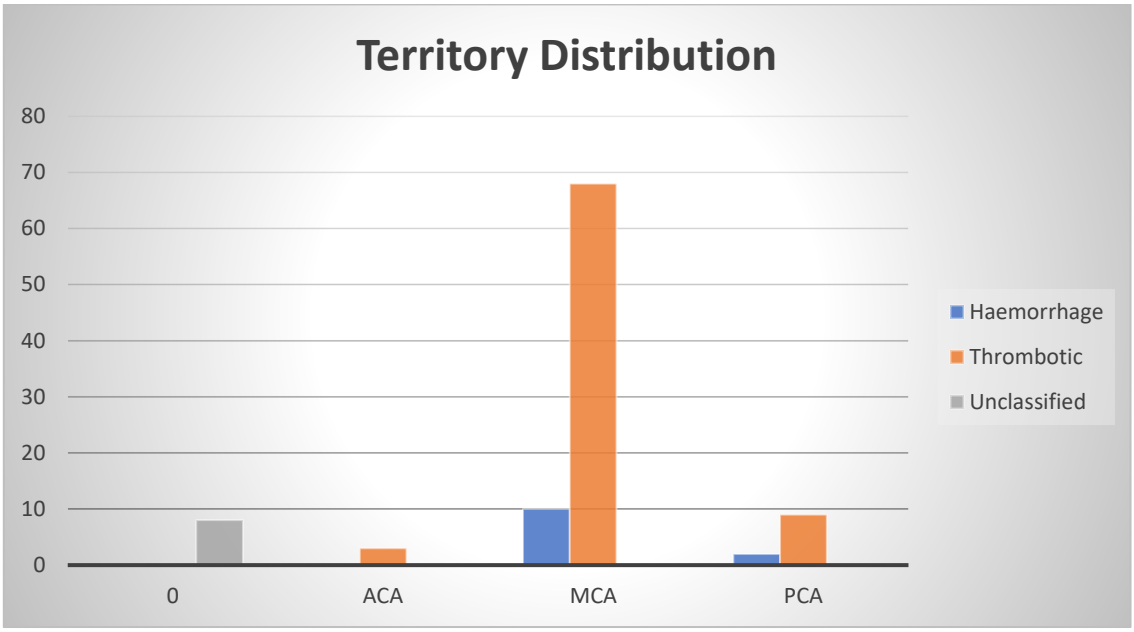

Fig 3 : Multiple Bar diagram shows the Territory Distribution with stroke .

GENDER IN RELATION TO STROKE PATTERNS AND TERRITORY INVOLVED.RESULT-COMMON STROKE IN MALE/FEMALE WITH MOST COMMON TERRITORY INVOLVED IN EACH GENDER.

Type of stroke * Territory Distribution * Gender Cross tabulation								
Count								
Gender			Territory Distribution				Total	p-value
			0	ACA	MCA	PCA		
Female	Type of stroke	Haemorrhage	0	0	0	1	1	P< 0.001
		Thrombotic	0	2	23	2	27	
		Unclassified	2	0	0	0	2	
	Total		2	2	23	3	30	
Male	Type of stroke	Haemorrhage	0	0	10	1	11	P,0.001
		Thrombotic	0	1	45	7	53	
		Unclassified	6	0	0	0	6	
	Total		6	1	55	8	70	
Total	Type of stroke	Haemorrhage	0	0	10	2	12	P<0.001
		Thrombotic	0	3	68	9	80	
		Unclassified	8	0	0	0	8	
	Total		8	3	78	11	100	

Inference: - In Territory Distribution MCA, maximum stroke patients were Thrombotic 23 among female,

in male it was 45 . Statistically significant relation with the female as well as for male . .

OCCUPATION AND STROKE WITH GENDER WISE DISTRIBUTION

Type of stroke * Occupation * Gender Cross tabulation							
Count							
Gender			Occupation			Total	p-value
			Manual Labourer	Moderate Activity	Sedentary		
Female	Type of stroke	Haemorrhage	0	1	0	1	0.038
		Thrombotic	6	2	19	27	
		Unclassified	1	0	1	2	
	Total		7	3	20	30	
Male	Type of stroke	Haemorrhage	5	4	2	11	0.781
		Thrombotic	24	22	7	53	
		Unclassified	2	2	2	6	
	Total		31	28	11	70	
Total	Type of stroke	Haemorrhage	5	5	2	12	
		Thrombotic	30	24	26	80	
		Unclassified	3	2	3	8	
	Total		38	31	31	100	

Inference: - In Occupation sedentary, maximum stroke patients were Thrombotic 19 among female, in male it was 22 in the occupation group moderate activity . statistically significant relation with the female but not for male . .

AGE WISE MALE & FEMALE STROKE PATIENTS.

Age * Type of stroke * Gender Cross tabulation							
Count							
Gender			Type of stroke			Total	P-value
			Haemorrhage	Thrombotic	Unclassified		
Female	Age	≤ 40	0	2	0	2	0.888
		41- 59	1	25	2	28	
	Total		1	27	2	30	
Male	Age	≤ 40	1	8	0	9	0.803
		41- 59	1	8	1	10	
		≥ 60	9	37	5	51	
	Total		11	53	6	70	
Total	Age	≤ 40	1	8	0	9	0.896

		41- 59	1	10	1	12	
		≥ 60	10	62	7	79	
	Total		12	80	8	100	

Inference: - In Gender Female , maximum stroke patients were Thrombotic 25 in the age group 41-50., in male it was 37 in the age group ≥ 60. No statistically significant relation .

AGE WISE DISTRIBUTION OF FASTING BLOOD SUGAR IN BOTH SEXES SEPERATELY

Age * FBS(F), 1=normal, 2=high * Gender Cross tabulation						
Count						
Gender			FBS(F), 1=normal, 2=high		Total	P-value
			Normal	High		
Female	Age	41- 59	1	1	2	0.685
		≥ 60	10	18	28	
	Total		11	19	30	
Male	Age	≤ 40	1	8	9	0.100
		41- 59	5	5	10	
		≥ 60	25	26	51	
	Total		31	39	70	
Total	Age	≤ 40	1	8	9	0.134
		41- 59	6	6	12	
		≥ 60	35	44	79	
	Total		42	58	100	

Inference: - In Gender Female , maximum FBS patients were Hig18 , in the age group 41-50., in male it was 26 in the age group ≥ 60 . No statistically significant relation .

WISE DISTRIBUTION OF HDL IN BOTH SEXES

Age * HDL(H) * Gender Cross tabulation			
Count			
Gender	HDL(H)	Total	P-value

			Normal	High		
Female	Age	41-59	2	0	2	0.786
		≥ 60	27	1	28	
	Total		29	1	30	
Male	Age	≤ 40	2	7	9	0.276
		41-59	5	5	10	
		≥ 60	26	25	51	
	Total		33	37	70	
Total	Age	≤ 40	2	7	9	0.030
		41-59	7	5	12	
		≥ 60	53	26	79	
	Total		62	38	100	

Inference: - In Gender Female , maximum HDL patients were normal 27 , in the age group ≥ 60., in male it was 26 in the age group ≥ 60. No statistically significant relation for male as well as female but as a whole significant relation with age & HDL .

AGE WISE DISTIBUTION OF TGL IN BOTH SEXES

Age * TGL(T) * Gender Cross tabulation						
Count						
Gender			TGL(T)		Total	P-value
			Normal	High		
Female	Age	41-59	1	1	2	0.765
		≥ 60	17	11	28	
	Total		18	12	30	
Male	Age	≤ 40	5	4	9	0.020
		41-59	3	7	10	
		≥ 60	38	13	51	
	Total		46	24	70	
Total	Age	≤ 40	5	4	9	0.044
		41-59	4	8	12	
		≥ 60	55	24	79	
	Total		64	36	100	

Inference: - In Gender Female , maximum TGL (T) patients were normal 17 , in the age group ≥ 60., in male it was 38 in the age group ≥ 60. No statistically significant relation for female but male significant relation and as a whole significant relation with age & TGL (T) .

AGE WISE DISTIBUTION OF WAIST CIRCUMFERENCE IN BOTH SEXES.

Age * WC(W) * Gender Cross tabulation						
Count						
Gender			WC(W) Normal	WC(W) High	Total	P-VALUE
Female	Age	41-59	1	1	2	0.844
		≥ 60	16	12	28	
	Total		17	13	30	
Male	Age	≤ 40	8	1	9	0.463
		41-59	8	2	10	
		≥ 60	36	15	51	
	Total		52	18	70	
Total	Age	≤ 40	8	1	9	0.326
		41-59	9	3	12	
		≥ 60	52	27	79	
	Total		69	31	100	

Inference: - In Gender Female , maximum WC (W) patients were normal 16 , in the age group ≥ 60., in male it was 36 in the age group ≥ 60. No statistically significant relation .

AGE WISE DISTIBUTION OF BLOOD PRESSURE IN BOTH SEXES.

Age * BP * Gender Cross tabulation						
Count						
Gender			BP Normal	BP High	Total	P-value
Female	Age	41-59	0	2	2	0.513
		≥ 60	5	23	28	

	Total		5	25	30	
Male	Age	≤ 40	0	9	9	0.200
		41-59	3	7	10	
		≥ 60	8	43	51	
	Total		11	59	70	
Total	Age	≤ 40	0	9	9	0.294
		41-59	3	9	12	
		≥ 60	13	66	79	
	Total		16	84	100	

Inference: - In Gender Female , maximum Blood Pressure patients were high 23 , in the age group ≥ 60., in male it was 43 in the age group ≥ 60. No statistically significant relation .

PREVALENCE OF METABOLIC SYNDROME(MS) IN STROKE PATIENTS IN BOTH SEXES AND ALL TOTAL SPERATELY IN DIFFERENT CHARTS.

Age * MS(>=3) * Gender Cross tabulation						
Count						
			MS(>=3)			
Gender			NO	YES	Total	P-value
Female	Age	41-59	0	2	2	0.377
		≥ 60	8	20	28	
	Total		8	22	30	
Male	Age	≤ 40	4	5	9	0.782
		41-59	6	4	10	
		≥ 60	28	23	51	
	Total		38	32	70	
Total	Age	≤ 40	4	5	9	0.955
		41-59	6	6	12	
		≥ 60	36	43	79	
	Total		46	54	100	

Inference: - In Gender Female , maximum MS patients were present 20 , in the age group ≥ 60., in male it was 23 in the age group ≥ 60. No statistically significant relation .

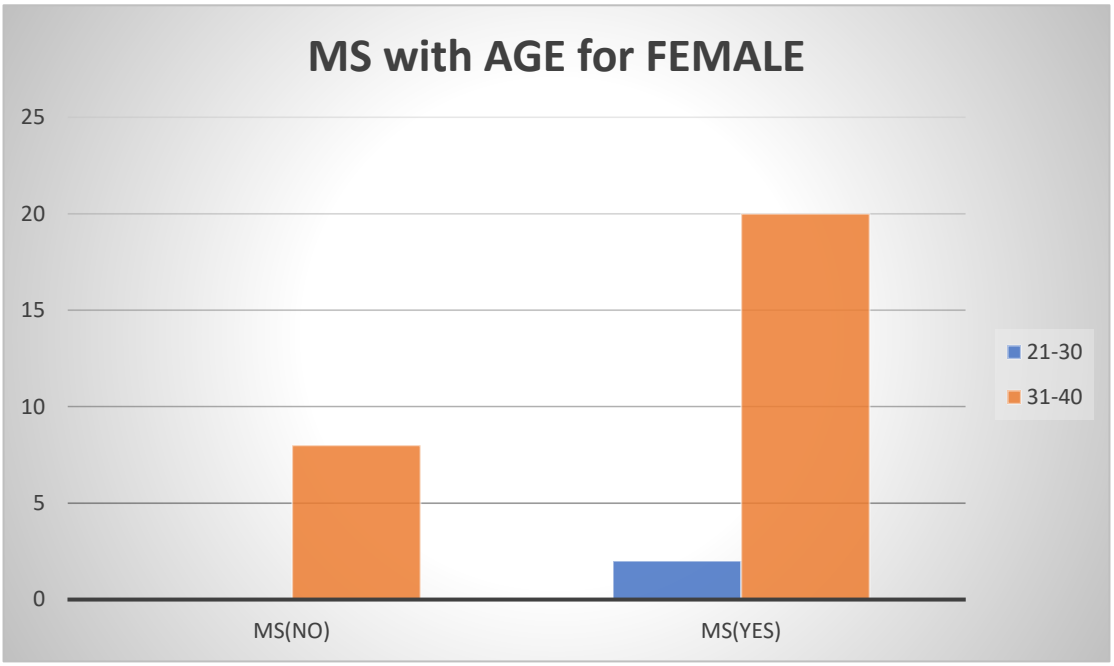

Fig 4 : Multiple Bar diagram shows the MS with AGE for FEMALE

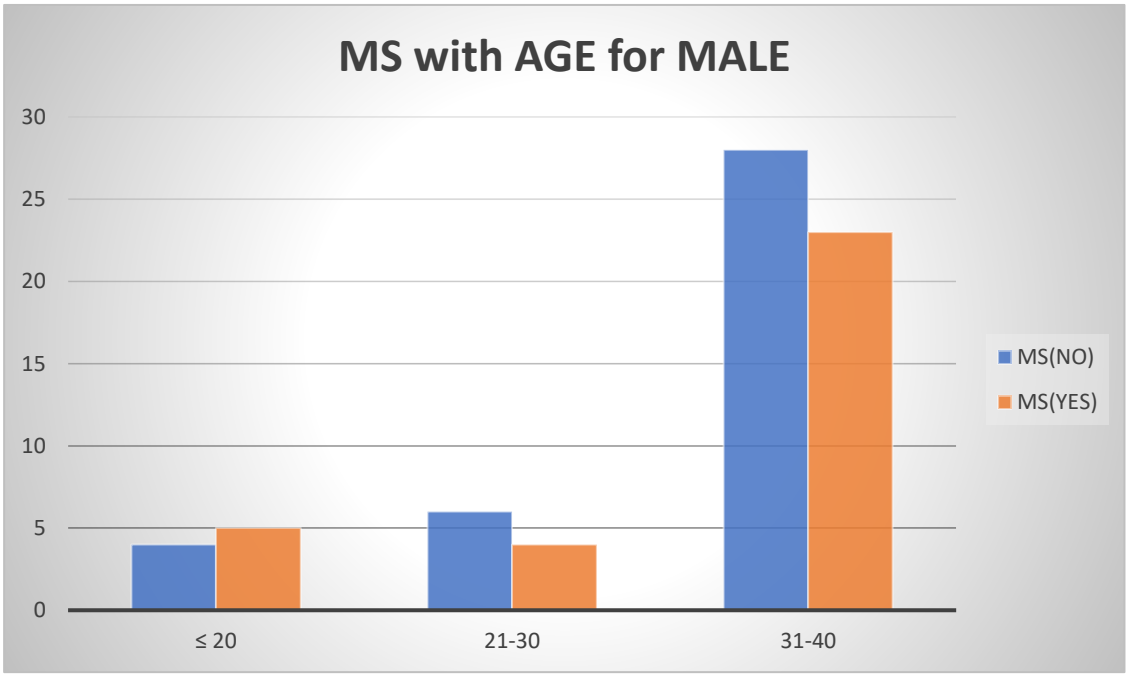

Fig 5 : Multiple Bar diagram shows the MS with AGE for MALE

METABOLIC SYNDROME AND TYPE OF STROKE.

Type of stroke * MS(>=3) Cross tabulation	

Count					
		MS(>=3)			P-value
		NO	YES	Total	
Type of stroke	Haemorrhage	6	6	12	0.858
	Thrombotic	37	43	80	
	Unclassified	3	5	8	
Total		46	54	100	

Inference: - In Thrombotic stroke , maximum MS patients were present 43 , . No statistically significant relation between them .

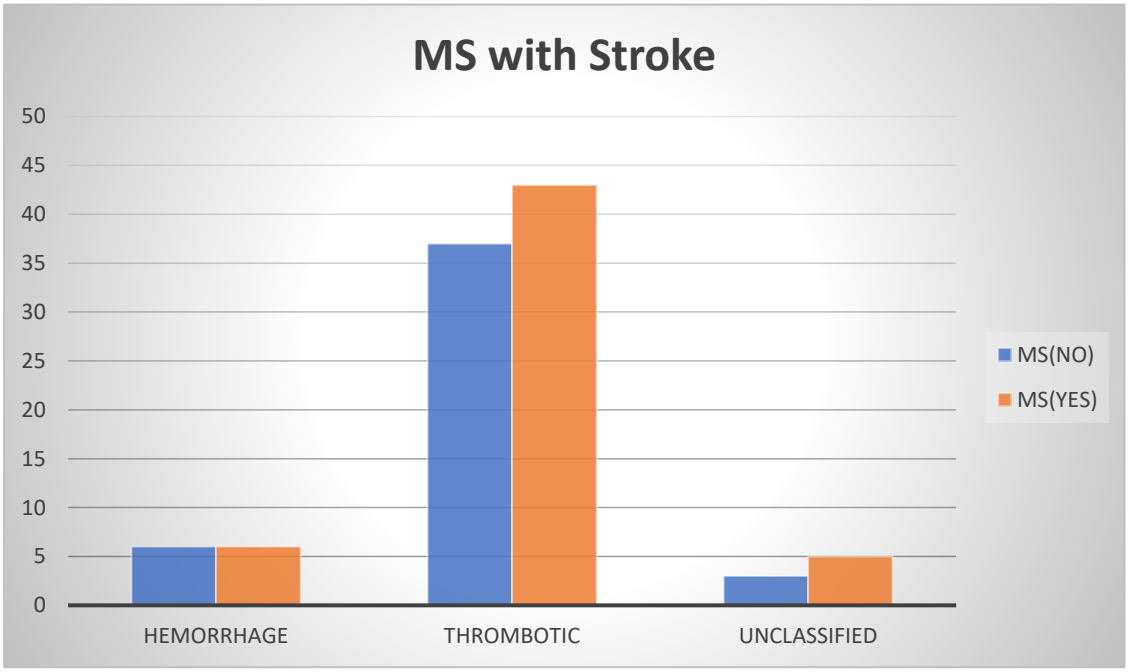

Fig 6 : Multiple Bar diagram shows the MS with stroke

18.% CONTRIBUTION OF EACH METABOLIC PARAMETER TO MS IN BOTH SEXES.

Gender * MS(>=3) Cross tabulation						
			MS(>=3)			P-value
			NO	YES	Total	
Gender	Female	Count	8	22	30	0.011
		Row%	26.7%	73.3%	100.0%	
		Column%	17.4%	40.7%	30.0%	

	Male	Count	38	32	70	
		Row%	54.3%	45.7%	100.0%	
		Column%	82.6%	59.3%	70.0%	
Total		Count	46	54	100	
		Row%	46.0%	54.0%	100.0%	
		Column%	100.0%	100.0%	100.0%	

In gender Female , MS present in 22 (40.7%) and in male , MS present in 32 (59.3%) . There were statistically significant relation between them .

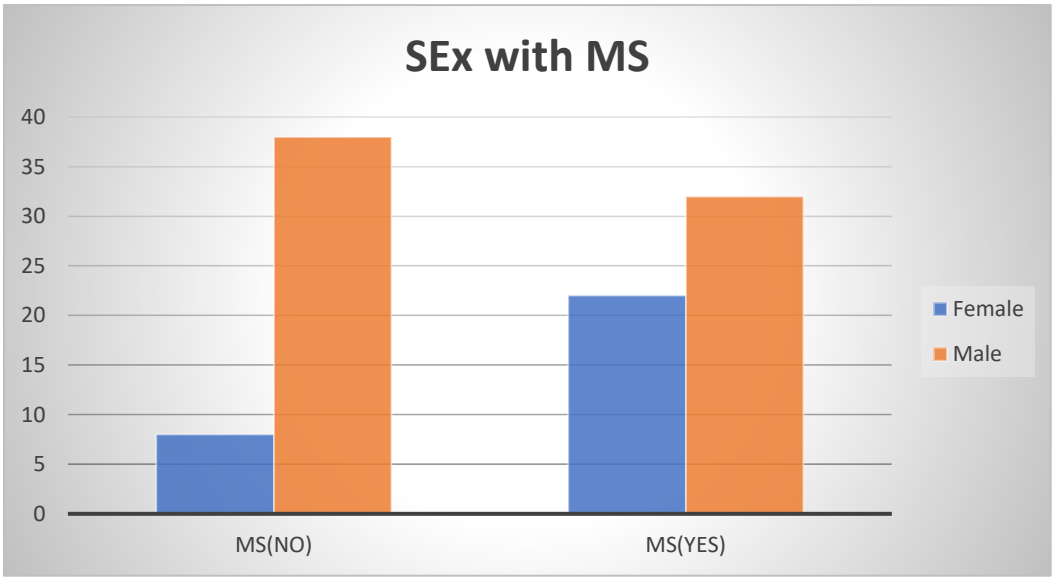

Fig 7 : Multiple Bar diagram shows the MS with sex

CONTRIBUTION OF EACH METABOLIC PARAMETER TO MS IN 100 STROKE PATIENTS.

Type of stroke * MS(>=3) Cross tabulation						
			MS(>=3)			P-value
			NO	YES	Total	
Type of stroke	Haemorrhage	Count	6	6	12	0.858
		Row%	50.0%	50.0%	100.0%	
		Column%	13.0%	11.1%	12.0%	
	Thrombotic	Count	37	43	80	

		Row%	46.3%	53.8%	100.0%	
		Column%	80.4%	79.6%	80.0%	
	Unclassified	Count	3	5	8	
		Row%	37.5%	62.5%	100.0%	
		Column%	6.5%	9.3%	8.0%	
Total		Count	46	54	100	
		Row%	46.0%	54.0%	100.0%	
		Column%	100.0%	100.0%	100.0%	

In Hemorrhage stroke , MS present in 6 (11.1 %) patients and in Thrombotic stroke , MS present in 43(79.6 %) . There were no statistically significant relation between them .

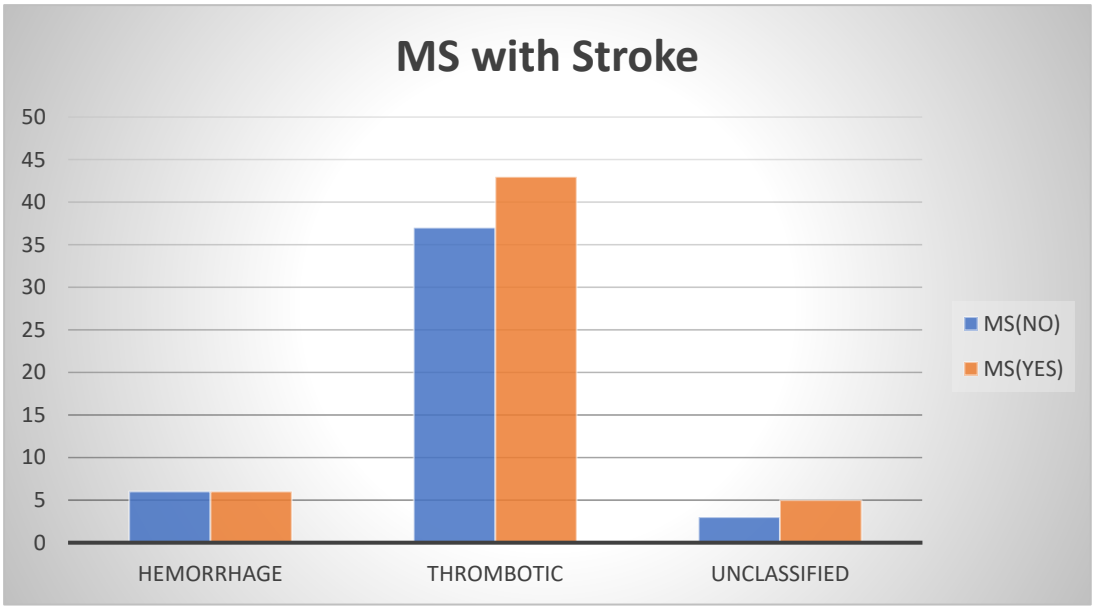

Fig 8 : Multiple Bar diagram shows the MS with stroke

MS AND AGE IN BOTH SEXES.

Age * MS(>=3) * Gender Cross tabulation						
Count						
Gender			MS		Total	P-value
			NO	YES		
Female	Age	≤ 40	0	2	2	0.377
		41-59	8	20	28	
	Total		8	22	30	
Male	Age	≤ 40	4	5	9	0.782
		41-59	6	4	10	

		≥ 60	28	23	51	
	Total		38	32	70	
Total	Age	≤ 40	4	5	9	0.955
		41-59	6	6	12	
		≥ 60	36	43	79	
	Total		46	54	100	

In gender Female , MS present in 20 in the age group ≥ 60 and in male , MS present in 23 in the age group ≥ 60 . There were no statistically significant relation between them .

SMOKING AND MS.GENDER WISE.

SMOKING * MS(>=3) * Gender Cross tabulation						
Count						
Gender			MS(>=3) NO	MS(>=3) YES	Total	P-value
Female	SMOKING	NO	1	22	23	P<0.001
		YES	7	0	7	
	Total		8	22	30	
Male	SMOKING	NO	7	13	20	0.045
		YES	31	19	50	
	Total		38	32	70	
		NO	8	35	20	P<0.001
		YES	38	19	57	
	Total		46	54	100	

In gender Female , MS present in 22 in the non smoker and in male , MS present in 19 in smoker. There were statistically significant relation between them .

ALCOHOL AND MS.GENDER WISE.

ALCOHOL * MS(>=3) * Gender Cross tabulation				
Count				
Gender	MS(>=3) NO	MS(>=3) YES	Total	P-value

Female	ALCOHOL	NO	1	22	23	P<0.001
		YES	7	0	7	
	Total		8	22	30	
Male	ALCOHOL	NO	10	8	18	0.900
		YES	28	24	52	
	Total		38	32	70	
		NO	11	30	41	P<0.001
		YES	35	24	59	
	Total		46	54	100	

In gender Female , MS present in 22 in the nonalcoholic and in male , MS present in 24 in alcoholic There were statistically significant relation between them for female but not not male . .

DIABETES AND MS(FBS>125).

DIABETIC * MS(>=3) Crosstabulation					
Count					
		MS(>=3)			P-VALUE
		NO	YES	Total	
DIABETIC	NO	5	8	13	P<0.001
	Y	9	0	9	
	YES	0	36	36	
Total		14	44	58	

In FBS>125 , MS present in 36 in the Diabetic patients and 9 patients having Ms absent but diabetic There were statistically significant relation between them .

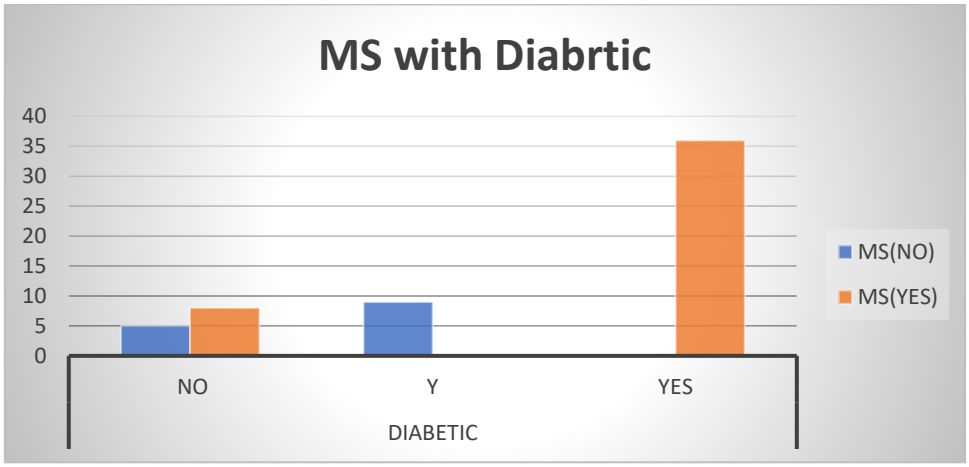

Fig 8 : Multiple Bar diagram shows the MS with diabetic with FBS >125.

PREDIABETES AND MS(FBS 100-125).

		MS (>3)			
		NO	YES	Total	P-value
PRE-DM	NO	37	6	43	P<0.001
	Y	11	0	11	
	YES	0	4	4	
Total		48	10	58	

In FBS>125 , MS present in 4 in the Pre Diabetic patients and 11 patients having Ms absent but diabetic There were statistically significant relation between them .

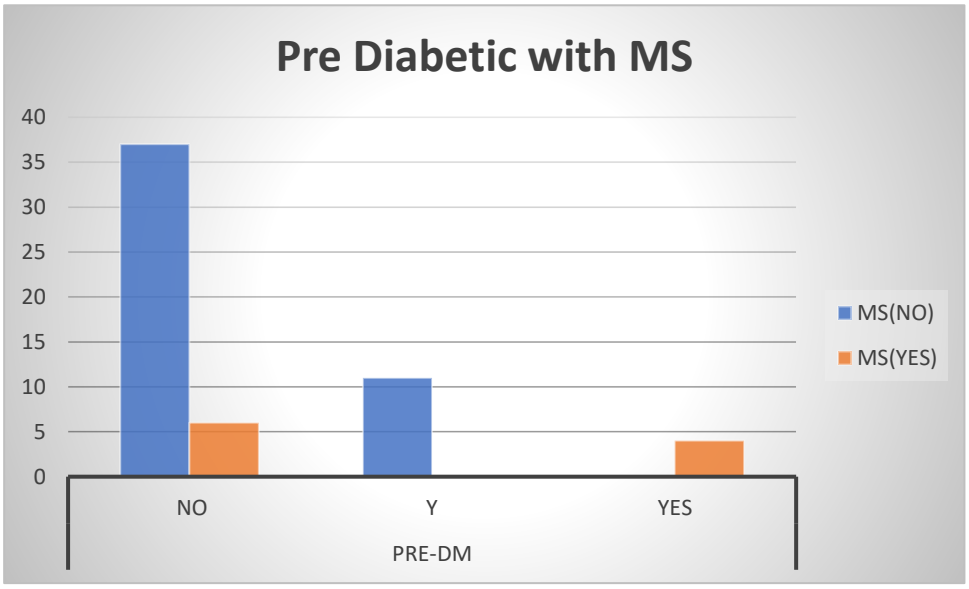

Fig 9 : Multiple Bar diagram shows the MS with diabetic with FBS (100-125)

HYPERTENTION(HTN) AND MS GENDER WISE.(BP>=140/90).

HTN * MS(>=3) * Gender Crosstabulation						
Count						
Gender			MS(>=3) No	MS(>=3) YES	Total	P-value
Female	HTN	No	0	1	1	P<0.001
		Y	8	0	8	
		YES	0	16	16	
	Total		8	17	25	
		Y	29	0	29	P<0.001
		YES	0	30	30	
	Total		29	30	59	
		No	0	1	1	P<0.001
		Y	37	0	37	
		YES	0	46	46	
	Total		37	47	84	

In BP> 140/90 , MS present in 16 in the Hypertension patients and 8 patients having Ms absent but Hypertensive in gender female . In male MS present in 30 in the Hypertension patients and 29 patients having Ms absent but Hypertensive . There were statistically significant relation between them .

HTN+DIABETES IN MS GENDER WISE.

HTN+DM * MS(>=3) * Gender Cross tabulation						
Count						
Gender			MS(>=3) N	MS(>=3) Y	Total	P-value
Female	HTN+DM	N	8	12	20	0.051
		Y	0	10	10	
	Total		8	22	30	
Male	HTN+DM	NO	38	13	51	P<0.001

		Y	0	19	19	
	Total		38	32	70	
Total	HTN+DM	NO	46	25	71	P<0.001
		Y	0	29	29	
	Total		46	54	100	

In gender female, 10 patents were HTN+DM with the presence of MS and in Male , 19 patients were HTN+DM with the presence of MS .There were statistically significant relation between them .

HDL CHOLESTEROL AND MS GENDER WISE.

HDL(H) * MS(>=3) * Gender Cross tabulation						
Count						
Gender			MS(>=3) NO	MS(>=3) YES	Total	P-value
Female	HDL(H)	Normal	8	21	29	0.540
		High	0	1	1	
	Total		8	22	30	
Male	HDL(H)	Normal	12	21	33	P<0.001
		High	26	11	37	
	Total		38	32	70	
Total	HDL(H)	Normal	20	42	62	0.004
		High	26	12	38	
	Total		46	54	100	

In gender female, 21 patents were normal HDL with the presence of MS and in Male , 37 patients were High HDL with the presence of MS .There were statistically significant relation between them .

TRIGLYCERIDE AND MS GENDER WISE.

TGL(T) * MS(>=3) * Gender Cross tabulation	
Count	

Gender			MS(>=3) N	MS(>=3) Y	Total	P-value
Female	TGL(T)	Normal	8	10	18	0.007
		High	0	12	12	
	Total		8	22	30	
Male	TGL(T)	Normal	31	15	46	0.002
		High	7	17	24	
	Total		38	32	70	
Total	TGL(T)	Normal	39	25	64	P<0.001
		High	7	29	36	
	Total		46	54	100	

In gender female, 12 patents were high TGL with the presence of MS and in Male , 17 patients were High HDL with the presence of MS .There were statistically significant relation between them .

WAIST CIRCUMFERENCE AND MS GENDER WISE.

WC(W) * MS(>=3) * Gender Cross tabulation						
Count						
Gender			MS(>=3) N	MS(>=3) Y	Total	P-value
Female	WC(W)	Normal	8	9	17	0.004
		High	0	13	13	
	Total		8	22	30	
Male	WC(W)	Normal	35	17	52	P<0.001
		High	3	15	18	
	Total		38	32	70	
Total	WC(W)	Normal	43	26	69	P<0.001
		High	3	28	31	
	Total		46	54	100	

In gender female, 13 patents were high WC with the presence of MS and in Male , 15 patients were High WC with the presence of MS .There were statistically significant relation between them .

DISCUSSION

It is a prediabetes aggregation of symptoms and a more prevalent risk factor than is type2 diabetes mellitus .India is already the diabetic capital of the world. Subsequently, epidemiological studies have confirmed that this syndrome is a common variety in a wide variety of ethnic groups.

Abdominal obesity-most strongly associated with the metabolic syndrome. It presents clinically as increased waist circumference. Leptin deficiency or resistance leads to tissue deposition of fat.

Atherogenic dyslipidaemia -Increased Triglycerides, decreased HDL are implicated independently in being atherogenic. Elevated Blood pressure strongly associated with obesity and occurs in insulin resistant persons. Insulin resistance is a physiological change in insulin action manifesting as resistance to insulin mediated glucose disposal .It is the fundamental defect in linking individual components of metabolic syndrome. Patients with longstanding insulin resistance frequently manifest glucose intolerance, which itself is an independent risk factor for CVD. In a study done by **Hillier TA et al** in older women (>65) with diabetes, metabolic syndrome was associated with 2 to 3 fold higher mortality risk due to CVD.[5] In a prospective cohort study done by **koren-Morag N et al** it was shown that all the components of metabolic syndrome were associated with increased risk for ischaemic stroke or TIA, but impaired fasting glucose and hypertension were the strongest risk predictors. [6] .

In the present study maximum stroke patients were Thrombotic (80%) followed by Haemorrhage stroke (12%) and unclassified were only (8%). Stroke probability was in more male than female in Thrombotic In Territory Distribution MCA, maximum stroke patients were Thrombotic 68 , in PCA it was 9 in Thrombotic stroke and in ACA it was 3. In Territory Distribution MCA, maximum stroke patients were Thrombotic 23 among female, in male it was 45 . Statistically significant relation with the female as well as for male. As the p-value was < 0.05, at 0.05 level of significance. In Occupation sedentary, maximum stroke patients were Thrombotic 19 among female, in male it was 22 in the occupation group moderate activity. Statistically significant relation with the female but not for male. . In Gender Female, maximum stroke patients were Thrombotic 25 in the age group ≥ 60., in male it was 37 in the age group ≥ 60. No statistically significant relation. In a study done by Zhang Y, et al [24] showed similar result . In Gender Female, maximum FBS patients were High 18 , in the age group ≥ 60., in male it was 26 in the age group ≥ 60. No statistically significant relation. Female, maximum HDL patients were normal 27 , in the age group ≥ 60., in male it was 26 in the age group ≥ 60. No statistically significant relation for male as well as female but as a whole significant relation with age & HDL. Female, maximum TGL (T) patients were normal 17 , in the age group ≥ 60., in male it was 38 in the age group ≥ 60. No statistically significant relation for female but with male significant relation was there and as a whole significant relation with age & TGL (T) . Female, maximum WC (W) patients were normal 16 , in the age group ≥ 60., in male it was 36 in the age group ≥ 60. No statistically significant relation between them. Female, maximum Blood Pressure patients were high 23 , in the age group ≥ 60., in male it was 43 in the age group ≥ 60. No statistically significant relation between them . In Female , maximum MS patients were present 20 , in the age group ≥ 60., in male it was 23 in the age group ≥ 60. No statistically significant relation . In Thrombotic stroke, maximum MS patients were present 43 , . No statistically significant relation between them. Several studies were there in support of this result .

In Haemorrhage stroke, MS present in 6 (11.1 %) patients and in Thrombotic stroke , MS present in 43(79.6 %) . There were no statistically significant relation between them . In gender Female, MS present in 20 in the age group ≥ 60 and in male, MS present in 23 in the age group ≥ 60. There were no statistically significant relation between them. Female , MS present in 22 in the non-alcoholic and in male , MS present in 24 in alcoholic There were statistically significant relation between them for female but not male . In FBS>125 , MS present in 4 in the Pre Diabetic patients and 11 patients having Ms absent but diabetic There were statistically significant relation between them . In BP> 140/90 , MS present in 16 in the Hypertension patients and 8 patients having Ms absent but Hypertensive in gender female . In male MS present in 30 in the Hypertension patients and 29 patients having Ms absent but Hypertensive. There were statistically significant relation between them . In gender female, 10 patents were HTN+DM with the presence of MS and in Male , 19 patients were HTN+DM with the presence of MS .There were statistically significant relation between them . In the study done by Kissela BM, et al [34] denied the above result . In female, 13 patents were high WC with the presence of MS and in Male , 15 patients were High WC with the presence of MS .There were statistically significant relation between them .

SUMMARY

In the present study the following findings were as follows

1. Out of 100 stroke patients, Thrombotic stroke 80 , Haemorrhage 12, Unclassified 8
2. Out of 100 stroke patients, female were 30, male were 70 .
3. 3. Maximum stroke patients were Thrombotic 27 female and in male it was 53
4. 4. In Territory Distribution, MCA were 68, PCA 9, ACA 3
5. In MCA, maximum stroke patients were Thrombotic 23 among female, in male it was 45.
6. In Occupation sedentary, maximum stroke patients were Thrombotic 19 among female, in male it was 22 .
7. In Female , maximum stroke patients were Thrombotic 25 in the age group ≥ 60., in male it was 37 in the age group ≥ 60
8. In Female FBS patients were High 18 , in the age group ≥ 60., in male it was 26 in the age group ≥ 60
9. In Female , maximum HDL patients were normal 27 , in the age group ≥ 60., in male it was 26 in the age group ≥ 60
10. In Female, maximum TGL (T) patients were normal 17 , in the age group ≥ 60., in male it was 38 in the age group ≥ 60.
11. In Female, maximum WC (W) patients were normal 16 , in the age group ≥ 60., in male it was 36 in the age group ≥ 60
12. In Female, maximum Blood Pressure patients were high 23 , in the age group ≥ 60, in male it was 43 in the age group ≥ 60
13. In Female, maximum MS patients were present 20 , in the age group ≥ 60., in male it was 23 in the age group ≥ 60
14. In Thrombotic stroke , maximum MS patients were present 43
15. In Haemorrhage stroke, MS present in 6 (11.1 %) patients and in Thrombotic stroke , MS present in 43(79.6 %) In Female, MS present in 22 in the non-alcoholic and in male , MS present in 24 in alcoholic

16. 17. In FBS>125 , MS present in 4 in the Pre Diabetic patients and 11 patients having Ms absent but diabetic
17. 18. In BP> 140/90 , MS present in 16 in the Hypertension patients and 8 patients having Ms absent but Hypertensive in gender female . In male MS present in 30 in the Hypertension patients and 29 patients having MS absent but Hypertensive
18. In female, 10 patents were HTN+DM with the presence of MS and in Male , 19 patients were HTN+DM with the presence of MS
19. 20. In female, 21 patents were normal HDL with the presence of MS and in Male , 37 patients were High HDL with the presence of MS
20. 21 . In female, 12 patents were high TGL with the presence of MS and in Male , 17 patients were High HDL with the presence of MS
21. 22. In female, 13 patents were high WC with the presence of MS and in Male , 15 patients were High WC with the presence of MS
22. From the present study it was concluded that maximum stroke patients were Thrombotic. This study also showed all the components of metabolic syndrome were associated with increased risk for ischaemic stroke or TIA, but impaired fasting glucose and hypertension were the strongest risk predictors.

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