

*Prevalence of stroke and
Associated risk factors in patients attending
Al-Hussein Teaching Hospital
In Al-Muthanna governorate 2018*

By

Kawther Adil Abd Ali

Sixth grade Medical student AL-Muthanna University

Supervised by

Dr.Asaad Adil Mnaather

F.I.C.M.S _ Neurology

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَيَسْأَلُونَكَ عَنِ الرُّوحِ قُلِ الرُّوحُ مِنْ أَمْرِ رَبِّي وَمَا أُوتِيتُمْ مِنَ
الْعِلْمِ إِلَّا قَلِيلًا

صدق الله العظيم

سورة الاسراء/ اية 85

Dedication

I dedicate my dissertation work to my family

Acknowledgment

First praise is to Almighty Allah.

I would like to express my deep respect and sincere gratitude to my supervisor, Dr. *Asaad Adil Mnaather* for his encouragement, supervision, guidance and support in the accomplishment and presentation of this study.

The last but not least, thanks for every one support me in this work.

Kawther adil abd ali

Content

Title

Chapter one: introduction

Chapter two: objective of study

Chapter three: patients and methods

Chapter four : Results

Chapter five: Discussion

Chapter six: conclusions

Chapter seven: recommendations

References

Abstract

Introduction:-

Stroke is defined as an acute neurological deficit lasting more than 24 hours and caused by cerebrovascular etiology. It is subdivided into ischemic stroke (caused by vascular occlusion or stenosis) and hemorrhagic stroke (caused by vascular rupture).

Patients and methods:

This study enrolled 100 stroke patients which included 56 males and 44 females and we estimate the prevalence of stroke and associated risk factors by using cross-selection study and we depend laboratory and imaging study from the same hospital.

Results:

Prevalence of ischemic stroke about 87% and hemorrhagic stroke about 13%, hypertension was found in 77% as common risk factor, diabetes mellitus in 43%, IHD in 18%, psychological stress is the most common trigger factors about 38%.

Conclusions:-

In this study, we found that ischemic stroke more common than hemorrhagic stroke also show male more affected than female by stroke, hypertension is the commonest risk factors, psychological stress more common than others trigger factors.

Key words: ischemic stroke, hemorrhagic stroke, hypertension, stress.

Chapter one

Introductions

1.1 DEFINITIONS

Stroke is a common medical emergency. The incidence rises steeply with age, and in many lower- and middle-income countries. ⁽¹⁾

Stroke represents the second most common cause of mortality and the third most common cause of disability in developed countries. ⁽²⁾

A stroke, or cerebrovascular accident, is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause. Thus, the definition of stroke is clinical, and diagnostic studies including brain imaging are used to support the diagnosis. The clinical manifestations of stroke are highly variable because of the complex anatomy of the brain and its vasculature. ⁽³⁾

Common causes of ischemic stroke: thrombosis, Lacunar stroke (small vessel), Large-vessel thrombosis. Cardio embolic: Atrial fibrillation, Myocardial infarction, dilated cardiomyopathy, Mechanical valve, mitral stenosis and Bacterial endocarditis. ⁽²⁾

Causes of intracranial hemorrhage: most commonly uncontrolled hypertension. Other causes of hemorrhagic strokes include cerebral amyloid angiopathy, The structural integrity of vessels is another important consideration in hemorrhagic stroke etiology, with aneurysms, arteriovenous malformations, cavernous malformations, capillary telangiectasia, venous angiomas. ⁽⁴⁾

1.2 CLASSIFICATIONS

Stroke classified According to vascular system into: arterial (>99%), venous (<1%), According to pathology into: infarction (85%), hemorrhage (15%), according to site of lesion if infarction into: anterior (carotid) circulation (65%), posterior (vertebrobasilar circulation) (20%), While intracranial hemorrhage was (10%) and (5%) is subarachnoid hemorrhage. TIA: This is similar to a mild ischemic stroke, except that symptoms last for less than 24 hours. ⁽⁵⁾

1.3 PATHOPHYSIOLOGY

Acute occlusion of an intracranial vessel causes reduction in blood flow to the brain region it supplies. A decrease in cerebral blood flow to zero causes death of brain tissue within 4–10 min; values <16–18 mL/100 g tissue per minute cause infarction within an hour; and values <20 mL/100 g tissue per minute cause ischemia without infarction unless prolonged for several hours or days. ⁽²⁾ Within hours, patients often have a central zone of irreversibly damaged tissue destined to die known as the infarct core and a surrounding zone of damaged tissue that may recover with abrupt restoration of CBF known as penumbra. ⁽⁶⁾ Focal cerebral infarction occurs via two distinct pathways: (1) a necrotic pathway in which cellular cytoskeletal breakdown is rapid, due principally to energy failure of the cell, and (2) an apoptotic pathway in which cells become programmed to die. Ischemia produces necrosis by starving neurons of glucose and oxygen, which in turn results in failure of mitochondria to produce ATP. Allowing intracellular calcium to rise, Free radicals are produced by degradation of membrane lipids and mitochondrial dysfunction. ⁽²⁾

The MCA stem, the arteries comprising the circle of Willis and the basilar and vertebral arteries all give rise to 30- to 300- μ m branches that penetrate the deep gray and white matter of the cerebrum or brainstem. Each of these small branches can occlude either by atherothrombotic disease at its origin or by the development of lipohyalinotic thickening. Thrombosis of these vessels causes small infarcts that are referred to as lacunes. These infarcts range in size from 3 mm to 2 cm in diameter. ⁽³⁾

Intracerebral hemorrhage it usually results from rupture of a blood vessel within the brain parenchyma. The explosive entry of blood into the brain parenchyma causes immediate cessation of function in that area as neurons are structurally disrupted.

The hemorrhage itself may expand over the first minutes or hours, or it may be associated with a rim of cerebral edema, which, along with the hematoma, acts like a mass lesion to cause progression of the neurological deficit. If the patient survives, the hematoma is gradually absorbed, leaving a hemosiderin-lined slit in the brain parenchyma.⁽¹⁾

Risk Factors for Ischemic Stroke

A. Non modifiable Risk factors: age Doubles for every successive decade after the age of 55 years, sex: 24% to 30% higher in men, race: 2 to 4-fold higher among African Americans, hereditary: almost 2-fold higher among first-degree relatives.⁽⁷⁾

B. Modifiable Risk Factors: hypertension, Current smoking, obesity, diet, Physical inactivity, hyperlipidemia, diabetes mellitus, heavy alcohol consumption, cardiac causes.⁽⁸⁾

1.4 TRIGGER OF STROKE

A new area of investigation in stroke epidemiology involves the determination of stroke triggers, addressing this issue reflects an increasing recognition that while we have a good understanding of the major stroke risk factors our understanding of why strokes occur at a particular point in time rudimentary.⁽⁹⁾ Potential Stroke Triggers: Depression and psychosocial stress as moderately important trigger factor for stroke, Heavy exertion, heavy meal/alcohol binge, upper respiratory infections, air pollution, coffee consumption, hospitalization for infection, Pregnancy/ postpartum, Recreational drugs, urinary tract infections, weather changes.⁽¹⁰⁾

1.5 CLINICAL DIAGNOSIS

A simple scoring system for TIA, useful for predicting short-term risk of stroke. The scoring system (ABCD2) is based on five easily identifiable factors: patient age, blood pressure, presence or absence of diabetes, type of symptoms, and duration of symptoms. Those with low-risk scores (less than four points) had a stroke risk as low as 1% at 7 days, while those with high-risk scores (greater than five points) had a

12% risk at 1 week.⁽¹¹⁾The most common lacunar infarction syndromes are the following:(1) pure motor (2) pure sensory (3) ataxic hemiparesis (4) dysarthria/clumsy hand or arm. Transient symptoms may herald a small-vessel infarct; they may occur several times a day and last only a few minutes. Recovery from small-vessel strokes tends to be more rapid and complete than recovery from large-vessel strokes; in some cases, however, there is severe permanent disability.⁽²⁾

Unilateral weakness is the classical presentation of stroke. Reflexes are initially reduced but then become increased with a spastic pattern of increased tone. Upper motor neuron weakness of the face (7th cranial nerve) is often present. Dysphasia and dysarthria are the most common presentations of disturbed speech in stroke. Coma is an uncommon feature of stroke, though it may occur with a brainstem event. If it is present in the first 24 hours, it usually indicates a subarachnoid or intracerebral hemorrhage. ⁽¹⁾ Total anterior circulation syndrome (TACS) Combination of: Hemiparesis higher cerebral dysfunction (e.g. aphasia) hemi sensory loss Homonymous hemianopia (damage to optic radiations). ⁽¹⁾ Complete MCA syndromes

are probably responsible for the development of many partial syndromes which include

hand, or arm and hand, weakness alone (brachial syndrome) or facial weakness with nonfluent (Broca) aphasia with or without arm weakness, A combination of sensory disturbance, motor weakness, and nonfluent aphasia suggests that an embolus has occluded the proximal superior division and infarcted large portions of the frontal and parietal cortices. If a fluent (Wernicke's) aphasia occurs without weakness, the inferior division of the MCA supplying the posterior part (temporal cortex) of the dominant hemisphere is probably involved. Jargon speech and an inability to comprehend written and spoken language are prominent features, often accompanied by a contralateral, homonymous superior quadrantanopia. Hemineglect or spatial agnosia without weakness indicates that the inferior division of the MCA in the nondominant hemisphere is involved. ⁽³⁾

Visual field defects (hemianopia, quadrantanopia, sectoranopia), hemi sensory deficit, and neuropsychological dysfunction (transcortical aphasia, memory disturbances) may be seen after occlusion of the posterior choroidal artery. ⁽¹²⁾

1.6 INVESTIGATIONS

Blood tests these help identify underlying causes of cerebrovascular disease: for example, blood glucose (diabetes mellitus), triglycerides and cholesterol (hyperlipidemia) or full blood count. Erythrocyte sedimentation rate (ESR) and immunological tests, such as measurement of ant neutrophil cytoplasmic antibodies (ANCA) may be required when vasculitis is suspected.⁽¹⁾ If there any cardiac source of embolism, Electrocardiogram (ECG), 24-hour ECG monitoring, Echocardiogram (transthoracic echocardiograph, transesophageal echocardiograph).⁽¹⁾

1.7 IMAGINGS

A non-contrast head CT may identify the early signs of stroke, but most importantly will exclude intracerebral hemorrhage and lesions that might mimic acute ischemic stroke such as tumor or intracerebral hemorrhage. ⁽¹³⁾ Magnetic resonance imaging (MRI) is used when there is diagnostic uncertainty or delayed presentation, and when more information on brain structure and function is required. ⁽¹⁾ An MRI without and with contrast is sometimes obtained to assess for an underlying neoplastic or vascular mass, or associated micro hemorrhages that may suggest amyloid angiopathy, multiple cavernous malformations, or septic emboli among other etiologies. In the acute phase, sensitivity of MRI may be limited by mass effect from the hematoma and the complex MRI signal of blood products that may obscure subtle enhancing lesions; its sensitivity is improved in the subacute phase once the hematoma has been resorbed. ⁽¹⁴⁾

1.8 MANAGEMENT

Management is aimed at minimizing the volume of brain that is irreversibly damaged, preventing complications, reducing the patient's disability and handicap through rehabilitation, and reducing the risk of recurrent stroke or other vascular events. With TIA there is no brain damage and disability, so the priority is to reduce the risk of further vascular events. ⁽¹⁾ The recent study confirmed the safety and efficacy of IV tPA(tissue plasminogen activator) in patients with acute ischemic stroke within 4.5 hours of symptom onset. ⁽¹⁵⁾ Aspirin: In the absence of contraindications, aspirin (300 mg daily) should be started immediately after an ischemic stroke unless rt-PA has been given, in which case it should be withheld for at least 24 hours. Aspirin reduces

the risk of early recurrence. In those with intracerebral hemorrhage, coagulation abnormalities should be reversed as quickly as possible to reduce the likelihood of the hematoma enlarging. This most commonly arises in those on warfarin therapy. ⁽¹⁾

Primary prevention

Although appreciable gains have been made in recent years in identifying, treating, and controlling vascular risk factors, rates of insulin resistance, type 2 diabetes, metabolic syndrome, and obesity, these factors increase the risk for cerebrovascular events and worsen the prognosis after stroke. Therefore, in order to reduce the burden of stroke, it is essential to tackle obesity and its related disorders, metabolic syndrome and insulin resistance. Studies have shown that lifestyle factors such as a healthy diet, physical activity, abstinence from smoking, mild alcohol intake, and maintenance of a healthy body mass index (BMI) reduce the risk of cardiovascular disease and mortality. Furthermore, adherence to combinations of these healthy lifestyle practices reduces the incidence of ischemic stroke. ⁽¹⁶⁾

Strategies shown to improve insulin sensitivity include aerobic exercise (increased daily energy expenditure), weight loss, and insulin-sensitizing drugs (metformin, rosiglitazone, and pioglitazone). ⁽¹⁷⁾ maintenance of a body mass index of 18.5 to 24.9 kg/m², regular exercise, consuming a diet rich in fruits and vegetables, and moderate alcohol intake have been associated with a lower risk of stroke. ⁽¹⁶⁾

Secondary prevention for stroke

Statins (antilipid): Ischemic stroke or TIA, The LDL treatment target for the high risk group is less than 100 mg/dL, for the moderate risk group is less than 130 mg/dL, and for the low risk group is less than 160 mg/dL. ⁽¹⁸⁾ Aspirin was the first agent to demonstrate significant benefit in prevention of recurrent stroke. ⁽¹⁹⁾ Hypertension an optimal target for these patients is 130/80 mmHg, but for patients known to have bilateral severe (>70%) internal carotid artery stenosis, SBP of 150 mmHg may be appropriate. ⁽²⁰⁾ Anticoagulation with warfarin (or newer oral anticoagulant): Ischemic stroke patients in acute cardiac emboli. Life style change (BMI between 18.5_24.9). ⁽¹⁾ Levels of HbA1c < 6.5 percentage should not be achieved in diabetic patients with history of cardiovascular disease or vascular risk factors. ⁽²¹⁾ Counseling should include education regarding a healthy diet (encouraging eating at least five

servings of fruits or vegetables per day and avoiding simple carbohydrates, saturated fats, salt, and fast food) and exercise a minimum of 30 minutes of moderate-intensity exercise daily for the primary prevention of stroke. ⁽²²⁾ 1 to 3 times a week for the secondary prevention of stroke. ⁽²³⁾

1.9 COMPLICATIONS

Neurological complication: cerebral edema, epileptic seizures, depression and anxiety. non neurological complication: deep venous thrombosis/ pulmonary embolism, Pressure sores, urinary infection, constipation. ⁽¹⁾ Pneumonia is the most common post-stroke infection. ⁽²⁴⁾

1.10 OUTCOME

Stroke mortality also differs by stroke subtype. The 1-month case fatality rate 8.1% for ischemic strokes and 44.6% for hemorrhagic strokes. ⁽²⁾ Unsurprisingly, longer-term survival after stroke is also age dependent: approximately 6 to 7 years for patients 60 to 69, 5 to 6 years for patients 70 to 79. ⁽²⁵⁾ About one-fifth of patients with an acute stroke die within a month of the event and at least half of those who survive are left with physical disability. ⁽¹⁾

Literature review:-

This was depend on the following previous study:-

1- Ashish Sharma, Kameshwar Prasad, M.V. Padma, Manjari Tripathi, Rohit Bhatia, Mamta Bhusan Singh, Anupriya Sharma, Prevalence of Triggering Factors in Acute Stroke: Hospital-based Observational Cross-sectional Study (February 2015) All consecutive patients of recent stroke were included in the study (290 patients) examined the prevalence of 11 predefined triggers, Psychological stress (17.6%), acute alcohol abuse (10.7%), and clinical infections (8.3%) were the most common triggers.

2_ S. Koton , D. Tanne, Bornstein and M. S. Green, Triggering risk factors for ischemic stroke(December, 2004) In a case-crossover study, 200 consecutive stroke patients were interviewed 1 to 4 days after the event using a validated questionnaire. Reported exposure to potential triggers including negative and positive emotions, anger, sudden posture changes as response to a startling event, heavy physical exertion, heavy eating, and sudden temperature changes, (38%) reported exposure to at least one of the study triggers during the 2-hour hazard period.

3_ Sukdeb Das, Kartick Chandra Ghosh, Satyabrata Pulai, et al, Systemic infection and inflammation as trigger factors of ischemic stroke (Jan 2011), 70 ischemic stroke patients were evaluated within 1.5 ± 1 days after stroke onset, It was found that respiratory tract infection is the most common type of infection (48.5%) compared with the non-stroke control group (30%),there were clinical evidence of infections like gastroenteritis, RTI, UTI etc .

4- Sapna E. Sridharan, Unnikrishnan, Sajith Sukumaran, et al, Incidence, Types, Risk Factors, and Outcome of Stroke in a Developing Country(2009), Trivandrum, Kerala, During a 6-month period, Stroke occurred at a median age of 67 years; only 3.8% of patients were aged 40 years and 74 for ischemic stroke, 10 intracerebral hemorrhage.

Chapter two
Objective of study

Objective of the study:-

- To estimate stroke patients in AL-Muthana governorate.
- To identify the risk factors and the trigger factors for stroke patients

Chapter three

Patients and methods

Our research involved 100 patients whose are selected from AL-Hussein Teaching hospital in AL-Muthanna governorate, from neurocare ward. From July 2018 to January 2019, patient was randomly select who is suffer from ischemic or hemorrhagic infraction, using cross-section study. We divided age categories into three age group (<50, 50-75, >75), also we depend laboratory and imaging study from same hospital as complete blood count, lipid profile, renal function test, echocardiogram, Computed tomography of the brain. We included in our research ischemic stroke (with multiple types), hemorrhagic stroke but not involved subarachnoid hemorrhage, trauma, tumor.

Statistical analysis:-

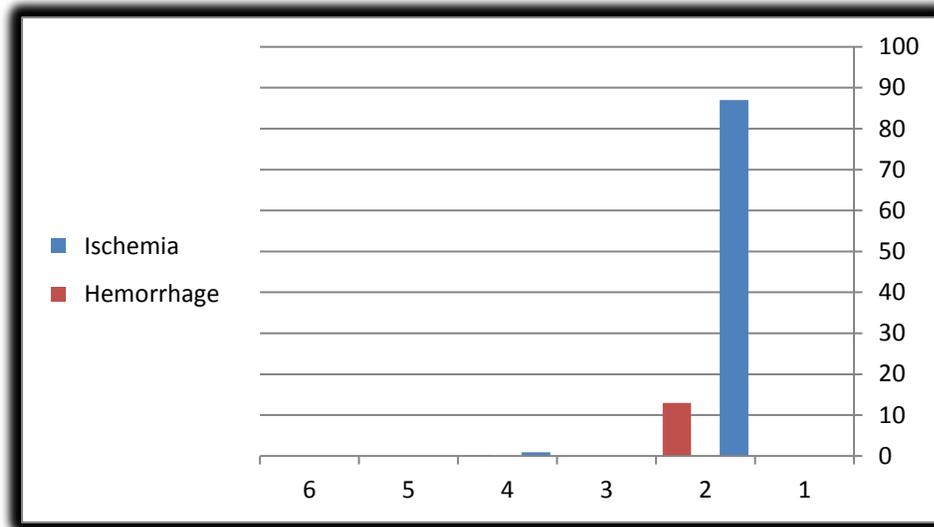
We used SPSS application to analyses data.

Chapter four

Results

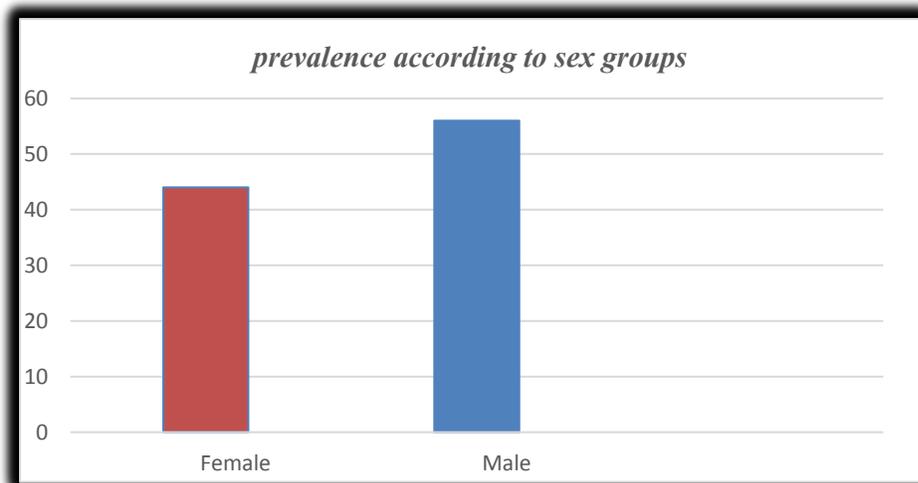
Table(1): prevalence of stroke

Type of stroke	Number	Percentage
Ischemia	87	87%
Hemorrhage	13	13%

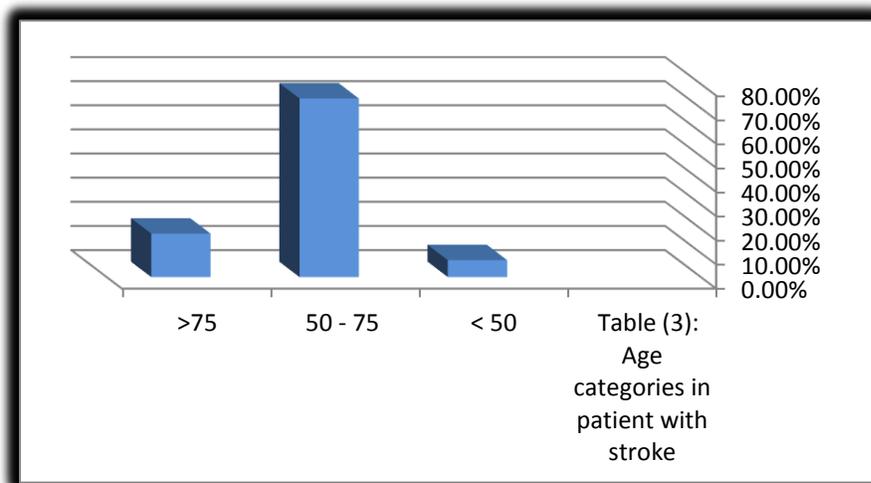


Table(2): prevalence of male and female

Gender	Number	percentage
Male	56	56%
Female	44	44%



< 50	7%
50 - 75	74%
>75	18%



Variable	Number	Percentage
Hypertension	77	77%
diabetes mellitus	43	43%
IHD	18	18%
Smoking	36	36%
Obesity	9	9%

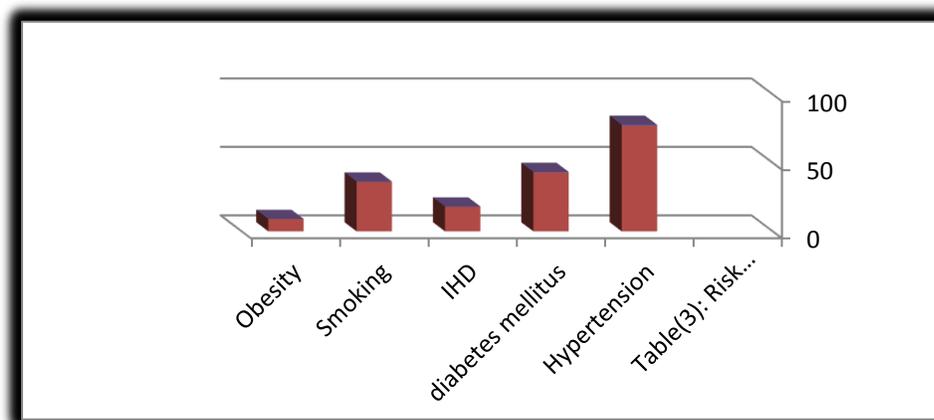


Table (5) : Risk factors with type of stroke

Variable	Ischemic stroke	Hemorrhagic stroke
Hypertension	64 (73 %)	13 (100%)
Diabetes mellitus	40 (45%)	3 (23%)
IHD	18 (20%)	0
Smoking	32 (36%)	4 (30%)
Obesity	6 (7%)	3 (23%)

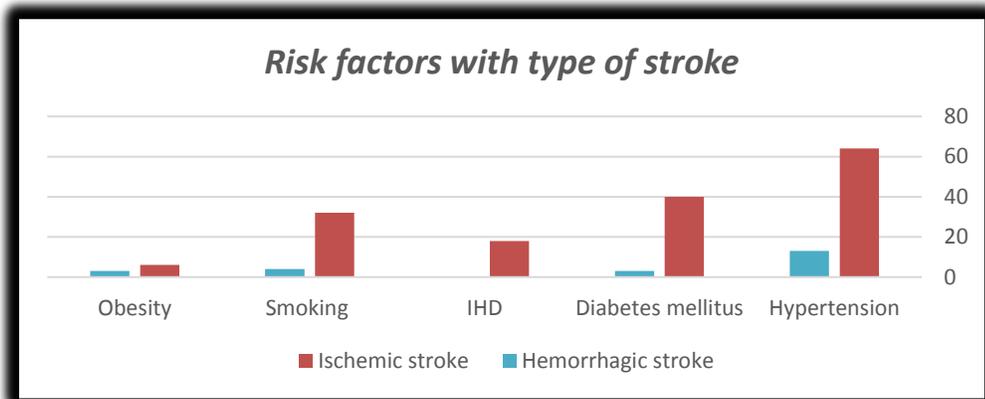


Table (6) : Trigger factors in patient with stroke

Variable	Number	Percent
Emotion	38	38%
Exertion	25	25%
Meal	7	7%
Infection	16	16%
Unknown	14	14%

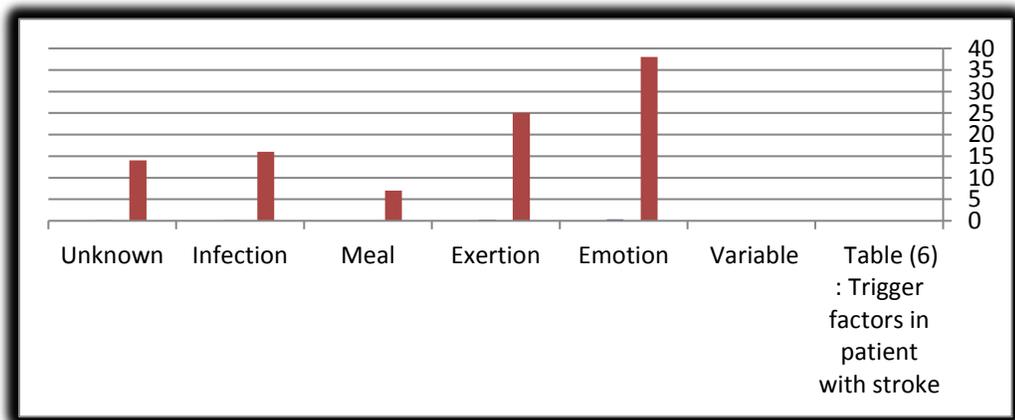
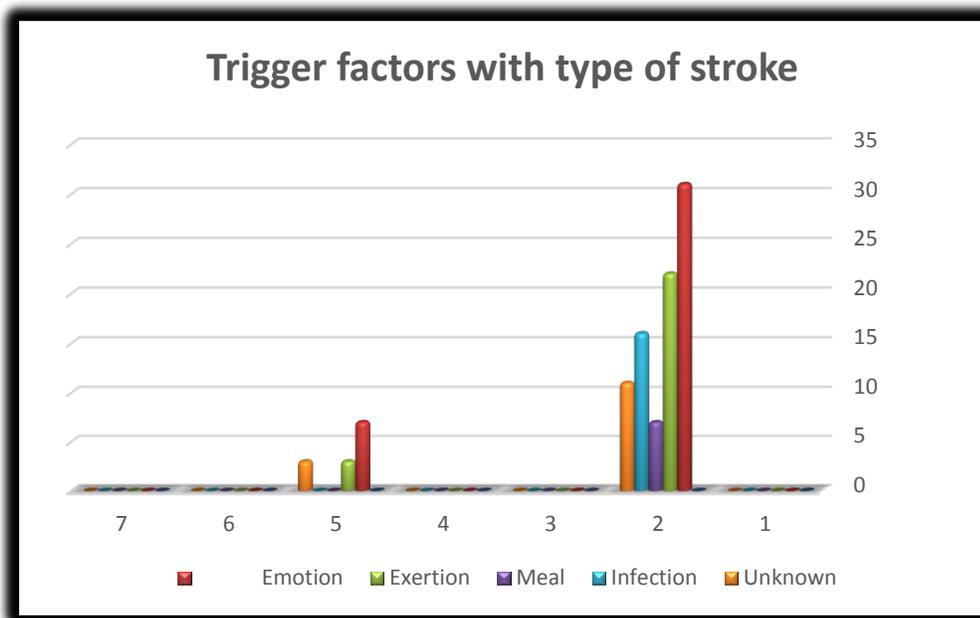


Table (7) : Trigger factors with type of stroke		
Variable	Ischemic stroke	Hemorrhagic stroke
Emotion	31(35%)	7(53%)
Exertion	22 (25%)	3 (23%)
Meal	7 (8 %)	0
Infection	16 (18%)	0
Unknown	11 (12%)	3 (23%)



Chapter five

Discussions

This study is concern about the prevalence of stroke, associated risk factors in patients attending AL-Hussein Teaching Hospital from July 2018 to January 2019.

The result of our data shows that prevalence of ischemic stroke about (87%) and hemorrhagic stroke about (13%). And thus agreement with study of Ülkü Türk Börü et al ⁽²⁶⁾ as it shows 80% of patients have had an ischemic stroke, 14% of those hemorrhagic stroke.

Our data showed prevalence of risk factor in stroke patients which included hypertension about (77%) and thus agreement with study of Azra Zafar et al ⁽²⁷⁾ as it show about (78%), diabetes mellitus about (43%) thus agreement with study of Zhe Kang Law et al ⁽²⁸⁾ as it show prevalence of diabetes mellitus about (49%), ischemic heart disease about (18%) this in agreement with Suhail Ahmed Almani et al ⁽²⁹⁾ which shows about (16%), smoking about (36%) and thus in agreement with other study of Tanika N. Kelly et al ⁽³⁰⁾ as it shows about (38%). So hypertension more prevalent than other risk factors.

And we searched about the most common risk factor with type of stroke which either ischemic or hemorrhagic, thus in agreement with study of K. Shravani et al⁽³¹⁾the data show prevalence of risk factor in ischemic patients include hypertension about (73%), while in the study about (62%), diabetes mellitus about (45%), while in other about (35%) ischemic heart disease about (20%), while other about (16%), smoking about (36%) other about (24%), then prevalence of risk factor in hemorrhagic patients include hypertension about (100%),while in study about (92%) diabetes mellitus (23%), while in study about (7%), ischemic heart disease (0%),while other about (11%) smoking (30%), other about (23%) in Telangana State, Warangal. ⁽³¹⁾

Also we search about the most common trigger factors that induced stroke, thus in agreement with study of Ashish Sharma et al ⁽³¹⁾ which include psychological stress about (38%), and in study about (17%), infection about (16%) in other about (8%) also in agreement with other study of Sushil Razdan et al ⁽³²⁾ which show psychological stress about (23%).

Also we detected the most common trigger factor with type of stroke which either ischemic or hemorrhagic so our result show psychological stress is the commonest trigger factor for both ischemic and hemorrhagic stroke as (35%), (53%) respectively .this result in comparative with study of Pauline Anderson ⁽³³⁾ which show influenza-like illness is associated with an increased risk of ischemic stroke on the order of 40%, regardless of sex, race, or geographical setting .

Chapter six

Conclusions

1-Ischemic stroke is more common than hemorrhagic stroke in patients attending Al-Hussein Teaching Hospital during 6 months duration of research.

2_The prevalence of male more than female.

3_ Age group (50-75) is more influenced in stroke.

4_Hypertension is the most common risk factor and also common in both types of stroke.

5_The psychological stress is the most common trigger factor than others and also common in both types of stroke.

Chapter seven
Recommendation

- 1- Primary health care centers should follow patient status to control BP and DM.
- 2- Need more care for stroke patient and open stroke unit.
- 3- Need further studies with wide population to include all risk factors and to minimize the percentage of error.

References

- 1-Walker BR, Colledge NR, Ralston HS, Penman ID, (2014).*Stroke disease, Davidson's Principles and Practice of Medicine, Twenty second Edition, Churchill Livingstone/Elsevier; 1231 – 1247.*
- 2-Tuttolomondo A, Maida C, Maugeri R, Iacopino G, Pinto A (2015) *Relationship between Diabetes and Ischemic Stroke: Analysis of Diabetes-Related Risk Factors for Stroke and of Specific Patterns of Stroke Associated with Diabetes Mellitus*
- 3-. Kasper DL, Hauser SL, Jameson JL, Fauci AS, Longo DL, Loscalzo J, (2015). *Neurologic Disorders, Harrison's principle of internal medicine ,Nineteenth Edition, McGraw-Hill Education; 2559 – 2586 .*
- 4-Hanley DF, Awad IA, Vespa PM,et al. *Hemorrhagic stroke: introduction. Stroke. 2013 Jun;44(6 Suppl 1):S65-6.*
- 5- Hankey GJ, Warlow CP. *Transient ischaemic attacks of the brain and eye. London: WB Saunders, 1994*
- 6- Wheeler HM, Mlynash M, Inoue M, et al. *The growth rate of early DWI lesions is highly variable and associated with penumbral salvage and clinical outcomes following endovascular reperfusion. Int J Stroke 2015; 10: 723–729*
- 7- Bruce Ovbiagele, Mai N. Nguyen-Huynh, *Stroke Epidemiology: Advancing Our Understanding of Disease Mechanism and Therapy. 2011 Jul; 8, P 319–329*
- 8-Amelia K. Boehme, Charles Esenwa, Mitchell S.V. Elkind, *Stroke Risk Factors, Genetics, and Prevention. 2017;120:472-495*
- 9- Elkind MS *Moving from stroke risk factors to stroke triggers. Curr Opin Neurol 2007;20(1):51-57.*
- 10-Mitchell S. V. Elkind, *Epidemiology and Risk Factors. American Academy of Neurology; 2011;17(6):1213–1232.*
- 11- Johnston SC, Rothwell PM, Nguyen-Huynh MN, et al. *Validation and refinement of scores to predict very early stroke risk after transient ischaemic attack. Lancet 2007;369(9558):283_292 .*
- 12- Okkes Kuybu; Rimal H. Dossani, *Posterior Cerebral Artery Stroke. 2018 Jan.*
- 13- Dale Birenbaum, Laura W. Bancroft, and Gary J. Felsberg, *Imaging in Acute Stroke. 2011 Feb; 12(1): 67–76*
- 14-Kidwell CS, Wintermark M. *Imaging of intracranial haemorrhage. Lancet Neurol. 2008 Mar; 7(3):256-67.*

- 15-Hacke W, Kaste M, Bluhmki E, et al; ECASS Investigators. Thrombolysis with alteplase 3 to 4.5 hours after acute ischemic stroke. *N Engl J Med* 2008;359(13):1317-1329 .
- 16- Amytis Towfighi, *Insulin Resistance, Obesity, Metabolic Syndrome, and Lifestyle Modification*. *American Academy of Neurology*. 2011;17(6):1293–1303.
- 17- Kernan WN, Inzucchi SE, Viscoli CM, et al. *Insulin resistance and risk for stroke*. *Neurology* 2002;59(6):809Y815.
- 18- Grundy SM, Cleeman JI, Merz CN, et al. *Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines*. *J Am Coll Cardiol* 2004;44(3):720-732.
- 19-James K. Liao, *Secondary Prevention of Stroke and Transient Ischemic Attack*. 2007 Mar 27; 115(12): 1615–1621.
- 20- Kameshwar Prasad, Subhash Kaul, M.V. Padma, S.P. Gorthi, Dheeraj Khurana, and Asha Bakshi. *Stroke management*. *Ann Indian Acad Neurol*. 2011 Jul; 14(Suppl1): S82–S96.
- 21- Gerstein HC, Miller ME, Byington RP, Goff DC Jr, et al. *Action to Control Cardiovascular Risk in Diabetes Study Group*.
- 22- Goldstein LB, Bushnell CD, Adams RJ, et al. *Guidelines for the primary prevention of stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association*. *Stroke* 2011;42(2):517Y584.
- 23- Furie KL, Kasner SE, Adams RJ, et al. *Guidelines for the prevention of stroke in patients with stroke or transient ischemic attack: a guideline for healthcare professionals from the American Heart Association/American Stroke Association*. *Stroke* 2011;42(1):227Y276.
- 24- Katzan IL, Cebul RD, Husak SH, Dawson NV, Baker DW: *The effect of pneumonia on mortality among patients hospitalized for acute stroke*. *Neurology*. 2003, 60: 620-625.
- 25- Lloyd-Jones D, Adams RJ, Brown TM, et al. *Heart disease and stroke statisticsY2010 update: a report from the American Heart Association*. *Circulation* 2010;121(7):e46Ye215.
- 26-Ülkü Türk Börü, Ahmet Şükrü Kulualp, Ömer Faruk Tarhan, et al. *Stroke prevalence among the Turkish population in a rural area of Istanbul: A community-based study*. 2018 Sep 3.

- 27- Azra Zafar, Fahd A. Al-Khamis, Aishah I. Al-Bakr, Abdulla A. Alsulaiman, and Amir H. Msmar, , *Risk factors and subtypes of acute ischemic stroke. A study at King Fahd Hospital of the University*, 2016 Jul; 21(3): 246–251.
- 28- Zhe Kang Law ,Wan Nur Nafisah, Ramesh Sahathevan, et al. *High prevalence of diabetes in stroke patients and its association with lacunar infarction*, *Neurology Asia* 2015; 20(2) : 121 – 127
- 29- Suhail Ahmed Almani, Muzaffar Shaikh, Mumtaz Ali Shaikh, Khalid Shaikh, M. Qasim Rahopoto, Ghulam Hussain Baloch and M. Iqbal Shah , *Stroke: Frequency of Risk Factors in Patients Admitted at Liaquat University Hospital Hyderabad/Jamshoro* ,
- 30- Tanika N. Kelly, Dongfeng Gu, , Jing Chen, et al. *Cigarette Smoking and Risk of Stroke in the Chinese Adult Population*, *Stroke*. 2008 Jun; 39(6): 1688–1693.
- 31- K. Shravani, Mihir Y. Parmar, Ramyasri Macharla, Uday Venkat Mateti, and Srinivas Martha. *Risk factor assessment of stroke and its awareness among stroke survivors: A prospective study* 2015 Aug 31
- 32- Sushil Razdan, KK Pandita and Sunil Kumar Raina, *Triggering Risk Factors for Stroke: A Case Crossover Study from a Tertiary Care Hospital in Northwest India* January 03, 2013
- 33- Amelia Boehm , *Flu-like Illness Linked to Stroke, Cervical Dissection*
Pauline Anderson, February 06, 2019