PREVALENCE OF STRESS HYPERGLYCEMIA AND PROGNOSIS IN ADULT PATIENTS ADMITTED WITH ACUTE STROKE (ISCHEMIC & HEMORRHAGIC) IN MEDICAL WARDS OF JIMMA UNIVERSITY SPECIALIZED HOSPITAL, JIMMA TOWN, SOUTHWEST ETHIOPIA.

BY

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ABSTRACT

Background: Stroke is the second most common cause of disability and death worldwide in adults. The incidence of stroke increases with age, and the number of strokes is projected to increase. The exact burden of stroke is not known in Africa as well as in sub-Saharan Africa. While developed countries experience a decline in stroke incidence and mortality rates, the problem is increasing in sub-Saharan Africa. The burden of stoke in Ethiopia is not clearly known but some hospital studies have shown that stroke is an important cause of morbidity and mortality. Stress hyperglycemia is one of the factors that can affect the prognosis of patients with stoke.

Objective: To determine the prevalence of stress hyperglycemia and prognosis in adult patients admitted with acute stoke to Jimma University Specialize Hospital medical wards from 1st December, 2013 to April 31, 2014

Methods: A hospital based prospective cross sectional study was conducted through patient interview and chart review using structured check list for patients admitted to Jimma University Specialize Hospital medical wards from 1st December, 2013 to April 31, 2014. Data was obtained from 85 patients admitted with a diagnosis of stroke and blood samples were collected to determine the admission blood glucose level. The data was organized, coded, entered, cleaned, and analyzed using SPSS version 16.0. Descriptive statistics and binary logistic regression analysis were done. A P-value of <0.05 was considered statistically significant.

Results: Data collected from 80 acute stroke patients were included in the analysis. Forty eight (60%) of them were males. the prevalence of stress hyperglycemia is 66%.The mean age of the study subjects was 55.9 ± 14.4; 40(50%) were above the age of 60 years. Thirty eight (47.5%), 19(23.8%), 5 (6.2%), 5 (6.2%), 2 (2.5%) of the respondents were farmers, housewife, government employee, merchants and students respectively. The majority of the patients 50 (62.5%) were from rural areas. The mean monthly income is 645 birr. Of the total 80 subjects in the study, 53 (66.2%) had admission stress hyperglycemia of which 33 were females. Of the total study subjects admitted with acute stroke to the hospital during the study period, 65 (81.2%) were discharged being improved and 15(18.8%) were dead. Forty four (55%) were admitted with in 24hrs of symptom onset and 74(92.5%) of the patients stayed for 2 or more days in hospital ,the mean average hospital stay in days being 10.1 ± 5.1 and the maximum and minimum hospital stay being 24 and 1day respectively. Of the 15(18.8%) patients who died the commonest immediate cause of death was respiratory arrest 9(11.2%) followed by multiple organ failure 3(3.8%) and sepsis 3(3.8%) respectively.

Outcome of the patient is strongly associated with stress hyperglycemia; all of the 15 patients who died during the study period had stress hyperglycemia at admission.Forty four (55%) were admitted within 24hrs of symptom onset &74(92.5%) of the patients stayed for 2 or more days in hospital ,the mean average hospital stay in days being 10.1 ± 5.1 and the maximum and minimum hospital stay being 24 and 1day respectively. The associations of hospital stay with stress hyperglycemia also revealed in this study with a p-value of 0.069.presence of stroke risk factors donot have strong association with stress hyperglycemia

Conclusion and Recommendation: this study found that the prevalence of Stress Hyperglycemia in acute Stroke patients is high and it has a poor prognostic implication in patient outcome. Therefore, understanding all pathways and developing specific therapies along with critical care of stroke patients with Stress Hyperglycemia, may reduce the mortality & morbidity, hence improve outcome & prognosis. Random Blood Sugar should be done for all patients with stroke and proper management of SH in stroke patients are mandatory for good patient outcome.

Key words: Stress Hyperglycemia, blood glucose level Hypertension, JUSH

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LIST OF ABBREVIATION AND ACRONYMS

AHA- American Heart Association

ASA-American stroke association

AMI-Acute myocardial infarction

BP- Blood Pressure

BG-Blood glucose

CNS -Central nervous system

CT -Computed tomography

DBP- Diastolic Blood Pressure

DM- Diabetes Mellitus

EUSI- European stroke initiative

HbA_{1c}-Hemoglobin $A_{1\,c}$

HHF- Hypertensive Heart Failure

HTN- Hypertension

ICSOL-Intracranial space occupying lesions

JUSH- Jimma University Specialized Hospital

MI- Myocardial Infarction

NCD- None communicable disease

RBS –Random Blood Sugar

SBP- Systolic Blood Pressure

SD- Standard Deviation

SH-stress hyperglycemia

TIA- Transient Ischemic Attack

U.S- United States

ACS (UA/NSTEMI)-Acute Coronary Syndrome (Unstable Angina/None ST Elevation Myocardial Infarction)

WHO- World Health Organization

CHAPTER ONE – Introduction

1.1 Background

A stroke defined by the abrupt onset of a neurologic deficit attributable to a focal vascular cause is one of the most common medical emergencies and it is devastating disorder (1).Worldwide in adults, stroke is the 2nd most common & leading cause of disability and death. It is a common medical emergency with an annual incidence of 180-300 million (2).According to the latest WHO statistics, stroke is responsible for 10.8% of total deaths. (3, 4, 5).
With the demographic and epidemiologic shifts now occurring in many developing countries, increased prevalence of risk factors for stroke are anticipated, including hypertension, tobacco use, obesity, unhealthy diets, physical inactivity, and diabetes. A recent systematic review of worldwide stroke incidence showed that stroke incidence has declined by 42% in high-income countries over the 4 decades from 1970–1979 to 2000–2008. During the same period, stroke incidence rose more than 100% in low- to middle-income countries (3, 4, 5, 6).

The incidence of stroke increases with age, and the number of strokes is projected to increase as the elderly population grows (1) .There are two types of stroke; Ischemic stroke (80-85%) and Hemorrhagic stroke (15-20%) (2). The exact burden of stroke is not known in Africa. Estimates suggest that 8% of all first-ever strokes occur in Africa and that 5% of the 30 million stroke survivors worldwide live in Africa (7).Reliable data on stroke incidence and outcomes in sub-Saharan Africa are sparse. Developed countries experience a decline in stroke incidence and mortality rates, while the problem is increasing in sub-Saharan Africa (8).

The burden of stoke in Ethiopia is not clearly known but some Hospital studies have shown that stroke is an important cause of hospital morbidity and mortality in Ethiopia. A study done in Tikur Anbessa hospital showed the burden of stroke appears to have increased significantly over the past three decades. Hemorrhagic stroke was the most common cause of stroke accounting for 57% of all patients and 59.2% among those who had CT scan (9).

Apart from hypertension, smoking, hyperlipidemia and diabetes mellitus, Stress Hyperglycemia is thought one of the culprit factors that affect the acute phase of stroke and mortality as well as out-come. Stress Hyperglycemia is thought one of the culprit factors that affect the acute phase of stroke and 30 days mortality and out-come. A prospective, multiple meta-analyses & case control studies have proved the importance of early stress hyperglycemia as a predictor of stoke outcome (10).

The risk of hospital complications relates to the severity of hyperglycemia, with a higher risk observed in patients without a history of diabetes compared to those with known diabetes. Meta-analysis studies have reported more than 3-fold increase in 30-days mortality in stress hyperglycemia compared with a 2-fold increase in known diabetics (10). Hyperglycemia is associated with increased risk of hospital complications and mortality in critically ill patients. (11).

The American Diabetes Association and American Association of Clinical Endocrinologists consensus on inpatient hyperglycemia defined stress hyperglycemia or hospital-related hyperglycemia as any blood glucose concentration > 7.8 mmol/l (140 mg/dl) without evidence of previous diabetes.(11) .Understanding stress hyperglycemia and developing specific therapies along with critical care of such patients may reduce the morbidity and mortality; hence improve outcome & prognosis (10).

Hyperglycemia in the acute phase of stroke has been established as a predictor of poor outcome in non-diabetic patients. Bruno et al reported worse neurological outcome at three months in ischemic stroke patients admitted with higher blood glucose level. Hyperglycemia was also found to be the only independent predictor of hemorrhagic transformation of ischemic stroke in one study (12).

Post stroke reactive hyperglycemia has been associated with increased mortality and poor recovery in nondiabetic patients. Few studies have demonstrated the relationship between stress hyperglycemia and stroke outcome in Africans. A prospective study was done to evaluate the prevalence of abnormal glucose metabolism in nondiabetic stroke patients and the risk of poor outcome in such patients (13). Hyperglycemia dramatically worsens brain injury during stroke, so it is reasonable to prevent hyperglycemia as much as possible.

1.2 .STATEMENT OF THE PROBLEM

Stroke, an abrupt onset of a neurological deficit attributable to a vascular cause ; is a major cause of death worldwide as well as in Africa (3, 4, 5).The exact burden of stroke is not known in Africa but estimates suggest that 8% of all first-ever strokes occur in Africa and that 5% of the 30 million stroke survivors worldwide live in Africa (7).Reliable data on stroke incidence and outcomes in sub-Saharan Africa are sparse but some studies show developed countries experience a decline in stroke incidence and mortality rates, while the problem is increasing in sub-Saharan Africa (8).

The burden of stoke in Ethiopia is not clearly known but some hospital based studies have shown that stroke is an important cause of hospital morbidity and mortality. A study done in Tikur Anbessa hospital showed the burden of stroke appears to have increased significantly over the past three decades. Hemorrhagic stroke was the most common cause of stroke accounting for 57% of all patients and 59.2% among those who had CT scan (9).

Stress hyperglycemia which is defined as blood glucose level >110mg/dl is one of the factors which can adversely affect the outcome of stroke patients. Hyperglycemia is common in patients with acute stroke, occurring in up to 60% of patients overall (4). Hyperglycemia is associated with poor prognosis both in terms of mortality and functional recovery, irrespective of patient's age, severity of condition or stroke sub- type (3).

In JUSH blood glucose level is not commonly done for all patients with stroke and stress hyperglycemia is not being addressed. This could be one of the reasons for the increased mortality that we see in our daily hospital practice.

Hence the this study will help to know the prevalence and the effects of stress hyperglycemia on the morbidity and mortality in patients with stroke during their hospital stay and at discharge so that we can increase the quality of care that we give for stroke patients.

CHAPTER TWO

2.1 LITERATURE REVIEW

Most of the studies that reported the association of stress hyperglycemia with stroke have been carried out mainly in Europe and North America. Most of these studies show the adverse effect of stress hyperglycemia in stoke patients. Hyperglycemia can cause detrimental effects of increasing tissue lactic acidosis, 2^{ry} to anaerobic glycolysis and free radical production. Randomized clinical trials on glucose control in critically ill patients were 1st reported in 1995in the DIGAMI (Diabetes Insulin-Glucose in AMI) study.

Christopher et. al. in 1997 in their study on 645 patients of stroke found that plasma glucose concentration > 8 mmol/L after acute stroke predicts a poor prognosis after correcting for age, stroke severity and stroke sub- type. They also found that raised plasma glucose concentration should be treated actively. (16)

Capes et. al. in 2001 in a meta- analysis of 31 studies done during 1966- 2000, found that hyperglycemia is associated with 3 fold greater risk of short term mortality, increased hemorrhagic transformation rate and poor functional recovery of stroke compared with euglycemic patients.(17)

Sarkar et. al. in their study on effect of glycemia on stroke outcome in 450 patients during 2002- 2004 found that the mortality within 4 weeks of stroke was higher in ischemic and hemorrhagic stroke patients with hyperglycemia (18).

Mehta. S in 2003 has reviewed that increased blood glucose levels in the first 12 hours after the onset was related to the severity of stroke, with larger lesions on CT scans, longer hospital stay and higher short term & long term mortality (19).

Yadav, Chaudhary et.al.in 2004 studied 50 patients of acute stroke to assess the role of glycemic status on clinical profile and outcome of stroke, found that hyperglycemia was an important risk factor for stroke and there was correlation between deranged glucose metabolism, size, severity and poor stroke outcome (20).

Perttuet. al. in 2004 demonstrated that on – admission hyperglycemia is associated with worsened clinical outcome, as reviewed in a systematic overview of 33 studies, along with the significance of strict glycemic control in non-diabetic patients with stress hyperglycemia (21).

In 2004 active lowering of elevated blood glucose by rapidly acting insulin is recommended in most published guidelines, even in nondiabetic patients (European Stroke Initiative [EUSI] guidelines >10 mmol/L, American Stroke Association [ASA] guidelines >300 mg/dL) hyperglycemia (>140 mg/dl) during the first 24 hours after stroke is associated with poor outcomes, and thus it is generally agreed that hyperglycemia should be treated in patients with acute ischemic stroke. A lower serum glucose concentration (possible >140 to 185mg/dl) should trigger administration of insulin.

Bruno et.al demonstrates an interaction between blood glucose and outcome already within three hours of stroke onset. Further, persistent hyperglycaemia in acute stroke was related to infarct expansion and poor clinical outcome; blood glucose and admission neurological deficit was just above the limit of statistical significance.

Bruno et. al. in 2005 found that in patients with acute ischemic stroke with higher admission glucose levels are associated with significantly lower desirable clinical outcomes and higher symptomatic intra-cerebral haemorrhage regardless of rt- PA treatment.

From the 1,259 patients in the TOAST trial of heparin treatment, admission hyperglycemia was associated with worse outcome in nonlacunar stroke but was not associated with hemorrhagic change.Thus, normalization of glucose might be a reasonable component of acute stroke management if the risks of treatment induced

A study by Capes and Osler carried out in Canada, revealed that in patients without diabetes, stress hyperglycemia was associated with a 3-fold increased risk of mortality after stroke (pooled relative risk, 3.07; 95% CI, 2.50 to 3.79). In this study, this risk was slightly more than 2-fold.

Weir et a performed a long-term follow-up of 750 nondiabetic patients with acute stroke and, after adjusting for age, sex, type of stroke, smoking, and blood pressure, admission hyperglycemia remained a significant independent predictor of long-term higher mortality and morbidity. Data from a multicenter trial (ORG 10172 in acute Stroke Treatment [TOAST]) that included 1259 patients found that in patients with nonlacunar stroke, higher blood glucose levels were associated with worse outcome at 3 months. Adjustments for age, stroke severity on admission, other vascular risk factors, and diabetes mellitus did not alter this result. One possibility is that these studies may have included patients with undiagnosed diabetes, and some smaller studies support this possibility by performing additional laboratory tests for glycosylated hemoglobin showing that prestroke hyperglycemia was a predictor of worse outcome. Other studies, which did not confirm these findings, suggested that admission hyperglycemia is a marker of extensive brain damage leading to a greater increase in stress hormones resulting in hyperglycemia. However, van Kooten et al, who also found a significant association between hyperglycemia on admission and stroke outcome, did not find a correlation between catecholamine and glucose levels, implying that increased stress was not responsible for the hyperglycemia. In conclusion, although the association between admission hyperglycemia and worse outcome in acute stroke has been shown in most studies, it is still unclear whether it is related to diabetes (diagnosed or undiagnosed previously) or to a stress reaction.

A major difficulty in investigating the role of diabetes and hyperglycemia in acute stroke is the heterogeneous nature of diabetes/hyperglycemia in regard to the site of ischemia, the degree of vasculopathy, and the state of reperfusion. For example, in the TOAST trial, higher admission blood glucose levels were associated with worse outcome in nonlacunar strokes. In lacunar strokes, the relationship between hyperglycemia and outcome was inconsistent and differed between those who did and did not receive a low-molecular-weight heparin. These observations may be related to the findings in animal models of focal ischemia: in models with reperfusion, hyperglycemia increased infarct size, while in animals without reperfusion; hyperglycemia seemed to have no adverse effect and might even have been beneficial. These findings may be owing to less blood reaching the territory of the end arteries—insufficient blood to cause lactate accumulation and acidosis. Under these conditions hyperglycemia might even be beneficial in maintaining energy metabolism. End-artery infarctions resemble lacunar strokes, which are very common in patients with diabetes. Therefore, studies aimed at evaluating the effect of hyperglycemia on stroke outcome but that do not separate lacunar from nonlacunar strokes may be misleading.

The correlation between hyperglycemia and occurrence of hemorrhagic strokes or hemorrhagic transformations of ischemic strokes is also controversial. Some studies point toward lower frequency of intracerebral hemorrhages in patients with diabetes. In the Copenhagen Stroke Study, intracerebral hemorrhages were 6 times less frequent in patients with diabetes than in those without. Other smaller studies found that hyperglycemia and diabetes may be associated with an increased incidence of hemorrhagic transformation of ischemic infarcts. Hyperglycemia was found to be the only independent predictor of intracerebral hemorrhage in a study of 138 patients with ischemic stroke treated with tissue plasminogen activator. Serum glucose levels higher than 200 mg/dL (11.1mmol/L) were associated with a 25% symptomatic hemorrhage rate.

Several prior studies have demonstrated that post-stroke hyperglycaemia is associated with worse patient outcomes following an acute stroke, including increased post-stroke mortality. However, no specific glucose cut-off has been established to define ‘hyperglycaemia’, nor has a cut-off been used consistently in the prior research. For example, Pulsinelli and colleagues found that neurological outcome was worse in patients with blood glucose levels >120 mg/dl (6.7 mmol/l). In a systematic review of hyperglycaemia and post- stroke outcomes, Capes and colleagues included 32 studies and found that admission blood glucose >108–144 mg/dl (6–8 mmol/l) was associated with increased in-hospital or 30-day mortality (relative risk 3.1,95% CI 2.5–3.8,inpatientswithout diabetes vs. 1.3, 95% CI 0.5–3.4, in patients with diabetes).

The actual incidence and prevalence of stroke have not been established in Nigeria. Most studies done so far are hospital based and hence may just be the tip of the iceberg. Osuntokun et al reported a crude incidence of stroke among Nigerians in Ibadan of 58/ 100,000 between 1973 -1975 and most recently Danesi et al in a mixed incomeurban population in Lagos reported an incidence of114/100,000. Stroke is the leading cause of neurological admissions in most tertiary hospitals in Nigeria surpassing CNS infections. It accounts for 0.92-4% of hospital admissions and 2.83-4.52% of total deaths in Nigeria.

It is found that scrupulous control of blood glucose might reduce the risk of cerebral infarction. Thus stress- induced hyperglycemia may be a modifiable risk factor for brain damage.

2.2 SIGNIFICANCE OF THE STUDY

Information regarding the prevalence of stress hyperglycemia in stoke patients will be critical in improving the inpatient care of stroke patients and for the development of locally sensitive guidelines, research programs and policies both for diagnosis, prevention and care of stoke patients.

This study will indicate the prevalence of stress hyperglycemia and their outcome among these study participants and pinpoint where we are in terms of our current practice of diagnosis, care and prevention cerebrovascular disease and how we should prepare our strategy for better intervention.

CHAPTER THREE

Objectives

3.1. General objective

- To determine the Prevalence of stress hyperglycemia & prognosis in adult patients admitted with acute stoke (ischemic & hemorrhagic) to JUSH

3.2. Specific objectives

- To determine the Prevalence of stress hyperglycemia in adult patients admitted with acute stoke (ischemic & hemorrhagic) to JUSH
- To assess socio-demographic profiles of patients admitted with stoke to medical ward of JUSH.
- To assess the prognosis in adult patients admitted with acute stoke (ischemic & hemorrhagic) to JUSH
- To assess risk factors associated to SH among stoke patients.

CHAPTER FOUR

Methods and Participants:

4.1 Study Area and period

The study was conducted in Jimma University Hospital medical ward, Jimma University, Jimma Zone from 1st December 2013 to March 31 2014

Jimma zone comprises Jimma town and its nearby woredas. It is located in South West of Ethiopia, Oromia regional state, with estimated population of 2,486,155. The town is located 350 Kilometers from the capital, Addis Ababa.

Jimma University Specialized Hospital (JUSH) is one of teaching hospitals in the country. JU runs both undergraduate and graduate programmes in several disciplines. The hospital gives health service at inpatient and outpatient level as a referral Hospital for 15 million population in the South West of the country.

The hospital has Medical, Pediatrics, OB/GYN, Surgery, Dental, Radiology, Ophthalmology, Anesthesiology and Psychiatry departments. The department of internal medicine has a total of 100 beds with about 2781 annual admission but there was no study that show how many of them were stroke patients . Emergency time admission cases are presented three times a week and rounds are made in all medical wards by Internists.

As of the outpatient service the hospital has specialty clinics where patients with neurologic problems like stroke after discharge are referred for follow-up. The actual number of stoke patients having follow up in the neurology referral clinic is not known and there is only one day visit program per week by internists, residents, and medical interns.

4.2 Study period

The study was conducted from 1st December, 2013 to March 31, 2014.

4.3 Study design

A cross sectional study was used. A primary data was obtained from all patients admitted with a diagnosis of stroke to medical wards of JUSH since day of admission up to either discharge or death by 1st year medical residents, BSC nurses and medical interns.

4.4 Population

4.4.1 Source population

The source population was all patients admitted to the medical wards of JUSH with the diagnosis of stroke.

4.4.2 Study population

The study population was all patients admitted to the medical wards of JUSH with a diagnosis of stroke during the period of the study.

4.5 Inclusion and Exclusion criteria

Inclusion criteria:

•All adult patients admitted to JUSH medical wards with a clinical diagnosis of stroke from 1st December 2013 to March 31, 2014

•All patients with stoke whose admission blood glucose level is >110mg/dl

•Patients with both 1st and recurrent admissions for similar diagnosis during the study period will be included in the study once.

Exclusion criteria:

•Neurology patients admitted to wards for other medical conditions other than stroke.

•Any stoke patients with admission blood glucose level <110mg/dl

•Known cases of ICSOLs (intracranial space occupying lesions)

•Cerebral Venous Thrombosis.

4.6 Variables

Dependent variable

- Stress hyperglycemia in stoke patients
- Outcome at discharge

Independent variables

•Socio-demographic characteristics

•Blood pressure

•BMI

•History of smoking

•Diabetes mellitus

•Days since onset of symptoms

4.7Data collection

4.7.1 Data collection instruments

Data collection format containing individual patient characteristics was prepared before the data collection time. Patients admitted during the period from 1st December 2013 to March 31, 2014 with a diagnosis of stoke and their outcome at discharge from medical ward were included; then individual patient or his/her immediate attendant who knows the clinical scenario of the patient was interviewed to fill the data collection format with relevant information about patient socio demographic characteristics, awareness and duration of hypertension, history of treatment, diabetes mellitus, alcohol intake, smoking, and drug complaints. Physical examination results, duration on admission, admission blood glucose level, diagnosis and outcome at discharge was taken from patient′s card.

4.7.2 Data collection process

Data collection was done from 1st December 2013 up to March 31 2014 the admission blood glucose was taken. Average of the first 3 records blood pressure using a standard mercury sphygmomanometer at emergency department and medical ward which is me measured by the admitting medical resident was taken. The other relevant information directly from patient or attendant and from his/her chart was entered in the structured questionnaire after a patient admitted with a diagnosis stroke by Medical resident, medical interns and BSC nurse.

4.7.3 Data collectors

Data collection was undertaken by 1st year internal medicine residents, medical interns and BSC nurses after they are trained for one day about stoke and stress hyperglycemia and outcome, objective of the study, variables on the questionnaire and its implication. Then, they were assigned to fill the data collection format. All data collection activities were supervised by trained medical residents and primary investigator.

4.8 Pre-test

The structured data collection format was pre tested on a sample of 15 patients before actual data collection begins.

4.9. Data quality control

Adequate training was provided for data collectors, and the compilation format was prepared in simple English to maintain clarity and easier understanding by those data collectors. Pre-testing of data collection tools was made. Data will be checked for completeness and internal consistencies right after collection by supervisor or principal investigator.

4.11 Data processing and analysis

The data collected was first cleaned, edited and entered into a computer and analyzed using software programme SPSS-16. Descriptive statistics was done for most of the variables. Categorical variables was also compared using Chi-squared tests as applicable & odds ratios (with 95% confidence interval CI) was calculated from the 2x2 tables. Bivariate analysis was used to look for association between various independent variables and dependent variables. Following analysis, when applicable data was interpreted (with 95% CI, at 1-Alpha =0.95) and P-value <0.05 was taken as statistically significant. Results presented in writing, tabulation & figurative presentations from which conclusion and recommendation was made. Results were compared with other studies & discussed.

4.11 Ethical consideration

The research proposal will be submitted to Jimma University Ethical Review Board to obtain ethical clearance, then data collection is going to be initiated after a letter of recommendation will be obtained from the above responsible office to the head of each medical wards. Informed written consent will be taken from each patient or his/her attendant and data/information from individual patient will be kept Confidential.

4.12 Operational definition

Stress Hyperglycemia…….Admission blood glucose level >110mg/dl

Chapter 5

5. Results

5.1 Socio-demographic characteristics

The study comprised of 80 patients with acute stroke admitted to medical wards during the study period were included in the analysis making a response rate of 94.1%. Forty eight (60%) of them were males. The mean age of the study subjects was 55.9 $\pm$ 14.4. Forty (50%) of them were in the age group of above 60 years. Forty two (52.5%) of the patients were illiterate, 25 (31.2%) and 10 (12.5%) of the respondents has completed primary and secondary school respectively. Sixty eight (85%) of them were married. Thirty eight (47.5%), 19 (23.8%), 5 (6.2%), 5 (6.2%), 2 (2.5%) of the respondents were farmers, housewife, government employee, merchants and students respectively. The majority of the patients 50 (62.5%) were from rural areas. The mean monthly income is 645 birr majority being in the first and third percentile (table 1).

Table 1. Sociodemographic characteristics of stroke patients admitted to JUSH medical wards from December, 2013 to March, 2014.

Variable	Category	Frequency	Percentage
Age	<45	26	32.5
	45-60	14	17.5
	>60	40	50.0
Sex	Male	48	60.0
	Female	32	40.0
Marital status	Single	2	2.5
	Married	68	85.0
	Divorce	2	2.5
	Widowed	8	10.0
Occupation	Farmer	38	47.5
	Housewife	19	23.8
	Government employee	5	6.2
	Student	2	2.5
	Merchant	5	6.2
	others	8	10.0
Educational status	Illiterate	42	52.5
	Primary school	25	31.2
	Secondary school	10	12.5
	College and above	3	3.8
Residence	Urban	30	37.5
	Rural	50	62.5
Income(birr/month,)	<400	31	38.8
	400 -700	33	41.2
	700	16	20.0

Table 2.Relationship of Stress Hyperglycemia to patient sociodemographic characteristics of stroke patients admitted to JUSH medical wards from December 2013 to March, 2014

Variable	Category	Stress Hyperglycemia		P value
		Yes	No	
Age (yrs)	< 45yrs	16	10	0.009
	45-59yrs	5	9	
	≥ 60yrs	32	8	
Gender	Male	33	15	0.562
	Female	20	12	
Marital status	Married	48	20	0.037
	Single	0	2	
	Divorced	0	2	
	Widowed	5	3	
Occupation	Farmer	24	14	0.197
	Housewife	12	7	
	Employee	5	0	
	Student	0	2	
	Merchant	3	2	
	Others	6	2	
Educational status	illiterate	29	13	0.515
	primary school	15	10	
	secondary school	6	4	
	collage and above	3	0	
Living area	Urban	23	7	0.127
	Rural	30	20	

5.2 Clinical Characteristics

Of the total 80 subjects in the study, 53(66.2%) had admission stress hyperglycemia (SH) [admission BGL of >110mg/dl] of which 33 were females. There was no significant difference in SH by gender (P=0.335). There is effect of age on SH (p=0.009).Fifty six (70%) of them had admission systolic hypertension (SBP >140mmHg) and 31(38.8%) had admission diastolic hypertension (DBP >90mmHg). Of the total patients with SH 39(73.3%) had admission Systolic hypertension and 22(41%) had admission diastolic hypertension but there was no strong association between the two variables. Sixty two (77.5%) had hypertension as a risk factor and 19(23.8), 9(11.2), 3(3.8) had smoking, DM and previous history of stroke as a risk factor respectively. Of the total study subjects admitted with acute stroke to the hospital during the study period, 65 (81.2%) were discharged improved and 15(18.8%) were dead. Forty four (55%) were admitted with in 24hrs of symptom onset and 74(92.5%) of the patients stayed for 2 or more days in hospital ,the mean average hospital stay in days being 10.1 $\pm$ 5.1 and the maximum and minimum hospital stay being 24 and 1day respectively. Of the 15(18.8%) patients who died the commonest immediate cause of death was respiratory arrest 9(11.2%) followed by multiple organ failure [3(3.8%)] and sepsis [(3(3.8%)] respectively.(Table 3)

Table 3. Association of stroke Risk factors and Stress Hyperglycemia in stroke patients admitted to JUSH medical wards from December 2013 to March, 2014.

Variable	Category	Stress Hyperglycemia		P value
		YES	NO	
Admission DBP	<90	31	18	0.478
	≥ 90	22	9	
Admission SBP	<140	14	10	0.327
	≥140	39	17	
Cigarette smoking	YES	15	2	0.094
	NO	36	24	
DM	YES	5	4	0.471
	NO	48	23	
Hypertension	YES	44	18	0.098
	NO	9	9	
Alcohol Use	YES	6	4	0.665
	NO	47	23	
Previous stroke	YES	3	0	0.208
	NO	50	27	

Table 4.Relationship of Stress Hyperglycemia to patient outcome of stroke patients admitted to JUSH medical wards from December 2013 to March, 2014.

Variable	**Category**	**Stress Hyperglycemia**		**P- value**
		YES	**NO**	
Onset of Symptoms	< 24hrs	33	11	0.067
	≥24hrs	20	16	
Hospital Stay	<2days	6	0	0.069
	>2days	27	27	
Patient outcome	Improved	38	27	0.002
	Dead	15	0	

Chapter 6

6.Discussion

6.1 Discussion

Stress Hyperglycemia (SH) is common in patients with acute stroke occurring in up to 60% of them.[20, 21].In this study 66.2% of the study subjects had admission SH. This finding goes in line with many studies done worldwide like Cazzato G. et al. of Italy done in 1991 which found the prevalence of SH in acute stroke patients to be 63%.[23]

Majority of the study subjects (60%) were males and 50% were above the age of 60 years w/c are established risk factors for stroke. Majority of the study subjects were illiterate and farmers and had one or more risk factor for stroke. When we see the association of the Sociodemographic characteristic of the patients with stress hyperglycemia ,there was a strong association b/n age and stress Hyperglycemia (P=0.009) but this finding is not in line with other studies .The other sociodemographic characteristics donot show association with stress hyperglycemia .

Of the total 80 subjects in the study, 53(66.2%) had admission SH of which 33 were females. There was no significant difference in SH by gender (P=0.335).Similar study done by Smith WS, English JD, Johnston SC. Show no association between stress hyperglycemia and gender of the patient.

Fifty six (70%) of the study subjects had admission systolic hypertension and 31(38.8%) had admission Diastolic hypertension. Of the total patients with SH 39(73.3%) had admission Systolic hypertension and 22(41%) had admission diastolic hypertension but there was no strong association between the two variables. Sixty two (77.5%) had hypertension as a risk factor and 19(23.8), 9(11.2), 3(3.8) had smoking, DM and previous hx of stroke as a risk factor respectively. These established risk factors for stroke donot affect the stress hyperglycemia as revealed in this study and as well other studies.

Of the total study subjects admitted with acute stroke to JUSH during the study period, 65 (81.2%) were discharged improved and 15(18.8%) were dead. Forty four (55%) were admitted within 24hrs of symptom onset and 74(92.5%) of the patients stayed for 2 or more days in hospital ,the mean average hospital stay in days being 10.1 $\pm$ 5.1 and the maximum and minimum hospital stay being 24 and 1day respectively. The length of hospital stay is affected by the presence of stress hyperglycemia (p =0.069) this is in line with studies of Szczudlik, A. et al in Poland 2001[20] Capes

Of the 15 patients who died all of them had admission SH , showing SH as being a poor prognostic factor affecting the outcome of patients (p=.002) and there was strong association between the admission SH and patient outcome. Many studies worldwide like those done by Szczudlik, A. et al in Poland 2001[20] Capes, S.E. et al.[7] and Dora B. et al. in Turkey 2004[28] showed that patients with stress hyperglycemia had higher stroke severity, worse clinical outcome but there is no agreement between this study and other studies regarding the effect of age gender and admission blood pressure .

Of the 15(18.8%) patients who died the commonest immediate cause of death was respiratory arrest 9(11.2%) followed by multiple organ failure [3(3.8%)] and sepsis [(3(3.8%)] respectively.

Conclusion

this study found that the prevalence SH in acute Stroke patients is high (66.2%) and it has a poor prognostic implication in patient outcome. Therefore, understanding all pathways and developing specific therapies along with critical care of stroke patients with SH, may reduce the mortality & morbidity, hence improve outcome & prognosis.

Recommendations

- Random blood sugar measurement should be done for all patients with clinical stroke as a base line investigation for timely management of SH.
- Proper management of SH in stroke patients is mandatory for good patient outcome.
- Additional studies with HgA1c has to be done to distinguish patients with stoke who may have preexisting un diagnosed DM from SH.

REFFERENCES

1. Smith WS, English JD, Johnston SC. Cerebrovascular Diseases. In: Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson , Loscalzoeds. Harrison's Principles of Internal Medicine 17th ed, vol 2, 2008; McGraw Hill, 2513-36.

2. Rajput R.M et al, Effect of stress hyperglycemia (SH) on mortality rate among acute ischemic stroke (IS) patients,MC Vol.17-No.2-2011 (32-35)

3. World Health Organization. Mortality estimates by cause, age, and sex for the year 2008. Geneva: WHO. Available at: www.who.int/healthinfo/global_burden_disease/en/. Accessed October 7,2011.

4.World Health Organization. The global burden of disease—2004 update. Geneva: WHO; 2008.

5.JohnstonSC,MendisS,Mathers CD. Global variation in stroke burden and mortality: estimates from monitoring, surveillance, and modelling. Lancet Neurol 2009; 8:345–354. FeiginV,LawesCMM,BennettDA,Barker-Collo SL, Parag . Worldwide stroke incidence and early case fatality reported in 56 population-based studies: a systematic review. Lancet Neurol 2009; 8: 355–369.

6.O'DonnellMJ,XavierD,LiuL,et al. Risk factors for ischaemic and intracerebral haemorraghic stroke in 22 countries (the INTERSTROKE study): a case-control study. Lancet 2010; 376: 112– 123.

7.Thomastruelsen, Stroke incidence studies in Africa The Lancet Neurology, Volume 9, Issue 8, Pages 755 - 757, August 2010

8.Jerome H. Chin, Stroke in Sub-Saharan Africa: An Urgent Call For Prevention ; Neurology March 27, 2012 vol. 78 no. 13 1007-1008

9.Zenebe G, Alemayehu M, Asmera J. Characteristics and outcomes of stroke at Tikur Anbessa Teaching Hospital, Ethiopia.Ethiop Med J. 2005 Oct;43(4):251-9.

10.……..Rajput R.M et al ,Fffect of stress hyperglycemia (SH) on mortality rate among acute ischemic stroke (IS) patients ,MC Vol.17-No.2-2011 (32-35)

11….F. Farrokhi et al. Glycemic control in non-diabetic critically ill patients / Best Practice & Research Clinical Endocrinology & Metabolism 25 (2011) 813–824

12.References Lt Col R Pakhetra MJAFI 2011; 67 : 53-57 management of stress hyperglycemia in critical illness:review of targets and strategies

13.B.AEzeala-Adikaibe, M.C Nwosu, I.I Ulasi, Prognostic value of admission plasma glucose in non-diabetic Nigerians with stroke.African Journal of Library AJOL Vol 14, No 2 (2009)

14.Reference ……..Smith WS, English JD, Johnston SC. Cerebrovascular Diseases. In: Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson , Loscalzoeds. Harrison's Principles of Internal Medicine 17th ed, vol 2, 2008; McGraw Hill, 2513-36.

15. J. Broderick, S. Connolly, E. Feldmann, D. Hanley, C. Kase, D. Krieger, M. Mayberg, L.Morgenstern, C. S. Ogilvy, P. Vespa, et al. Guidelines for the Management of Spontaneous Intracerebral Hemorrhage in Adults: 2007 Update: A Guideline From theAmerican Heart Association/American Stroke Association Stroke Council, High BloodPressure Research Council, and the Quality of Care and Outcomes in ResearchInterdisciplinary Working

Group: The American Academy of Neurology affirms the valueof this guideline as an educational tool for neurologists. Stroke, June 1, 2007; 38(6): 2001 – 2023 (15)

16.Weir CJ, Murray GD, Dyker AG, Lees KR. Is hyperglycemia an independent predictor of poor outcome after acute stroke? Results of a long term follow up study. BMJ 1997;314:1303.

17. Capes SE, Hunt D, Malmberg K, Pathak P, Gerstein HC. Stress hyperglycemia and prognosis of stroke in non-diabetic and diabetic patients: A systematic overview. Stroke 2001;32:2426-32.

18.Sarkar RN, Banerjee S, Basu A. Comparative evaluation of diabetic and non-diabetic stroke –Effect of glycemia on outcome. J Indian Med Assoc 2004;102(10): 551-53.

19.Mehta S. The glucose paradox of cerebral ischaemia. J Postgrad Med 2003; 49:299-301.

20. Yadav KK, Chaudhary HR, Gupta RC, Jain R, Yadav RS, Sharma S, et al. Clinical profile and outcome of stroke in relation to glycemic status of patients. J Indian Med Assoc 2004;102(3):138-40.

21. Lindsberg PJ, Roine RO. Hyperglycemia in acute stroke. Stroke 2004;35:363-64.

22.Hanne Christensen Dan Med Bull 2007;54:210-25 Acute stroke– a dynamic process

23.MohsinSaif, *Imran Saif, *Muhammad Naeem Khan, *Jehanzeb, *Wasif Anwar journal of medical corps pakistan Issue Year : 2006, Issue Number : 2, Issue Month : June (23)

24.Nadya Kagansky, MD; Shmuel Levy, MD; HillaKnobler, MD The Role of Hyperglycemia in Acute StrokeArch Neurol. 2001;58(8):1209-1212. doi:10.1001/archneur.58.8.1209 (24)

25.D.M. Bravata et al Hyperglycaemia in patients with acute ischaemic stroke: how often do we screen for undiagnosed diabetes Q J Med2003;96 :491–497 (25)

26 Bell-Gam H.I, et al – Stroke Management in Nigeria (26)

27. Hope Ilanye Bell - Gam, AuthurOnwuchekwa. AlagomaMurtalaIyagbaImproving Stroke Management through Specialized Stroke Units in Nigeria: The Nigerian Health Journal, Vol. 12, No 2, April — June, 2012 (27)

ANNEX- I

CONSENT FORM

College of Public Health and Medical Sciences, Department of Internal Medicine JUSH. Questionnaire on hypertension-related admissions and outcome at discharge of patients admitted to medical ward of JUSH, from 1st October,2012 to March 31, 2013G.C

A).INFORMATION TO THE PARTICIPANT/ATTENDANT

Interview code no _____

Greeting and self introduction and consent by translating to his/her language.

Greeting: - Good morning/afternoon.

My name is----------We are conducting a scientific research on hypertension-related admissions and outcome at discharge of patients admitted to medical ward of JUSH. Therefore, I am happy to inform you that you are one of the potential participants in this study. Your participation is only determined by you. If you feel you will not participate in this study, your decision will be much respected from the outset. It is only if you are willing I will proceed to ask you some information. Data will be collected with interview and from patient chart. The information gathered will be used for writing a proposal for partial fulfillment of a specialty certificate in Internal Medicine at Jimma University. Here, I want to assure you that any information obtained from you will remain confidential and even there is no need of writing your names or any personally identifiable information.

B) CERTIFICATE OF CONSENT

Do you wish to participate in the study?

If the participant/attendant agrees to participate in the study, proceed with interview and the rest data will be taken from patient's chart after the patient/attendant has signed the consent.

I have adequate information about the research and I have decided to participate in the study.

Signature ----------

If the participant/attendant says “No, I don’t want to participate in the study”, thank him(her) and stop .Thank you!

Name of interviewer_____ Date_____/_____/_____

Annex III: Questionnaire designed to assess the prevalence of stroke and prognosis in patients in admitted with stoke to JUSH medical wards December 2013 –march 31 2014

Date of completion of the questionnaire __ __ ____

Part I – Identification, Sociodemographic characteristics and anthropometric measurements of the study participants

Card No---------- weight (kg) ---------- Height (cm) --------- Age (yrs) ---------

Gender □M □F

Marital status □Married □Single □Divorced □Widowed

Occupation □Farmer □House wife □Employee □Student

□Merchant □ others (specify) ----------

Literacy status □Illiterate □Semi-literate □Literate

Annual Income (birr) □ <3000 □3000-6000 □>6000

Living area □Urban □ Rural

Part II

Admission blood glucose level ……mg/dl

Admission blood pressure SBP……mmHg DBP……mmHg

Which of the following risk factors does the patient have?

□High BP □DM □Alcohol use

□Smoking □Previous stroke

Outcome of the participant

Days since onset of symptoms & admission …….

Length of hospital stay …….days

Is patient Discharged ……Dead……Referred……

If discharged ……improved…….disabled …….

If dead immediate cause of death……..