MEDICAL CHANNEL

Original Article

EFFECT OF STRESS HYPERGLYCEMIA (SH) ON MORTALITY RATE AMONG ACUTE ISCHEMIC STROKE (IS) PATIENTS

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ABSTRACT:

Introduction: Worldwide, in adults stroke is a 2nd most common & leading cause of disability and death. The incidence rises steeply with age and in many developing countries because of adoption of less healthy lifestyles.

Apart from hypertension, smoking, hyperlipidemia and diabetes mellitus, Stress Hyperglycemia (Hyperglycemia occurred during acute ischemic stroke in a non diabetic patient) is thought one of the vulnerable factor that affects the acute phase of stroke and 30 days mortality and out-come.

Stress hyperglycemia (SH) i.e.; Random Blood Sugar level >121 mg/dl or > 6.1 mmol/L has been found in 2/3rd of all stroke patients and in almost ½ of the acute Ischemic Stroke (IS) population.

A prospective, multiple meta-analyses & case control studies have reported more than 3-fold increase in 30-days mortality in non diabetic (stress) hyperglycemia compared with a 2-fold increase in known diabetics. Imaging studies suggest that metabolic derangements contribute to detrimental effects on short term mortality, infarct size & clinical outcome. Various factors have been proposed, those become activated during cascade of SH with IS leading; Vasoconstriction, Prothrombosis & Proinflammation, activation of Hexosamine/Nitric oxide, Pentose phosphate & Protein Kinase-C pathways respectively.

Study Design & Place: This observational and prospective study was conducted from 1st January 2009 31st December 2009, at Medical Unit-II in Liaquat University Hospital (LUH) Jamshoro/Hyderabad.

Results: Sixty cases were inducted for study, out of these 30 were suffering from IS with SH and 30 were belonging to IS without SH. From these, 38 (63.3%) were male & that of 22 (36.7%) were female.

Initially all IS patients with SH, for 01 week were treated by ICU management with Regular Insulin along with other standard stroke-protocol & later with General management for 02-03 weeks.

During hospitalization the mortality rate was high in SH patients 10 (33.3%) i.e.; Male were 07 (23.3% & Female were 03 (10%), as compared to patients without SH 02 (06.7%) i.e.; all were Male.

While in case of SH the survivors have delayed recovery and poor prognosis but patients without SH have rapid recovery and good prognosis respectively.

Conclusion: In our study we found that Stress Hyperglycemia in acute Ischemic Stroke patients increases the duration of hospitalization stay & short term mortality and long term morbidity, therefore, understanding all pathways and developing specific therapies along with critical care of IS patients with SH, may reduce the mortality & morbidity, hence improve outcome & prognosis world wide.

Key Words: Ischemic stroke, Stress hyperglycemia, Mortality, Outcome.

INTRODUCTION:

Worldwide in adults, stroke is a 2nd most common & leading cause of disability and

death. It is a common medical emergency with an annual incidence of 180-300 million/1 lack. The incidence rises steeply with age and in many developing countries because of adoption of less healthy lifestyles .

There are two types of stroke; ***Ischemic stroke*** (80-85%) and ***Hemorrhagic stroke*** (15-20%). Apart from hypertension, smoking, hyperlipidemia and diabetes mellitus, Stress Hyperglycemia (Hyperglycemia occurred during acute ischemic stroke in a non diabetic patient) is thought one of the culprit factor that affects the acute phase of stroke and 30 days mortality and out-come.

Stress hyperglycemia (SH) i.e.; Random Blood Sugar level >121 mg/dl or > 6.1 mmol/L has been found in 2/3rd of all stroke patients and in almost ½ of the acute Ischemic Stroke (IS) population.

A prospective, multiple meta-analyses & case control studies have proved the importance of early SH as a predictor of IS out-come-but debate continues whether the effect is independent of pre-existing diagnosis of diabetes mellitus or initial stroke severity and still no cut off value has been decided in diabetics and stress hyperglycemics for the safety profile .

Meta-analysis studies have reported more than 3-fold increase in 30-days mortality in non diabetic (stress) hyperglycemia compared with a 2-fold increase in known diabetics .

Imaging studies suggest that metabolic derangements contribute to detrimental effects on short term mortality, infarct size & clinical outcome. Various factors have been proposed, those become activated during cascade of SH with IS leading; Vasoconstriction, Prothrombosis & Proinflammation , activation of Hexosamine/ Nitric oxide , Pentose phosphate , activation of Protein Kinase-C pathways.

In rats with hyperglycemia in IS, increases oxidative stress (Super oxides) & Metalloproteinase-9 (MM-9) which cause exacerbation of blood brain barrier dysfunction .

Understanding these all pathways and developing specific therapies along with critical care of such patients may reduce the morbidity and mortality, hence improve outcome & prognosis.

STATISTICAL ANALYSIS:

Statistical analysis was done on SPSS version 11.0 and the effect of stress hyperglycemia and known diabetic patients with acute ischemic stroke was calculated. Proportions were used in tables. For differences in means the continuous variables were analyzed by students "t'' test. Fisher's exact test was used where applicable. Discrete non-continuous variables were analyzed by chi-square (x2) test. Statistically P-values <0.05 & <0.01, were considered significant.

PATIENTS & METHODS:

This observational and prospective study was conducted from 1st January 2009 31st December 2009, at Medical Unit-II in Liaquat University Hospital (LUH) Jamshoro/Hyderabad.

INCLUSION CRITERIA: All the patients of age > 20 years of either sex were included in the study with confirmed Ischemic Stroke on CT scan brain plain or MRI brain.

EXCLUSION CRITERIA: All the patients with < 20 years of age & having either, Subarachnoid Hemorrhage or Space Occupying Lesion (SOL) were excluded from the study.

During hospitalization the detailed history & examination was done and data was recorded on proforma specially designed for this study.

All the following required investigations were carried during hospitalization.

1. C.T Scan Brain Plain / MRI Brain.
2. Complete blood count & ESR.
3. Urine D/R.
4. X-Ray Chest (P.A.view).
5. FBS / RBS.
6. Fasting Lipid Profile.
7. ECG.
8. Echocardiography.
9. Doppler of neck vessels.

RESULTS:

Total 60 cases were inducted for study purpose, out of them 30 cases were suffering from Ischemic Stroke (IS) with Stress Hyperglycemia (SH) i.e.; newly increase in blood sugar level (>121 mg/ dl) and 30 cases were belonging to IS without Stress Hyperglycemia (SH) (<120 mg/ dl). Out of 60 cases, 38 (63.3%) were male & that of 22 (36.7%) were female.

Initially all IS patients with SH, for 01 week were treated by ICU management with Regular Insulin along with other standard stroke-protocol & later with General management for 02-03 weeks. During whole period we observed an impaired blood sugar level among IS patient with SH despite of High doses of regular insulin therapy as compared to the patients with IS without Stress Hyperglycemia.

During hospitalization the mortality rate was high in SH patients 10 (33.3%) i.e.; Male were 07 (23.3% & Female were 03 (10%), as compared to patients without SH 02 (06.7%) i.e.; all were Male (Table: I & II).

While in case of SH the survivors have delayed recovery and poor prognosis but patients without SH have rapid recovery and good prognosis respectively (Table: III).

DISCUSSION:

Ischemic Stroke due to any etiology, may cause increase blood sugar level due to SH, that directly affects to the morbidity & mortality of these patients.

Human meta-analytic, case control & imaging studies have proved that SH during acute IS has detrimental effect on out-come and prognosis.

In our study we found that out of 30 cases of acute IS with SH, 10 (33.3%) expired i.e.; 07 were male & 03 were female within 04 weeks of hospitalization stay despite of all suitable ICU measures. While only 02 (06.7%) patients i.e.; all were male, expired out of 30 patients of IS without SH. This shoes a significant difference in 04 weeks Hospital stay mortality rate or out come between IS patients with and without Stress Hyperglycemia.

In local study at Military Hospital Rawalpindi, conducted by Saif et al, among 100 cases of acute IS i.e.; 50 cases were with SH & 50 cases were without SH. They found that 22 (44%) patients died within 04 weeks of acute IS with SH with male dominance (63%) as compared to IS without SH (10 (20%) and the survivors have delayed recovery in SH patients rather good recovery in non SH group of the patients. We also found the similar results in our study.

Another study conducted at Neurology department of University Hospital Vinogradska, Zagreb, Croatia by Kes et al, in diabetic (with SH) and non diabetic (without SH) in IS patients. They

Table: I.
Frequency of death in acute IS with SH.
n =30

Sex	*n:*	*Expired*	*Total Expired*
MALE	22	07 (23.3%)	10 (33.3%)
FEMALE	08	03 (10%)	

Table: II.
Frequency of death in acute IS without SH.
n =30

Sex	*n:*	*Expired*	*Total Expired*
MALE	16	02 (06.7%)	02 (06.7%)
FEMALE	14	Nil	

Table: III.
Blood sugar level difference & prognosis between acute IS with & without SH.

Mean blood sugar level with SH.	Mean blood sugar level without SH.
>121 mg / dl.	< 120 mg / dl.
Poor prognosis & delayed recovery.	Good prognosis & rapid recovery.

inducted 630 patients of IS. Out of these 220 were with SH & 410 were without SH. They found 20% deaths in SH patients as compared to 25% deaths in patients without SH, despite of intensive insulin therapy at ICU. Comparatively with low numbers of patients with SH, the mortality is very high in patients with SH as compared to high number of patients without SH. In this regard similar results we found in our study.

Metz et al, from department of Neurology, Donauklinikum & Neurosciences Centre, Donau-Universitat, Maria Gugging, Austria.in their study among 238 patients of acute stroke found 47 (19.7%) with SH, in whom they found a worse out-come (Modified Rankin scale 0-1 at discharge: 40.2 vs 63.8). In our study we also found a poor out-come & worse prognosis in IS patients with SH.

CONCLUSION:

In our study we found that Stress Hyperglycemia in acute Ischemic Stroke patients increases the duration of hospitalization stay & short term mortality and long term morbidity, therefore, understanding all pathways and developing specific therapies along with critical care of IS patients with SH, may reduce the mortality & morbidity, hence improve outcome & prognosis world wide.

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