ABSTRACT:
Objectives: To determine the frequency of metabolic syndrome in patients of stroke, to prevent or minimize the morbidity and mortality of stroke, cardiovascular disease and diabetes mellitus type 2.
Study Design: This was a cross-sectional study
Place and Duration: This study was conducted in Medical unit one of Chandka Medical College Teaching Hospital Larkana, over a period of one year from March 2009 to March 2010.
Method and Material: In this study, 131 cases of proved stroke of either sex from age of 20 to 85 year were included after getting verbal and written consent for assessment of metabolic syndrome by revised ATP III criteria.
Results: Out of 131 cases of stroke patients male were 76 (58.0%) and female were 55 (42.0%). Minimum and maximum age of patients was 28 and 85 years respectively, while mean age was 55.49 + 12.149. Out of 131 cases, 87(66.4%) were of ischemic type and 44(33.6%) were of hemorrhagic type. Out of 87 cases of ischemic stroke 51 and 36 were male and female, accounting 58.6% and 41.4%. Out of 44 cases of hemorrhagic stroke 25(56.8%) were male, and 19 (43.2%) were female.
Metabolic syndrome was present in 49 (37.4%) cases out of 131, and out of 49 cases of metabolic syndrome 34(69.4%) cases were found in ischemic stroke type, and 15 (30.6%) were in hemorrhagic stroke type. Metabolic syndrome was found in 32.9% of all male stroke patients and 43.6% of all female stroke patients (p= 0.210).
Conclusion: In our study, quite high (37.4%) frequency of metabolic syndrome was found in patients of stroke, affecting mainly middle age group, with no significant difference of gender and stroke types.

Key Words: Types of Stroke, Metabolic Syndrome.

INTRODUCTION
Stroke is a clinical condition characterized by sudden onset of focal neurological deficit of vascular in origin. It can cause permanent neurological damage and death, after a stroke the risk of developing another stroke is 5 to 10 % in first week, 15% in first year and 5% per year after first year.1 Worldwide about 15 million people suffer a stroke, of these 5 million die and another 5 million are left permanently disabled, placing a burden on family and community. Annual incidence is between 180 and 300 per 100000, and about one-fifth of patients with an acute stroke will die within a month of the event, and at least half of those who survive will be left with physical disability. Though the incidence is falling in western countries, but is rising in south Asian countries (India, Pakistan, Bangladesh and Sri Lanka), and is postulated that number of stroke and related deaths will be doubled till year
Stroke is classified into Transient ischemic attack (TIA), progressing stroke (or stroke in evolution) and complete stroke, each may be ischemic or hemorrhagic type. Hemorrhagic stroke accounts for 15 - 20 % of all stroke, while ischemic stroke accounts for about 80 to 85%. The risk factors for stroke include advanced age, high blood pressure, heart disease (atrial fibrillation, heart failure, endocarditis), diabetes mellitus, hyperlipidemia, smoking, excess alcohol consumption, polycthymia, elevated serum homocysteine level, Oral contraceptives, pregnancy, infections, and vasculitis are important etiological factors in young stroke patients.

Metabolic syndrome is a collection of interrelated vascular risk factors of metabolic origin for production and promotion of atherosclerosis resulting to coronary heart disease and stroke. This syndrome is also being known by other names i.e. Visceral fat syndrome, Syndrome X, Deadly quartet and Insulin resistance syndrome.

Metabolic syndrome as a whole is said to be the predictor of future ischemic stroke, more over its individual components are also increasing the risk, and probability of stroke occurrence rises with the number and severity of vascular risk factors. It is evident from 37 studies that this condition accounts for doubling the risk of coronary artery disease, also increases risk of stroke, fatty liver diseases, diabetes and cancer. 7, 8, 9

These risk factors mainly include increased abdominal (central) obesity, increased insulin resistance, raised blood pressure, athgeroic dyslipidemia and hyperglycemia. Ford ES et al observed that prevalence of metabolic syndrome among USA adult increases with age, from 6.7% to 43.5% among individuals of 20 to 29 and 60 to 69 years respectively. 4

To define metabolic syndrome several expert groups proposed criteria i.e. WHO criteria, European Group for Study of Insulin Resistance, American Association of Clinical Endocrinologists, International Diabetics Foundations (IDF), National Cholesterol Education Program (NCEP) Adult Treatment Panel III, and American Heart Association.

Now a day the revised NCEP ATP III, 10 and IDF 11 criteria are the two broadly recognized definitions in use.

Though the exact pathogenesis of metabolic syndrome is not yet known, but it is said that metabolic syndrome is a proinflamatory condition, and multiple factors play to form this syndrome, they include obesity (especially abdominal obesity), physical inactivity, insulin resistance, aging, and genetics. Insulin resistance is the fundamental phenomenon in developmental of metabolic syndrome, which leads to compensatory hyperinsulinemia and many studies have proved that there is significant association between stroke risk and insulin resistance. 7, 8, 9

Abdominal obesity causes significant increased risk of stroke, and reduction of 10% weight with controlling of diabetes mellitus, hyperlipidemia and hypertension results reduction of stroke risk up to 13 per 1000 people. 10 Hyperglycemia (duration and Hb A1c level) and hypertension individually and alone causes increased risk of stroke. 11

This syndrome is highly prevalent worldwide, and is expected to substantially increase in the future alongside the growing obesity epidemic; several studies have suggested that individuals with the metabolic syndrome are at high risk for experiencing first and recurrent stroke. Therefore it is essential to know the profile of the vascular risk factors, to initiate lifestyle modification and, if necessary, drug treatment to prevent or minimize the morbidity and mortality of stroke and coronary heart disease.
and out of 49 cases of metabolic syndrome 34(69.4%) cases were found in ischemic stroke type, and 15 (30.6%) were in hemorrhagic stroke type. Types of stroke were analyzed with metabolic syndrome, we found no significant correlation among them (p=0.577). Table 3

Out of 76 male stroke patients 25 (32.9%) had metabolic syndrome, and out of 55 female stroke patients 24 (43.6%) had metabolic syndrome and statically it was not significant (p=0.210). Table 4.

The majority of cases were above the age of 40 years, 70 cases (53.5%) were of age group 41 to 60 years, and 5 cases (3.8%) were of more than 80 years of age group. Table 1. The waist circumference was high in 32.8% of cases, and fasting blood sugar was high in 16% of cases while high triglyceride and low HDL were found in 42.0% and 51.1% of cases. Table 1.

**DISCUSSION:**

It is estimated that around 20 to 25 per cent of the world’s adult population have the metabolic syndrome, and in USA around 47 million peoples are having this syndrome. The incidence of the
Metabolic syndrome is rising worldwide; this is partly due to a significant increase in the prevalence of obesity. The increasing trained of use excessive soft drinks, refined and meat containing products, less exercise has increased prevalence of obesity, metabolic syndrome and diabetes mellitus type 2 worldwide and also in Pakistan. Stroke is a one of major cause of morbidity and social dependence, by year 2020 is projected that stoke will be the main cause of worldwide morbidity and mortality. So its incidence can be reduced by identifications of its preventable risk factors and atherosclerosis. In metabolic syndrome there is increased prevalence carotid intima-media thickening and asymptomatic carotid atherosclerotic plaques, which poses major risk for cardiovascular diseases and stroke. Individuals of metabolic syndrome are twice as likely to die from and three times as likely to have a heart attack or stroke in comparison to people without the syndrome, and are at fivefold greater risk of developing type 2 diabetes. So its early diagnosis and proper treatment is an essential step in preventing the above dreadful conditions.

### TABLE 3.
**TYPES OF STROKE * METABOLIC SYNDROME CROSSTABULATION**

<table>
<thead>
<tr>
<th>Types of stroke</th>
<th>Ischemic</th>
<th></th>
<th>Present</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischemic</td>
<td>53</td>
<td>34</td>
<td>87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within Types of stroke</td>
<td>60.9%</td>
<td>39.1%</td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within Metabolic syndrome</td>
<td>64.6%</td>
<td>69.4%</td>
<td>66.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>40.5%</td>
<td>26.0%</td>
<td>66.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemorrhagic</td>
<td>Count</td>
<td></td>
<td>29</td>
<td>15</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>% within Types of stroke</td>
<td>65.9%</td>
<td>34.1%</td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within Metabolic syndrome</td>
<td>35.4%</td>
<td>30.6%</td>
<td>33.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>22.1%</td>
<td>11.5%</td>
<td>33.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>82</td>
<td>49</td>
<td>131</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within Types of stroke</td>
<td>62.6%</td>
<td>37.4%</td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within Metabolic syndrome</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>62.6%</td>
<td>37.4%</td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chi-square = 0.311, df = 1, p=0.577

### TABLE 4.
**METABOLIC SYNDROME * GENDER CROSSTABULATION**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metabolic syn Absent</td>
<td>Count</td>
<td>51</td>
<td>31</td>
</tr>
<tr>
<td>% within Metabolic syndrome</td>
<td>62.2%</td>
<td>37.8%</td>
<td>100.0%</td>
</tr>
<tr>
<td>% within Gender</td>
<td>67.1%</td>
<td>56.4%</td>
<td>62.6%</td>
</tr>
<tr>
<td>% of Total</td>
<td>38.9%</td>
<td>23.7%</td>
<td>62.6%</td>
</tr>
<tr>
<td>Present</td>
<td>Count</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>% within Metabolic syndrome</td>
<td>51.0%</td>
<td>49.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>% within Gender</td>
<td>32.9%</td>
<td>43.6%</td>
<td>37.4%</td>
</tr>
<tr>
<td>% of Total</td>
<td>19.1%</td>
<td>18.3%</td>
<td>37.4%</td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>76</td>
<td>55</td>
</tr>
<tr>
<td>% within Metabolic syndrome</td>
<td>58.0%</td>
<td>42.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>% within Gender</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>% of Total</td>
<td>58.0%</td>
<td>42.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

(p=0.210)
FREQUENCY OF METABOLIC SYNDROME IN PATIENTS OF STROKE IN TERTIARY CARE HOSPITAL LARKANA

III and IDF criteria. Omanis have prevalence of 21%. An Iranian study showed prevalence of metabolic syndrome that was 34.7%, 37.4% and 41.6% by definition of ATP III, IDF and ATP III/AHA/NHLBI. Study in Japan by Shimamato prevalence 25.4% is reported. While in UK study of Pakistani cohort show prevalence of 53% by IDF and 44% by NCEP criteria.

In Pakistan it varies from 18% to 46%. And in our study prevalence of metabolic syndrome is 37.4% which is almost similar to study of Jhan F et al in Karachi outdoor patient had prevalence of metabolic syndrome in 35.2% of cases. While study of Hydrize MZ et al in Karachi prevalence was 34.8% and 49% by IDF and modified ATP III criteria respectively. This variability may be due to selection of different criteria as shown in various studies.

The abdominal obesity and insulin resistance have strong correlation, and around 50% of stroke patients have insulin resistance, several studies show correlation between insulin resistance, carotid atherosclerosis and stroke risk, and reduction of insulin resistance in diabetes mellitus type 2 reduces the carotid atherosclerosis and stroke. Impact of metabolic syndrome on acute stroke prognosis has not been evaluated yet, but some metabolic abnormalities and risk factors that interrelated the metabolic syndrome have been associated with worsening of stroke outcomes. Moreover ongoing modern changes in human environment, behavior, and lifestyle caused increase frequency of metabolic syndrome and subsequently increased future risk of cardiovascular disease and diabetes mellitus type 2 with great threat of morbidity and mortality. Therefore clinicians and patients must work together to identify and provide the best prevention and treatment strategies for patients who are overweight and obese, and to modify other risk factors also.

CONCLUSION:
In our study, quite high percentage of metabolic syndrome was found in patients of stoke, affecting the middle age group (earning source) of people despite of their significant physical work, as prevalence of this syndrome is increasingly affecting the people of Pakistan which needs to pay more attention and starting mass awareness program at all levels in order to minimize the risk of stroke, cardiovascular disease and diabetes mellitus type 2.

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Quarterly Medical Channel www.medicalchannel.pk
FREQUENCY OF METABOLIC SYNDROME IN PATIENTS OF STROKE IN TERTIARY CARE HOSPITAL LARKANA