DIFFERENCES IN DISTRIBUTION OF RISK FACTORS AMONG PATIENTS OF HEMORRHAGIC AND ISCHEMIC STROKE ADMITTED IN LIAQUAT UNIVERSITY HOSPITAL, HYDERABAD, PAKISTAN

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ACRONYMS

1. A.F = Atrial Fibrillation
2. A.I.D.S = Acquired Immuno Deficiency Syndrome
3. A.V.M = Arterio Venous Malformation
4. B.H.Us = Basic Health Units
5. B.M.I. = Body Mass Index
6. CT-Scan = Computerized Tomography
7. C.V.A = Cerebro Vascular Accident
8. C.V.Ds = Cardio Vascular Diseases
9. E.C.G = Electro Cardiography
10. F.Y = Fiscal Year
11. G.D.P = Gross Domestic Product
12. M.I = Myocardial Infarction
13. M.R.I. = Magnetic Resonance Imaging
14. N.C.Ds = Non Communicable Diseases
15. P.P.P = Purchasing Power Parity
16. R.H.Cs = Rural Health Centers
17. T.I.A = Transient Ischemic Attack
18. W.H.O = World Health Organization
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Abstract

Background

According to world health organization (WHO) estimates, approximately 15 million people have a stroke in the world annually. One third of them people die within one year and one third suffer disability permanently. Over 85% of Stroke related deaths happen in low- and middle-income countries which are also home of majority of communicable as well non-communicable diseases. Stroke is very common disorder in Pakistan and one of the major causes of morbidity and mortality. The incidence of stroke has not been well studied in Pakistan but it is estimated that 350,000 cases of stroke occur per year.

Objective

This study was aimed to determine the different potential risk factors of Hemorrhagic / Ischemic stroke and their frequencies among the stroke patients admitted at Liaquat University hospital in Hyderabad, Pakistan.

Material and methods

The quantitative study was hospital-based cross-sectional survey. This was performed among patients of either sex who were of more than 25 years of age admitted to the Liaquat University Hospital Hyderabad, Sindh during June 18th, 2010 through September 18th, 2010 and were diagnosed as Hemorrhagic and Ischemic Stroke, included in the study. CT-Scan was used to identify and confirm the diagnosis. Blood pressure was checked by doctors at the time of admission. Laboratory reports were used for cholesterol and Blood sugar levels. A well prepared pre-designed written questionnaire was used to collect patient’s information.

Results

Various risk factors like; Age, Education, Socioeconomic Condition, B.M.I, Hypertension, Cardiovascular Diseases, Diabetes, Smoking, Previous stroke etc. were found among the patients of Liaquat University Hospital. Majority of the patients in this study were Males (54%) while 46% of the patients were females. Majority (36.4%) of patients belongs to older age group (55-64 years). Ischemic Stroke was found among 66% of study participants while the remaining 34% had Hemorrhagic Stroke. Among the patients with Hemorrhagic stroke 48.3% were hypertensive, 56% were uneducated, 19% with cardiovascular diseases history and 64% with hypercholesterolemia. While 62.2% Ischemic stroke patients were hypertensive, 30% with cardiovascular disease history, 72% were uneducated and 47% with hypercholesterolemia.
A significant difference of age group, hypertension, education level, cardio vascular diseases and Hypercholesterolemia was found between patients with Hemorrhagic and Ischemic stroke p-value <0.05.

**Conclusion**

All the participants of this study were stroke patients (either hemorrhagic or ischemic stroke). There was differences in the level of distribution of the risk factors like; age, hypertension, hypercholesterolemia, cardiovascular diseases and education seen among the patients with Hemorrhagic stroke compared to the patients with Ischemic stroke. Higher proportion of patients with Ischemic stroke were more hypertensive than hemorrhagic stroke patients. A significant difference was also found between age groups and both types of stroke. High proportion of patient with Ischemic stroke belongs to older age group (55-64) years while, proportion of Hemorrhagic stroke patients were higher among elderly age group (65+) years. Higher proportion of patients with hemorrhagic stroke had higher level of cholesterol than ischemic stroke patients. Cardiovascular disease history was also predominantly higher among patients with Ischemic stroke than hemorrhagic stroke. Most of the patients of this study were uneducated and were found to be unaware of stroke and its types. So the level of awareness in this study was found to be poor.

**Key Words**

Hemorrhagic Stroke, Ischemic Stroke, Hypertension, Hyperlipidemia
1. INTRODUCTION

1.1 Overview

Stroke is defined by the World Health Organization as “rapidly developed clinical signs of focal or global disturbance of cerebral function, lasting more than 24 hours or until death, with no apparent non-vascular cause”\(^1\). It is a clinical syndrome said to occur as a result of interruption of blood supply to the brain due to any blockage caused by some clot or burst of the blood vessel. This interruption results in the focal or global disturbance of cerebral functions because of improper supply of oxygen and nutrients, causing damage to the brain tissue.\(^2\)

Stroke or Brain Attack or Cerebrovascular accident is a medical emergency and the major cause of death and permanent disability\(^2\). It can injure the brain tissue similarly like heart attack can cause injury to heart.\(^3\)

There are two main types of Stroke;

**Ischemic Stroke:**

This type of stroke is seen in 87% of cases\(^4\). Stroke is said to be Ischemic if the blood supply to brain is interrupt due to blockade of tinny blood vessels to brain by some blood clot occur or as a result of hardening of major blood vessels due to deposition of fat in the vessel walls.\(^3\) The condition is called *Atherosclerosis*. This deposition of fat can lead to two types of conditions:

* *Cerebral thrombosis* means, formation of a thrombus (blood clot) at the clogged part of the cerebral vessel. That results in blockage of supply blood and nutrients to the brain tissue leads to damage to the brain tissue.\(^4\)

* *Cerebral embolism* refers generally to a portion of the blood clot, that forms at some other location of the circulatory system breaks loose, enters in the bloodstream and travels through the blood vessels to brain until it reaches to the tiny vessels of brain and cause blockade there. Another important cause called Atrial Fibrillation also contributes in cerebral embolism. In which heartbeat become irregular, thus creates conditions where clots can form in the heart, dislodge and travel to the brain.\(^4, 5\)
It disrupt the supply of oxygen and other nutrients to the anterior (frontal) and posterior (back) areas of brain tissue which control normal motor activity, sensation, speech, thought, automatic and the coordination functions of brain.\textsuperscript{2,4,5}

**Hemorrhagic Stroke:**

This type of stroke occurs when the blood vessels to brain, rupture or burst out as a result of an aneurysm (a tiny spot or damaged area that balloons out and can burst out) as result of it bleeding occur in the surrounding tissues. This bleeding compresses nearby blood vessels and causes the deprivation of oxygen and important nutrients of surrounding tissues. This blood can also cause irritation to the surrounding tissues which causes edema of that tissue and in turn further compression of the vessels. This type of stroke carries higher risk of death, as it usually affects a large area of the brain. It accounts for around 13\% of cases in general.\textsuperscript{2,3,5}

There are two types of Hemorrhagic Stroke; one when there is ballooning of the tiny spot of blood vessel (Aneurysm) which if left untreated can rupture and bleeds into the brain.

Another type is called Arteriovenous Malformation (AVM) that is the cluster of abnormally formed blood vessels. These vessels are prone to rupture and cause bleeding in the brain.\textsuperscript{2,3,5}

![Figure 1: Different types of Stroke (Hemorrhagic and Ischemic)](http://www.simpalife.com/wp-content/uploads/Types-of-Stroke.jpg)
**Transient Ischemic Attack (T.I.A)**

The term, Transient ischemic attack (TIA) or mini stroke implies to the condition when, for the short time brain gets less blood supply than normal. It sometimes called as Mini Stroke, but it’s more accurately called as warning for the major stroke which must be taken seriously. It usually happens when the blood vessels blocked by some clot. The main difference between Stroke and T.I.A is that, with T.I.A the vessel blockage by clot is temporary (transient). Symptoms of T.I.A appear rapidly and last a very short time period. Mostly the symptoms of T.I.As last for less than five minutes up to an hour. There is no any permanent injury to brain occur, at the end of T.I.As. ², ³, ⁵

**1.2 Signs and Symptoms of Stroke:** ², ³, ⁶

Stroke effects different people in different ways, depends upon the type, area and severity of the injury to brain tissue.

There are five major signs of stroke which are; (most patients have two or more signs):

- There is a sudden weakness or numbness of the half side of the body (either right or left) including arm, face, leg etc.
- Patients become confused and have difficulty in speaking or understanding it.
- There is sudden disturbance in patient’s vision of one or both eyes.
- There is sudden difficulty in walking, dizziness and loss of balance or coordination.
- Patient complains of severe headache without any cause.

As stroke is a medical emergency and it happens very fast, so the symptoms of a stroke may occur suddenly. These symptoms depend upon the type of stroke, area of brain or severity of the injury to brain tissue. Weakness or paralysis is the most common symptom, with partial or complete loss of voluntary movement or sensation in a leg or arm of one side of the body. There can be speech problems and the weakness of facial muscles, causing drooling. Numbness or tingling is very common. A stroke that involve base of the brain can affect balance, vision, swallowing, breathing and even unconsciousness ³, ⁵
1.3 Risk Factors\textsuperscript{5, 8}

The most common risk factors of stroke are similar to those for coronary heart disease; the most significant Modifiable risks factors are;

- High blood pressure (Hypertension),
- Hypercholesterolemia (Raised level of cholesterol)
- Tobacco use (smoking)
- Diabetes mellitus
- Increasing age,
- Atrial fibrillation,
- Heart failure,
- Valvular heart disease
- Heart attack

Stroke is the leading cause of death among people above 60 years of age\textsuperscript{8}. It commonly occur after age of 50 years, but if it occur in younger individuals (less than 50 years) common risk factors include; use of certain drugs, such as cocaine or amphetamines, ruptured Aneurysms and inherited (genetic) diseases related to blood clotting etc.\textsuperscript{5}

1.4 Diagnostic Criteria:

Diagnosis of stroke starts with detailed history of current events along with that general medical history for chronic diseases like; Hypertension, Diabetes Mellitus, Cardiovascular diseases, other Neurological diseases etc.\textsuperscript{2,3,5} After history taking, next steps of diagnosis are; measuring the blood pressure in arms, pulse, neurological examination, test for level of consciousness etc.\textsuperscript{7} Identification of stroke does not stop just on history and examination, different other tests used to confirm the diagnosis.\textsuperscript{7}
Computerized Tomography (C.T. scan) is the most commonly used test to diagnose Stroke. It can give the accurate picture of both types of Stroke (Hemorrhagic or Ischemic) no matter how minor the attack or symptom. Sometime as a follow up, another test i.e. Magnetic Resolution Imaging (M.R.I.) used to diagnose stroke which is not only more detailed than C.T scan but also often recommended to diagnose Transient Ischemic Attacks (T.I.A). Other tests include; E.C.G, Trans-cranial or Carotid Doppler Ultrasounds, Random Blood Sugar, Serum Cholesterol etc.

1.5 Global Burden of Stroke

Stroke is a major global health problem and is the second most common cause of global mortality, just after Cardio Vascular Diseases (C.V.Ds) and sixth leading cause of disease burden worldwide.

Stroke has a huge impact on public health worldwide. It is the fact that, 1 in 6 people experience a stroke during their lifetime. Every second, someone somewhere experiences a stroke and every sixth second, regardless of age, gender, ethnicity, origin or region, someone dies of a stroke.

The World Health Organization (WHO) estimates that worldwide, each year 15million people suffer from stroke. Out of these stroke claims lives of 5.8 million people (3 million women and 2.8 million men) and around 5 million face health consequences like disability, paralysis and cognitive impairment, reduced earning capacity, placing burden on families and communities.
There are about one million of new cases of stroke every year, within European Union and 700,000 in United States of America\textsuperscript{14}. It is expected to become fourth leading cause of disease burden globally by the year 2020\textsuperscript{10}. An estimate, in every 60 seconds around 30 incidences of stroke occur per worldwide\textsuperscript{14}. It accounts for around 10\% of all deaths, globally\textsuperscript{15} During last three decades between 1970 and 2008, stroke rates across the developed world fell by 42\% and there is reduction in the risk of dying as a result of stroke by improved prevention in developed countries\textsuperscript{15}. It is the leading cause of neurologic disability in adults and much can be done to limit the mortality and morbidity through prevention and acute intervention\textsuperscript{16}.

In recent years, along with other non-communicable diseases (NCDs), the burden of stroke has risen sharply in the developing countries\textsuperscript{15}. From the year 2000 to 2008, the overall stroke incidence rates of stroke rose in low to middle income or developing countries by 20\% exceeded that of high-income countries. The burden of stroke now disproportionately affects individuals living in resource-poor countries\textsuperscript{15}.

Developing countries borne more than two third of the global burden of stroke and the vast majority of stroke related deaths occur in the poor or low income countries\textsuperscript{17, 18}. Rates of Stroke in middle-aged people (30 to 69 years) are 5 to 10 times higher in countries like; China, Russia, Pakistan, Brazil and India, compared with the United Kingdom or United States\textsuperscript{17}. The average age of stroke patient is 15 years younger than in developed world, as fewer people in developing countries at the oldest ages so higher share of stroke occurs among people at younger ages.\textsuperscript{15, 18}

Between the years 1970 and 2008, stroke rates across the developed world fell 42\% while it rose 100\% over the same period in developing countries with higher fatality rates of stroke. According to reports most of the world’s regions will see an increase in stroke and NCDs related deaths between years 2002 and 2030, with most of them in the South Asian countries.\textsuperscript{15} The exact figures for the developing countries are not available, but the five million stroke related deaths in the year 1990 has been predicted to be double by year 2020 with most of increase occurring in the developing countries like; Pakistan, India, Sub-Saharan Africa etc. All this because of the expected demographic and health transitions and changes in lifestyle like; prevalence of hypertension, obesity, diabetes, smoking etc.\textsuperscript{19}
The limited data from different studies in developing countries indicate the difference between epidemiology of stroke from these countries and western developed world.\textsuperscript{17}

1.5.1 Consequences

Globally, total number of people dies because of stroke is more than because of AIDS, malaria and tuberculosis, put together. The panorama gets even darker because 85\% of all strokes related mortality and morbidity occur in developing countries where the resources for stroke care are limited.\textsuperscript{13,14} 60\% of the Stroke affected people die or become disabled for the rest of their lives. (2) 10\% of people die within 30 days after experiencing their first stroke while 50\% remain disabled after 6 months and 30\% improve completely.\textsuperscript{12, 13}

1.6 Country Profile: PAKISTAN

1.6.1 Geography:

Pakistan is the 6\textsuperscript{th} most populous country in the world and 2\textsuperscript{nd} most populous in South Asia with an estimated population of 174 million.\textsuperscript{20} More than 40\% of population lives in urban areas. Pakistan shares the south-western border with Iran, and long north-western border with Afghanistan. China makes up the country’s north-eastern border and eastern border with India. Southern boundary of the country is of 1,064 km coastline with Arabian Sea. Total area of Pakistan is 796,095 sq km and is nearly four times the size of the United Kingdom.\textsuperscript{21} The landscape of Pakistan divides it into six major regions, the North High Mountainous Region (including the Himalayas, the Karakoram (K2 - 28,250 ft. (8,611 m)) and the Hindukush), the Western Low Mountainous Region (spread from the Swat and Chitral hills in a north-south direction (along which Alexander the Great led his army in 327 B.C) and cover a large portion of the Khyber-Pakhtoonistan province), the Baluchistan Plateau, the Potohar Uplands, the Punjab and the Sindh Plains.\textsuperscript{22} (Figure 3) Mostly hot, dry desert; temperate in northwest; arctic in north. Flooding along the Indus after heavy rains (July and August)\textsuperscript{24} Natural resources of Pakistan includes; extensive natural gas reserves, limited iron ore, petroleum, coal, copper, salt, limestone.\textsuperscript{21}
1.6.2 Economy

Pakistan is a developing country with an estimated per capita income of $2,600 in the year 2009 (15). 24% of country’s population estimated to live below poverty line. Country has suffered from many years of internal political disturbances and negligible foreign investment\(^2\)\(^1\).

The Pakistani economy based on agriculture, which contributes more than 50 % of the country's labor force and constitutes more than 25% of the GDP. Economy of the country faces several long term challenges such as curbing inflation and mounting investment in healthcare, education, and electricity production\(^2\)\(^4\).

Despite the fact that Pakistan is a poor country, yet its growth rate has been better than global average growth rate (1.6%). Pakistan is facing 6.6% unemployment plus substantial underemployment with estimated \(^2\)\(^5\).

Major exports commodities of the country are; Textile (garments, cotton cloth, yarn etc.), Sports goods, Rice, Leather goods, Chemicals, Carpets and rugs\(^2\)\(^1\).

Major import commodities of the country are; Petroleum and Petroleum products, Plastic, Machinery, Edible Oils, Tea, Iron, Steel etc.\(^2\)\(^1\)
1.6.3 Existing Health System

Pakistan has a health system which comprises different service giving facilities the health system has different levels (tiers). There are four provinces and a federally administrated area with 132 districts. The national health of the country is based on primary health care. The health care system includes a basic health unit which provides health services to around 5000 people. There are a total of 4872 registered BHUs in service 26, 27.

These are 572 Primary health centers in Pakistan, which provide services to the population together with the basic health units 26.

The secondary and tertiary care system, which are established in the main cities are responsible for referred and complicated cases. This level of health care includes around 965 hospitals with a capacity of around 100,000 beds for indoor treatment. Among the many hospitals of the country Tehsil and District headquarters hospital and teaching hospital are a part of the tertiary health system 26, 27.

Box1: Summary of Total number of Health care facilities and personals 26, 27.

<table>
<thead>
<tr>
<th>Total Health Facilities</th>
<th>13,937</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td>965</td>
</tr>
<tr>
<td>Dispensaries</td>
<td>4,916</td>
</tr>
<tr>
<td>Primary Health Centres (PHC)</td>
<td>572</td>
</tr>
<tr>
<td>Tuberculosis clinic</td>
<td>293</td>
</tr>
<tr>
<td>Basic health units (BHUs)</td>
<td>4,872</td>
</tr>
<tr>
<td>Doctors</td>
<td>127,458</td>
</tr>
<tr>
<td>Dentists</td>
<td>7,879</td>
</tr>
<tr>
<td>Nurses</td>
<td>43,646</td>
</tr>
<tr>
<td>Midwives</td>
<td>2,788</td>
</tr>
<tr>
<td>Health visitors</td>
<td>3,864</td>
</tr>
</tbody>
</table>

1.6.4 Condition of Stroke

Stroke is one of the emerging chronic diseases in developing countries like Pakistan 17. There is no epidemiological literature on pattern and burden of stroke in Pakistan. Several hospital based studies mentioned about the increased prevalence of stroke in the country 28. It is estimated that, every year 250/100,000 incidence of stroke occur in Pakistan, translation to 350,000 new cases every year 29. According to recent findings published by Aga Khan University, one in four urban Pakistanis suffered the symptoms of a stroke. Stroke now account for around 41 percent of total disease burden in the country 30.
A study about stroke in Pakistan showed, almost 60% stroke patients are about the age of 60 years. Different Hospital based studies also have revealed a higher proportion of strokes at a much younger age compared with the stroke population in the west. This made it a main health problem at a productive time in life causing a huge economic damage to the individual in particular and the country in general 31.

Hypertension is the most preventable cause of stroke. Different epidemiological studies in Pakistan however have showed 50 to 82% stroke Patients were hypertensive. In Pakistan, the prevalence of hypertension has been reported to be about 33% in the population over 45 years of age. More than 70% of the rural population is unaware that they have hypertension, and do not come to medical facilities to get the appropriate service for it32-41. Even though there is a limited data regarding the prevalence of established risk factors of stroke, hospital based studies have revealed diabetes, ischemic heart diseases, hyperlipidemia together with hypertension are among the Common risk factors of Stroke in Pakistan28.

1.7 JUSTIFICATION FOR THE STUDY:

Being a medical student, during my rotations in medical and neurology units in Liaquat University Hospital, Hyderabad, Pakistan was my initial exposure to Stroke. With this background, it was impossible to ignore the high prevalence of stroke and the potential risk factors of stroke on medical ward rotation, during my internship there, in Liaquat University Hospital. With the fast increasing rates of Stroke in Pakistan and several parts of the world, I deem it necessary to highlight the risk factor of Stroke especially the one that was associated with the Stroke patients admitted in the public sector hospital.
2. OBJECTIVES

General objective
An overall aim of this study was to determine the difference in distribution of the existing risk factors of Hemorrhagic and Ischemic stroke among patients who were admitted at Liaquat University hospital in Hyderabad, Pakistan.

Specific aims
- To assess if there is a difference in the distribution of hypertension, hypercholesterolemia, and cardiovascular diseases among hemorrhagic stroke patients compared to ischemic stroke patients.
- To assess if there is a difference in the distribution of age and education among hemorrhagic stroke patients compared to ischemic stroke patients.
3. MATERIALS AND METHOD

3.1 Study Setting

This study was carried out at Liaquat University during June 18\textsuperscript{th} to September 18\textsuperscript{th} 2010. It is situated in the heart of the city of Hyderabad, Sindh and it is one of the biggest public sector hospitals located in the city.

![Map of Hyderabad City](image)

* Red circle indicating Liaquat University Hospital (Civil Hospital)

Sources: [www.maps.google.com](http://www.maps.google.com) (Hyderabad, Sindh, Pakistan)

3.2 Study Design

This study was a cross-sectional survey.

3.3 Study Sample

This study was carried out within the big hospital of Hyderabad, situated in the main city centre. A total of 1296 patients admitted in medical wards, of which 261 were diagnosed and confirmed as stroke patients.

Inclusion criteria: All patients of both sexes aged ≥ 25 years who were confirmed on CT-scan as stroke were included in this study.

Exclusion criteria: Patients younger than 25 years and diagnosed with other diseases like; Infective meningitis (Tuberculous or Bacterial), space occupying lesions, psychosis, viral or bacterial encephalitis, or multiple sclerosis were excluded for the study. Patients who were not diagnosed as Stroke on CT-Scan or referred from other hospitals were also excluded from this study.
3.4 Operational Definitions of Variables

Family History: Patient said to have a positive family, if he/she had first degree relative (parents, siblings etc.) who had Stroke (Ischemic or Hemorrhagic)

(C.V.Ds) Cardiac Vascular Diseases History: Cardio vascular diseases history said positive if patient have previous history of Myocardial Infarction (M.I.), Valvular Heart Disease, Atrial Fibrillation (A.F), coronary angioplasty, bypass graft surgery etc.

Hypertension: Patients were labeled as Hypertensive, if there was any previous history of hypertension and taking medication or newly diagnosed on the basis of average blood pressure >140/90 mmHg. Blood pressure was measured twice (sitting and lying position) by a doctor using standard method

Diabetes Mellitus: Patients were considered as Diabetic if Fasting serum glucose was > 126mg/dl and Random serum glucose was >200mg/dl, whether they were a known case of diabetes mellitus or diagnosed during hospital admission. Blood glucose was measured by commercially available kits.

B.M.I (Body Mass Index):
Patient considered underweight if BMI was ≤18.5, normal if BMI was 18.6-24.9 and overweight/obese if BMI was ≥ 25. It was calculated by using Quetelet formula, weight (Kg) / Height (m²).

Hypercholesterolemia (Elevated Cholesterol Level): Patients were tested for fasting serum cholesterol. Those with fasting serum cholesterol level >200mg/dl were considered as Hypercholesterolemia.

3.5 Study Tool

A special questionnaire was designed for the purpose of this study. It includes questions related to; Age, Sex, Education level, Body Mass Index (BMI), Systolic and Diastolic blood pressure, total serum cholesterol level, brief clinical history, previous history of hypertension, diabetes, cardio vascular diseases and stroke, family history of Stroke and smoking history.
3.6 Statistical Analysis

After the entry of the collected data, STATA 10 was used to analyze and describe the different findings of the study. Descriptive analysis was done by calculating proportions. While statistical analysis was done by using Chi² test by the same program to identify differences in distribution of variables among patients with Hemorrhagic and Ischemic stroke. The level of significance was at p-value <0.05.

3.7 Ethical Consideration

Before collecting the data, permission was taken from Board of Advance Studies and Research (BASR) Liaquat University of Medical and Health Sciences in Pakistan. In addition, approval also was obtained from the Ethical Review Committee of Liaquat University of Medical and Health Sciences. After taking consent, the study's criteria and purpose was explained in detail to all patients/relatives.
4. Results

A total of 261 patients were diagnosed with stroke and included in the present study, 54% of them were male and 46% female. The mean age of patients was 54.7 years. Out of these 172 (66%) patients had Ischemic whereas 89 (34%) patients had hemorrhagic stroke. All patients were divided into five different age groups ranging from 25 - 95 years (Chart 1).

![Chart 1: Percentage Distribution of Stroke Patients in Different Age Groups]

Regarding distribution of descriptive risk factors of stroke among patients (Males and Females) in different age groups, the highest proportion of patients (36.4%) belongs to age group (55-64 years) whereas the lowest proportion patients (12.6%) belong to younger age group (25-34 years) [Table 1].

Majority (67%) of patients had no educational attainment, while low proportion (15.4%) of patients was educated with secondary or higher education. Among the study patients, 57.4% males and 77.5% female were illiterate while 42.4% male and 22.4% female patients were educated with a secondary or higher degree. (Table1)

Most patients (79%) were married in both sexes, while only 8% were unmarried and 13% widowed, divorced or separated. Positive stroke family history was present in 24.5% of patients. Majority (54%) of males showed positive family history of stroke as compared to (46%) of females. On the basis of type of stroke, (66%) had ischemic and (34%) had hemorrhagic stroke. Ischemic stroke was prominently found among females (70.8%) compared with males (61.7%). Hemorrhagic stroke proportion among males and females was (38.3% and 29.2% respectively). (Table1)
The findings of the results showed that there is a significant difference in distribution of different age group among patients Hemorrhagic and Ischemic stroke (p-value < 0.05) (table 2).

As shown in table 2, 25.8% of Hemorrhagic stroke patients belong to elderly 65+ years age group when compared to younger age group 25-34 years (21.3%). Furthermore, majority of

<table>
<thead>
<tr>
<th>Number of Subjects=n (%)</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age groups</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-34</td>
<td>14(10.0)</td>
<td>19(15.8)</td>
<td>33(12.6)</td>
</tr>
<tr>
<td>35-44</td>
<td>15(10.6)</td>
<td>19(15.8)</td>
<td>34(13.0)</td>
</tr>
<tr>
<td>45-54</td>
<td>27(19.1)</td>
<td>13(10.8)</td>
<td>40(15.3)</td>
</tr>
<tr>
<td>55-64</td>
<td>53(37.6)</td>
<td>42(35.0)</td>
<td>95(36.4)</td>
</tr>
<tr>
<td>65+</td>
<td>32(22.7)</td>
<td>27(22.6)</td>
<td>59(22.6)</td>
</tr>
</tbody>
</table>

| **Education**            |       |         |       |
| Illiterate               | 81(57.4) | 93(77.5) | 174(67.0) |
| Primary                  | 30(21.2) | 16(13.3) | 46(17.6) |
| Secondary/Higher         | 30(21.2) | 11(9.1)  | 41(15.4) |

| **Marital Status**       |       |         |       |
| Un-Married               | 10(7.1)  | 11(9.1)  | 21(8.0) |
| Married                  | 113(80.2) | 94 (78.3) | 207(79.0) |
| Widow/Divorced/Separated | 18(12.7) | 15(12.5) | 33(13.0) |

| **Socio-Economic condition (Monthly Income)** |       |         |       |
| Lower (< 10,000)          | 77(54.6) | 53(44.1) | 130(50.0) |
| Middle (10,000-50,000)    | 47(33.3) | 55(45.8) | 102(39.0) |
| Upper (>50,000)           | 17(12.1) | 12(10.0) | 29(11.0) |

| **Family History Stroke** |       |         |       |
| Yes                       | 35(24.8) | 29(24.1) | 64(24.5) |
| No                        | 106(75.2) | 91(75.9) | 197(75.5) |

| **Stroke Type**           |       |         |       |
| Ischemic Stroke           | 87(61.7) | 85(70.8) | 172(66.0) |
| Hemorrhagic Stroke        | 54(38.3) | 35(29.2) | 89(34.0) |
Ischemic stroke patients belong to old age group 55-64 years than the younger age group 25-34 years (8.1%). (Table 2)

Table 2: Comparison and distribution of different age groups among patients with Hemorrhagic and Ischemic stroke (n=261)

<table>
<thead>
<tr>
<th>AGE GROUP</th>
<th>Hemorrhagic Stroke</th>
<th>Ischemic Stroke</th>
<th>p-value (Chi2 test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-34 years</td>
<td>19(21.3)</td>
<td>14(8.1)</td>
<td></td>
</tr>
<tr>
<td>35-44 years</td>
<td>16(18.0)</td>
<td>18(10.5)</td>
<td></td>
</tr>
<tr>
<td>45-54 years</td>
<td>10(11.2)</td>
<td>30(17.4)</td>
<td></td>
</tr>
<tr>
<td>55-64 years</td>
<td>21(24.7)</td>
<td>74(43.0)</td>
<td></td>
</tr>
<tr>
<td>65+ years</td>
<td>23(25.8)</td>
<td>36(21.0)</td>
<td></td>
</tr>
</tbody>
</table>

* < 0.05

The findings of the results showed that there is a significant difference in distribution of different levels of education among patients with Hemorrhagic and Ischemic stroke (p-value < 0.05) (Table3).

As showed in table3, that 56% of patients with hemorrhagic stroke were illiterate while 22.5% of the Hemorrhagic stroke patients had secondary/ above education. In the same way 72% of Ischemic stroke patients were illiterate as compared to 12.3% of them which were educated (secondary/above).

Table3: Comparison and distribution of different education levels among patients with Hemorrhagic and Ischemic stroke (n=261)

<table>
<thead>
<tr>
<th>Education</th>
<th>Hemorrhagic Stroke</th>
<th>Ischemic Stroke</th>
<th>p-value (Chi2 test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Education</td>
<td>50(56.0)</td>
<td>124(72.0)</td>
<td></td>
</tr>
<tr>
<td>Primary Education</td>
<td>19(21.3)</td>
<td>27(15.7)</td>
<td></td>
</tr>
<tr>
<td>Secondary and above</td>
<td>20(22.5)</td>
<td>21(12.3)</td>
<td></td>
</tr>
</tbody>
</table>

* <0.05
Majority (57.4%) of the patients of this study were hypertensive. Of which 56% males and 59.2% females were hypertensive. (Table 4)

Regarding cardiovascular diseases, (28.4%) male patients were found to have a previous history of cardiovascular diseases as compared to (25%) females. The majority (60%) of patients were diabetic. Of which 59.5% of male and 60% female patients were diabetic. (Table 4)

Findings of the study showed that 33% of patients were smokers. Majority (50.3%) of smokers was male and 13.3% smokers were female. (Table 4)

Regarding cholesterol level, majority of study patients (53%) showed the higher level of serum cholesterol. Majority of male patients (64.5%) in the study with higher cholesterol levels as compared to females (39.2%). [Table4]

Regarding BMI, 23.7% of participants of the study with high BMI (>30). 29.8% males and 16.6% of females with high BMI level. 20.5% of males and 22.5% of females with positive previous stroke history. (Table4)

Table 4: Frequency and percentage distribution of other explanatory factors of stroke (n=261)

<table>
<thead>
<tr>
<th></th>
<th>MALE n(%)</th>
<th>FEMALE n(%)</th>
<th>TOTAL n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hypertensive</strong></td>
<td>141(54.0)</td>
<td>120(46.0)</td>
<td>261</td>
</tr>
<tr>
<td><strong>Non Hypertensive</strong></td>
<td>79(56.0)</td>
<td>71(59.2)</td>
<td>150(57.4)</td>
</tr>
<tr>
<td><strong>C.V.Ds</strong></td>
<td>40(28.4)</td>
<td>30(25.0)</td>
<td>70(26.8)</td>
</tr>
<tr>
<td><strong>No CVDs</strong></td>
<td>101(71.6)</td>
<td>90(75.0)</td>
<td>191(73.2)</td>
</tr>
<tr>
<td><strong>Diabetic</strong></td>
<td>84(59.5)</td>
<td>72(60.0)</td>
<td>156(60.0)</td>
</tr>
<tr>
<td><strong>Non-diabetic</strong></td>
<td>57(40.5)</td>
<td>48(40.0)</td>
<td>105(40.0)</td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-smokers</td>
<td>45(32.0)</td>
<td>98(81.6)</td>
<td>143(55.0)</td>
</tr>
<tr>
<td>Smokers</td>
<td>71(50.3)</td>
<td>16(13.3)</td>
<td>87(33.0)</td>
</tr>
<tr>
<td>Ex-smokers</td>
<td>25(17.7)</td>
<td>6(5.0)</td>
<td>31(12.0)</td>
</tr>
<tr>
<td><strong>Hypercholesterolemia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>50(35.5)</td>
<td>73(60.8)</td>
<td>123(47.0)</td>
</tr>
<tr>
<td>Yes</td>
<td>91(64.5)</td>
<td>47(39.2)</td>
<td>138(53.0)</td>
</tr>
<tr>
<td><strong>B.M.I</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 18.5</td>
<td>32(22.7)</td>
<td>38(31.7)</td>
<td>70(27.0)</td>
</tr>
<tr>
<td>18.6 – 29.9</td>
<td>67(47.5)</td>
<td>62(51.7)</td>
<td>129(49.3)</td>
</tr>
<tr>
<td>≥ 30</td>
<td>42(29.8)</td>
<td>20(16.6)</td>
<td>62(23.7)</td>
</tr>
<tr>
<td><strong>Previous stroke</strong></td>
<td>29(20.5)</td>
<td>27(22.5)</td>
<td>56(21.5)</td>
</tr>
</tbody>
</table>

*C.V.Ds* = Cardio Vascular Disease
The findings of the results showed that there is a significant difference in distribution of Hypertension between patients with Hemorrhagic and Ischemic stroke (p-value < 0.05) (Table 5).

Results in table 5 have revealed that 48.3% Hemorrhagic stroke patients were hypertensive as compared to 62.2% of Ischemic stroke patients were hypertensive. (Table5)

Table 5: Comparison and distribution of Hypertension among patients with Hemorrhagic and Ischemic stroke (n=261)

<table>
<thead>
<tr>
<th>Hypertension</th>
<th>Hemorrhagic Stroke 89 (34.0)</th>
<th>Ischemic Stroke 172(66.0)</th>
<th>p-value (Chi2 test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Hypertensive</td>
<td>46(51.7)</td>
<td>65(37.8)</td>
<td>0.031*</td>
</tr>
<tr>
<td>Hypertensive</td>
<td>43(48.3)</td>
<td>107(62.2)</td>
<td></td>
</tr>
</tbody>
</table>

* <0.05

The findings of the results showed that there is a significant difference in Cardio Vascular Disease history among patients with Hemorrhagic and Ischemic stroke p-value <0.05 (Table6).

As showed in table 6, a total 19% of patients with Hemorrhagic stroke having previous history of cardiovascular diseases and 30.8% of Ischemic stroke patients with positive cardiovascular diseases history. (Table6)

Table6: Comparison and distribution of Cardiovascular diseases history among patients with Hemorrhagic and Ischemic stroke (n=261)

<table>
<thead>
<tr>
<th>Cardiovascular Diseases (CVDs)</th>
<th>Hemorrhagic Stroke 89 (34.0)</th>
<th>Ischemic Stroke 172(66.0)</th>
<th>p-value (Chi2 test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No CVDs</td>
<td>72(81.0)</td>
<td>119(69.2)</td>
<td>0.043*</td>
</tr>
<tr>
<td>CVDs positive</td>
<td>17 (19.0)</td>
<td>53(30.8)</td>
<td></td>
</tr>
</tbody>
</table>

* <0.05
The findings of the results showed that there is a significant difference in distribution of Hypercholesterolemia among patients with Hemorrhagic and Ischemic stroke 
p-value < 0.05 (Table 7)
Among patients with Hemorrhagic stroke, 64% showed raised serum cholesterol level (hypercholesterolemia) while 47% patient of Ischemic stroke showed hypercholesterolemia. (Table 7)

Table 7: Comparison and distribution of Hypercholesterolemia among patients with Hemorrhagic and Ischemic stroke (n=261)

<table>
<thead>
<tr>
<th>Hypercholesterolemia</th>
<th>Hemorrhagic Stroke 89 (34.0)</th>
<th>Ischemic Stroke 172 (66.0)</th>
<th>p-value (Chi2 test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>32 (36.0)</td>
<td>91 (53.0)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>57 (64.0)</td>
<td>81 (47.0)</td>
<td>(0.009^*)</td>
</tr>
</tbody>
</table>

* <0.05

Patients belong to age group (55-64 years) were found to be more hypertensive (36%) as compared to younger (25-34 years) age group (12.6%). C.V.Ds was found to be more common among age group 55-64 years (35.7%) and lowest proportion among younger age group 23-34 years (5.7%). (Chart 2)
5. Discussion

Stroke is the leading cause of neurological disability and mortality around the globe. According to different studies it is the third commonest cause of deaths in Pakistan, just after Ischemic heart diseases and Cancers. This study focused on distribution of different risk factors among patients with Hemorrhagic and Ischemic stroke in a tertiary care hospital. During the three month period of study, total of 261 stroke patients (Hemorrhagic and Ischemic) were admitted in the Liaquat University Hospital.

Demographic characteristics of study sample were typical for hospital based study and the patterns followed in this study had similarity to previous related studies. Proportion of male patients was slightly higher as compared to females in our study (54% and 46% respectively). Only one study conducted in Mayo Hospital, Lahore shown the female dominance (52%). Almost all other studies shown higher frequency of males has also ranging 59.2-71.42%. The mean age of the patients in this study was 54.7 years which was slightly lower than one of study where the mean age of the patients was 59 years.

In the present study majority of Hemorrhagic stroke patients belongs to age group 65+ years. While majority of Ischemic stroke belongs to the age group 55-64 years this might be because majority of the older age group patients with Ischemic stroke were hypertensive and with positive cardiovascular disease history. This may be the reason because Cerebro embolism is one of the causes of Ischemic stroke.

Findings of this study also revealed the 21.3% of Hemorrhagic stroke patients belongs to younger age group 25-34 years which is not only surprising but also an alarming sign.

In the present study majority of Ischemic stroke patients were illiterate as compared to Hemorrhagic strokes patients. This raises few questions here that why Ischemic stroke is more common among patients who were illiterate? One reason might be possible that majority of patients participated in this study were uneducated. They may not aware about the different risk factors of Hemorrhagic and Ischemic stroke.

One of the local study reported that 82% of their patients had Ischemic stroke and 18% had Hemorrhagic. While the frequency reported by some other studies was 78–79% Ischemic and 17–21% hemorrhagic respectively. Ischemic stroke was the predominant type in this present study as majority (66%) of patients in this study had Ischemic stroke. The findings of this study were similar to some local studies with higher proportion of ischemic stroke in their studies ranged 61%-70.1%. Hypertension is one of the modifiable risk factor for both types of stroke. Adequate control of blood pressure plays important role in prevention of stroke. One study reported the 19% of
overall prevalence of hypertension among Pakistanis aged ≥ 15 years. In our study, Hypertension was one of the most important risk factors. Similar findings also reported by various local studies.

Among patients of present study, 57.4% Hemorrhagic stroke were hypertensive while 62.7% those with ischemic stroke were hypertensive. One study reported the percentage of hypertensive hemorrhagic stroke in range of 45-70%.

Many studies reported higher percentage of ischemic stroke (52-68%) among the hypertensive which is in contrast to our study observations i.e. 62.2%.

Some researchers abroad quoted that Hypertension is a major risk factor for Ischemic and Hemorrhagic stroke which affects at least 65 million persons in the United States. Hypertension as a risk factor was present in 57.4% of our cases which was quiet similar to the local studies ranged 56%-61%.

The findings have indicated that 24.3% of Hemorrhagic stroke patients were with positive cardiovascular diseases history as compared to 71.7% Ischemic stroke patients. This might be because cardiovascular diseases like: Atrial fibrillation is one of reason for the formation of embolus that has an ability to block the cerebral vessels.

According to (NHSP) National health Survey of Pakistan 12% population above age 15 years is suffering from Hypercholesterolemia. Studies abroad reported that the higher level of cholesterol >270 mg/dl increases the risk of ischemic stroke. Other studies reported that with every m.mol/L rise in total cholesterol increases ischemic stroke rate increases. In this study high serum cholesterol level present in 41.3% of patients with Hemorrhagic stroke while 59.7% ischemic stroke patients with high serum cholesterol. This might be because hypercholesterolemia can increase the risk of clot or thrombus formation in the vessels that later block the vessels which leads to Ischemic stroke.

**Study Strengths and Limitations**

The study was conducted in one of the biggest public sector hospital of Hyderabad. A clear inclusion and exclusion criteria of study subjects was defined, in order to ensure a representative sample of all the patients admitted in Liaquat University Hospital. Face-to-face interviews were conducted in the hospital with patients or their relatives using a questionnaire. Blood pressures of all patients were checked at the time of admission by the help doctors. Laboratory reports were used to find out the Cholesterol levels and Blood sugar levels.

The chi-square test was used to test statistical significance to analyze the data for this study which is quite easier to compute and might be more powerful in detecting population differences. A pilot study was conducted by using a small sample to improve the reliability of
the instrument of the study and also to test the length of the questionnaire. Skilled persons and experts confirmed that the item in the questionnaire represents the topic under study which enhanced the validity of the questionnaire.

Despite the strengths, there were also some limitations in this study. As it was conducted only in one hospital so there might be a generalizability issue. Other limitation in this study was the potential of recall bias related remembering family histories of stroke.
6. Conclusion

All the participants of this study were stroke patients (either hemorrhagic or ischemic stroke) and there was differences in the level of distribution of the risk factors like; age, hypertension, hypercholesterolemia, cardiovascular diseases, smoking and education seen among patients of Hemorrhagic stroke compared to the patients with Ischemic stroke.

This study had revealed higher proportion of patients with Ischemic stroke were more hypertensive than hemorrhagic stroke patients. A significant difference was also found between age groups and both types of stroke. High proportion of patient with Ischemic stroke belongs to older age group (55-64) years while, proportion of Hemorrhagic stroke patients were higher among elderly age group (65+) years.

With regard to hypercholesterolemia, higher proportion of patients with hemorrhagic stroke had higher level of cholesterol than ischemic stroke patients. Cardiovascular disease history was also predominantly higher among patients with Ischemic stroke than hemorrhagic stroke. Most of the patients of this study were uneducated. Higher proportion of patients with Ischemic stroke was uneducated compared to hemorrhagic stroke.

7. Recommendations

A well designed prospective study at the community-level is advocated to evaluate total incidence and prevalence of stroke and risk factors. Education about stroke and its risk factors on community level by the health care centers and training should be given to health professional. In addition qualitative study is also suggested to evaluate people’s knowledge about stroke and its potential risk factors. This study also raises some questions regarding the distribution of risk factors among Hemorrhagic and Ischemic Stroke patients like why uneducated people having more Ischemic stroke?

Additional studies which can evaluate in details about the risk factors of Hemorrhagic and Ischemic stroke. Improvement in primary and secondary prevention as well as promoting the facilities for rehabilitation and proper stroke registry in Pakistan is recommended.
8. References

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8. APPENDIX I (Questionnaire)

a) Patient I.D: 

b) H.R #: ............

c) Age: 

d) Day & Date (yyyy/mm/dd): ....

e) Sex: M / F 

f) Marital Status: Married / Not Married / divorced 

g) Education: No / low / middle / high 

h) BMI: < 18.5, 18.6-29.9, > 30 (Wt.: _____ kg, Ht.: _____ cm)

PRESENTING COMPLAINTS:

PERSONAL INFORMATION:

SMOKING HISTORY

- Do you smoke?? YES | NO
- If yes, then since how long? ............ (time period in months or years)
- At what age you started smoking? .......
- How many cigarettes you smoke per day? ( < 1 packet, 1 packet, > 1 packet)
- What you use to smoke? (White cigarette, hand rolled, Hukka or anything else ________)
- Within one day, how much money you spend on smoking? .......
- How many members of your family do smoke right now?

HYPERTENSION HISTORY

- Are you known hypertensive patient? YES | NO
- If yes, since how long you have this problem? ............
- Last time when you went to doctor for your blood pressure check up? ............
- Do any other family member of yours having this problem? YES | NO
- If yes then, what’s your relation with them? (Brother, Sister, Father, Mother, Wife, )
DIABETES HISTORY

- Do you have any previous history of diabetes? YES | NO
- Since how long you have it? (Since childhood / since young age / after pregnancy)
- Is your blood sugar always staying high? YES | NO
- Do any other of your family member having this disease? YES NO
  (Brother, Sister, Father, Mother, Wife)

CARDIO VASCULAR DISEASES HISTORY

- Do you have any history of heart disease? YES | NO
- If yes then of what type of disease it is? (M.I, Vascular disease, atrial fibrillation, ________)
- Did you gone through any cardiac surgical process? YES | NO
- If yes then which one? ________
- Do any other of your family member having this problem? YES | NO
  (Brother, Sister, Father, Mother, Wife)

STROKE HISTORY

- Do you have any previous history of stroke? YES | NO
- Does anyone in your family have this disease before? YES | NO
- If yes what is your relation with them? (Father, Mother, Sister, Brother)

PERSONAL HISTORY (ADDICTION)

○ Do you have any other addiction of; PAN, GHUTKA, ALCHOL, NASWAR, SMOKING
○ Since how long are you addicted with it?
○ How much quantity you use per day?

SOCIO ECONOMIC CONDITION:

- How much you earn per month? ________________
- How many children / siblings you have? ________________
- You live in joint family or separate? Joint / separate
- How many family members you have in your family?
- Are you only member earn in your family?  YES / NO
- If yes then, do you easily fulfill daily food and medical needs of your family? YES / NO
- If no then how many members earn?
- Can you please tell me the average income of your family (if joint family)? ______
- Is your family environment cooperative, stressful, other? ...............  
- How is the health condition of your family?

**JOB STATUS:**

- What type of job you do?  
  Farmer, Shopkeeper, Labor, Landlord, businessman, ______
- How many hours you spend at your job? 
- How is the environment there? ..................... (friendly, Cooperative, etc) 
- Are you satisfied with your job condition? 
- You do any part time job with this job? YES / NO

**BLOOD CHEMISTRY**

- Random Blood Sugar: 
- Lipid Profile: (cholesterol level) 
- Fasting Blood sugar (if any). 
- Blood C.P

**BLOOD PRESSURE**

- **SYSTOLIC:** 
- **DIASTOLIC:**

**RADIOLOGICAL FINDINGS:**

- **CT SCAN** 
  ISCHEMIC (hypo dense) 
  HEMORRHAGIC (hyper dense)
9. APPENDIX 2

Dr. Tariq Feroz Memon,
Bunglow No. 80,
Memon Cooperative Society,
Hyderabad, Sind.

15th June 2010

Subject: Approval of a study project entitled "The risk factors of stroke and their frequencies among stroke patients admitted in Liaquat University, Hyderabad, Sindh."

Dear Dr. Tariq F Memon,

This is to inform you that your above submitted research project with the given title is approved by the Board of Advanced Studies and Research (BASR) of the Liaquat University of Medical and Health Sciences. Further more, the research project is cleared by our Ethical Committee of the University without reservation. You are hereby asked to collect your data through your questionnaire by contacting the medical officers of our four medical units of the University Hospital in Hyderabad and Jamshoro. The permitted period of your data collecting is from June 18 to September 18, 2010.

You are also permitted by our BASR to use these data for your MS thesis at Umea University, Sweden.

Professor Khaliqu Rehman Shaikh
Director, MRC,
LUMHHS, Jamshoro.