Depression among stroke patients and relation with demographic and stroke characteristics

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Depression among Stroke Patients and relation with Demographic and Stroke Characteristics

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Acknowledgement:

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I dedicate this work to my beloved family.
Abstract:

Objective: To identify the prevalence of depression in post stroke patients as well as to access the relationship between demographic factors, stroke characteristics and post stroke depression.

Design: Cross sectional study.

Setting: Neurology Out Patient Department of the Liaquat University Hospital, Pakistan

Method: We screened stroke survivors (n=81) for depression, visiting the neurology Out Patient Department of the Liaquat University Hospital, Pakistan using the DSM IV TR criteria. Data was collected over demographic and stroke related factors. Patients were also asked about their lifestyle characteristics and their general experiences in life after stroke based on DSM IV TR symptoms profile. Description of categorical variables like sex, marital status, employment status, stroke lesion, depression, was presented as numbers and percentages. Analysis to determine the relationship between post stroke depression and demographic variables and stroke characteristics were performed by Chi Square ($X^2$) test. P-value < 0.05 was considered as significantly associated. Further, to examine associations between post stroke depression and demographic and stroke characteristics simple and multiple logistic regression analysis were also performed. SPSS 19 version was used to perform statistical analysis.

Results: 31 patients out of 81 were (38%) met the criteria of depression. Demographic variables like young age, male gender, primary level of education, unemployment and lower level of monthly income were significantly associated with post stroke depression (P –value < 0.05). Post Stroke depression was also significantly associated with ischemic stroke type (P-value < 0.05) but was not associated with lesion location.

Conclusion: Post stroke depression occurs in one third of the stroke patients. It is associated primarily with demographic, socio economic and stroke related factors.
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Abbreviations:

AIDS: Acquired Immune Deficiency Syndrome.

BASR: Board of Advance Studies and Research.

BDI: Beck Depression Inventory

CI: Confidence Interval

CNS: Central Nervous System.

CT Scan: Computed tomography Scan.

DSM: Diagnostic and Statistical Manual of Mental Disorders

DSM III: Diagnostic and Statistical Manual of Mental Disorders. 3rd edition

DSM IV TR: Diagnostic and Statistical Manual of Mental Disorders. 4th edition - Text Revision

GDP: Gross Domestic Product.

MADRS: Montgomery Asberg Depression Rating Scale

OPD: Out Patient Department.

OR: Odd Ratio

PSD: Post Stroke Depression.

SD: Standard Deviation.

SPSS: Statistical Packages for the Social Sciences

T.B: Tuberculosis.

WHO: World Health Organization.
1 Introduction:

1.1 Stroke:

Stroke as defined by the World Health Organization is “a rapidly developed clinical signs of focal or global disturbance of cerebral function, lasting for more than 24 hours or until death, with no apparent non-vascular cause. Stroke is caused by the interruption of the blood supply to the brain, usually because a blood vessel bursts or is blocked by a clot. This cuts off the supply of oxygen and nutrients, causing damage to the brain tissue”. ¹

As per an estimate of WHO every year about 15 million of world population suffers from stroke out of which around 33% (5 million) die and 33% become disabled permanently. Globally on every 10th second, a life is taken by stroke and on every ½ second an incident of stroke occurs. High blood pressure is the major risk factor in stroke which causes more than 80% of stroke cases (12.7 million) worldwide. Other risk factors of stroke are smoking, atrial fibrillation, heart failure and heart attack. ¹,²

In developing countries burden of stroke is increasing rapidly. They borne about 66% of total stroke burden and rate of stroke in these countries has exceeded the rate of developed countries by 20% during the period from 2000 to 2008. ³ In terms of mortality and morbidity caused by the stroke globally, stroke found to be the leading cause of death in people of age group of 60 years and above and is the 5th leading cause of death among people of age group 15-59 years. ⁴ In terms of disability as per the Lancet 28 Nov 2009 issue, stroke is found to be the leading cause worldwide and in developing countries it is the 2nd leading cause of disability.

Around four fifth (> 80%) of stroke cases are caused by ischemic brain infarction. Ischemic stroke is caused by obstruction in a blood vessel supplying blood to brain. This blockage in blood vessel could be caused due to blood clot in the vessel or due to hardening of blood vessel supplying blood to the brain because of accumulation of fat in vessel walls. Remaining one fifth (13 %) of stroke cases are caused by hemorrhagic stroke, which is less frequent and occur due to rupture or burst of a blood vessel which leads to the bleeding. Accumulation of blood compresses surrounding brain tissues causing deprivation of oxygen and nutrients to the surrounding tissues. This type carries higher risk of death.⁶

In first month after stroke about 80 to 90% ischemic stroke patients survive while survival rate drops to 67-80% in one year after stroke. Rate of stroke mortality is greater than that of other chronic diseases if all put together (AIDS, TB and Malaria) worldwide. Major recovery occurs within first three months after stroke while long term disability often remains for a longer
period of time. Stroke has major affects on quality of life of its survivors and of their caregivers of long term durations which require more targeted rehabilitation to avoid further complications in terms of depression and other allied disabilities.

Incidences of stroke are reducing in the west but reverse is true in case of south Asia. Specifically in case of Pakistan fewer studies have been conducted on prevalence of stroke and very limited data on the subject is available. However, prevalence of stroke risk factors in the country is very high which could be translated into high prevalence of stroke in the country. Estimated incidences of stroke per year are 250/100,000 with 350,000 new cases each year. Prevalence of stroke in much younger age has been observed in some studies as compare to the west in case of Pakistan.

1.2 Depression

As per WHO definition “Depression is a common mental disorder characterized by sadness, loss of interest in activities and by decreased energy. Depression is differentiated from normal mood changes by the extent of its severity, the symptoms and the duration of the disorder”

According to an estimate, identifiable depression prevalence is 5-10% of the population at any given point of time which requires psychological treatment. Risk of developing depression in female during a life time is 10-20% which is comparatively higher than males.

Post stroke depression is defined/ categorized as mood disorder which occurs due to a general medical condition. Post stroke depression in terms of early studies found related with stroke related factors e.g location of stroke and focal disturbance of neurotransmitter pathways.

In addition to stroke related factors, patient related factors e.g age, sex, personality, coping abilities, quality of life, enhanced disability and poor rehabilitation outcomes, extended use of healthcare, higher rate of mortality, suicidal ideation and social support provided are also associated with post stroke depression.

Post stroke depression is segregated in to two major types: Major Depression and Minor Depression. Major depression is the outcome of left interior lesion location of stroke. Risk of developing cognitive impairment is high among patients suffering from major depression. Minor or dysthemic depression is the outcome of posterior brain injury. Chance of developing cognitive impairment in 2nd type of depression is negligible whereas major depression is related with high functional impairment. Study of post stroke depression (PSD) is of vital importance to avoid long term unfavorable consequences of post stroke depression. Through
early study of PSD, patients could be helped out at an early stage and long term unfavorable complications could be avoided.

1.3 Prevalence of Post Stroke Depression:

Stroke is significantly associated with high rate of mortality and morbidity. Although a decreasing trend could be observed in mortality rate from stroke especially in western societies rate of morbidity is still very high. According to an estimate about one third of the post stroke patients suffer from substantial depressive symptoms. WHO has predicted cerebrovascular disease as the second highest cause of disability worldwide by 2020. Different studies on prevalence of post stroke depression (PSD) report different frequencies and results vary considerably across studies. The prevalence as reported in different studies ranges from 9% to 60%. On the basis of population selection we can divide studies on Prevalence of Post Stroke Depression into three categories: 1) Population based studies, 2) Hospital Based Studies and 3) Community / Rehabilitation based studies. Population based studies usually include all those stroke patients having most representative depressive symptoms either admitted to hospitals for extensive care or not. Different population based studies report range of post stroke depression from 23-40% while using DSM III and IV criteria. Hospital base studies recruit those patients who were admitted in medical wards of general hospitals for intensive care. Different hospital based studies report range of post stroke depression from 35-53% while using DSM III and IV criteria. Community/ rehabilitation based studies recruit patients from rehabilitation centers, wards, hospitals or stroke units. In community / rehabilitation based studies prevalence is found from 9-23% range using DSM III and IV criteria.

![Reported Prevalence Range](image)

Figure-1: Showing reported prevalence range of Post stroke depression in various study settings.
This large variation in range of depression reported by different studies could be attributed to variation in population characteristics being studied, different assessment measures/ study designs used, definition of depression, time of assessment and clinical characteristics.

Stroke progression could be taken as an important risk factor in development of post stroke depression (PSD) as comparatively less depression is observed in first ever stroke patient as compare to the patients having recurrent stroke history. Community base studies which also include the patients having mild depressive symptoms, show lower frequency of depression as compare to the hospital based studies. However no big difference in frequencies was observed in a study in pooled frequencies review of population based and hospital based studies but if DSM (Diagnostic and Statistical Manual of Mental Disorders) criteria are used for diagnosis of depression prevalence of depression is found higher in hospital based studies than that of community based studies.

In case of Pakistan this area is under researched area and no significant studies/ published material is available on the subject in Pakistan.

1.4 Course of Post stroke depression:

Persistent prevalence of post stroke depression, which may prolong from a period of weeks to years, deteriorate the conscious mental activities of patients e.g dysphoric emotions, low motivation levels, disturbed sleep, appetite, libido and energy. It has negative impact on functional outcome, quality of life and mortality. Duration over which post stroke depressive symptoms could prolong may vary in patients from weeks to years.

A stable but high prevalence of depression was observed in 2 years after stroke in a study but with changes in the composition of patients. Improvement was observed in 100% patients suffering from major depression in 2 years post stroke. However, rate of improvement among patients suffering from dysthymic depression was just 30% in same time duration of 2 years and patients who were having no depressive symptoms developed mood disorders in 2 years after stroke. Another study found persistent depressive symptoms among 17% of patients during 1st year after stroke and improvement/ recovery after 1st year after stroke was found among those patients who developed early depressive symptoms (within 3 months after stroke). A study has found stable prevalence of depression from 6 months to 1 year after stroke with a significant decline in prevalence by 3rd year after stroke.

Literature review on course of depression with respect to study design report contradictory findings. A hospital based study report decreasing trend in post stroke depression from 6
months to 3 years after stroke\textsuperscript{27}. In contrast another hospital based study report decreasing trend in prevalence of post stroke depression up to 1\textsuperscript{st} year following stroke but increasing trend in 2\textsuperscript{nd} and 3\textsuperscript{rd} year after stroke\textsuperscript{31}. Likewise, similar trend was reported by a rehabilitation population based study.\textsuperscript{32} Different studies report different results with respect to assessment criteria on course of depression. No change in post stroke depression was observed in 12-15 months using Beck Depression Inventory (BDI) criteria\textsuperscript{33}. In contrast using the same BDI criteria House et al (1991) reported decreasing trend in PSD from 6\textsuperscript{th} month onwards after stroke. Likewise, same trend was reported by Verdello et al (2004) using Montgomery Asberg Depression Rating Scale (MADRS) \textsuperscript{26,32}. Mostly Post stroke depression as found in literature review has an early onset. Andersen et al (1994) and Aben et al (2003) report early inception of depression in about 50\% of stroke patient i.e within 4 weeks after stroke. Mood disorder was observed during first 6 weeks after stroke in about 60\% of post stroke patients who developed depression subsequently \textsuperscript{27,34}.

From literature review the early onset of post stroke depression in stroke patients is evident but consensus on course of depression among different studies has not been found.

\subsection*{1.5 Etiology of Post Stroke Depression:}

The subject of etiology of post stroke depression has been addressed by the scientific community in two different perspectives. Some support the view that post stroke depression is caused by the brain injury due to the affect of stroke on primary biological mechanism and neural circuits of the brain, which involved in mood regulation and in turn cause depression in the patients after stroke. The relation is further explained as below:

\textbf{Physiological Mechanism of Post Stroke Depression}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{physiological_mechanism.png}
\caption{Physiological Mechanism of Post Stroke Depression}
\end{figure}

\textsuperscript{Ref; 35}

The Endogenous depression as assumed and explained by many researchers is caused due to the changes in neurotransmitter. Depression may be caused by the paucity of monoamine transmitters’ dopamine, serotonin and noradrenalin or due to the overall malfunctioning of monoaminergic neurotransmitter system in different circuits of brain\textsuperscript{36}. However, in studies of
both the post stroke depression and endogenous depression the receptors of monoamine neurotransmitters and the molecular events that these receptors trigger are now been focused more than that of monoamine neurotransmitters themselves which include regulation of gene expression and downstream signal transduction. Further, one study has proposed a new hypothesis for post stroke depression that increased production of pro-inflammatory cytokines in case of stroke is responsible for pathogenesis of mood disorders37. The importance of lesion location in causing post stroke depression has not been proved up till now as different studies have conflicting results to endorse this relation. Some support the idea that acute depression may be linked with left hemisphere location of stroke 38. Carson et al 2000 in his study has found no significant relation between post stroke depression and lesion location39. Structural and functional abnormalities of limbic system and in prefrontal cortex as identified by neuroimaging and neuro-pathological studies of endogenous mood disorders are of immense importance in regulating emotional behaviors and their malfunctioning could be considered as responsible for causing cognitive emotional expression of long term mood disorders40.

The 2nd group of researchers believes that post stroke depression is the outcome of psychological and social stressors that emerge as a response to the impairment or loss caused by stroke.

**Psychosocial Mechanism of post stroke depression**

![Diagram](image)

In analyzing post stroke depression (PSD) with psychological perspective time passed after stroke is an important factor. The increasing trend in post stroke depression was followed in stroke patients’ from 1 to 6 months with post stroke depression at its peak in 6th month and thereafter decreasing trend was observed till 24th month after stroke 41. The patients develop the acceptance of loss gradually because they become aware of their injury gradually so post stroke depression is also developed and intensified gradually with decreasing trend as the time elapsed since injury with the help of recovery and rehabilitation. Post stroke depression in a study is categorized as a categorical construct instead of continuous construct. It has been considered as matter of degree rather than of kind. Another study has considered both major and minor depression as the outcome of psychological consequence of stroke. Somatic symptoms in stroke
patients were found dependent upon presence of depressive mood symptom in stroke patients. 42-44

1.6 Post Stroke Depression Assessment:

1.6.1 Method of accessing Post Stroke Depression:

Different methods of measuring depression are being used in studies on post stroke depression due to which reported prevalence rate of depression vary across studies. Most of the recent studies have used diagnostic definition of major depression in which diagnosis of depression required to observe a specific criterion, in addition to the psychiatric interviews. Different criteria’s for diagnosis of depression are being used in studies now out of them one is Diagnostic and Statistical Manual of Mental Disorders, IV edition, Text Revision (DSM IV TR) of American Psychiatric Association 2000. The Diagnostic and Statistical Manual of Mental Disorders, IV edition, Text Revision provides information about each mental health diagnosis and contains important information and resources for mental health professionals. It is being commonly used as a guide to communicate mental illness by the physicians, social workers, psychologists, nurses, family / marriage therapists and by psychiatrists. Multidimensional approach covering five dimensions of diagnosis is used in DSM IV TR criteria including clinical disorders, mental retardation, personality disorders, physical health issues that may affect mental health, psychosocial issues and highest level of functioning. It has a distinguished feature of classifying mental disorders in different categories of a patient instead of categorizing the patient itself and thus provides a clear picture of a person’s illness. It is fit for all types of research e.g prevalence studies, clinical trials and outcome researches45-47.

DSM IV TR includes nine different depressive symptoms. Out of those nine symptoms if a patient is having at least five of them (including one of either depressed mood or Loss of interest or pleasure) he/ she is categorized as suffering from major depression. Nine symptoms of DSM IV TR criteria are: decrease in weight, decrease in appetite, insomnia, psychomotor agitation or retardation, fatigue, diminished concentration or decision making, feeling of guilt depressed mood, loss of interest or pleasure and suicidal ideation 46-47.

1.6.2 Importance of Various Symptoms In Post Stroke Depression:

Different views have been found among different writers/ researchers of Post Stroke Depression on importance of various symptoms in post stroke depression. Some support the idea of equal importance of both somatic and psychiatric symptoms irrespective of their origin and support the use of DSM (Diagnostic and Statistical Manual of Mental Disorders) criteria44, 48. However,
stein et al 1996 in their study has found non-somatic symptoms more explicit in post stroke depression than that of somatic symptoms. Some studies stressed to consider each symptom individually instead of grouping them in to somatic and psychological categories and stressed on use of different symptom profiles for post stroke depression and endogenous depression. Symptom of depressed mood was found as most sensitive symptom in discriminant analysis. However, reduced appetite, fatigue, and psychomotor slowing (somatic symptoms) were also found as having discriminative properties. When symptoms profile was combined with time factor in different studies it has given conflicting results. As symptoms those categorize a patient having major depression after stroke tends to change during the period of 24 months following stroke.

1.7 Post Stroke Depression and its Related Factors:

1.7.1 Post Stroke Depression and Demography:

Literature review of post stroke depression mostly found stroke related factors responsible for creation of post stroke depression to a large extent. However, in addition to those, different patient related factors are also found equally responsible in causing post stroke depression like age, gender, education level, income and residence status of the patient. Studies on association between age and post stroke depression show contradictory findings. Literature reveals complex relationship between age and post stroke depression which could be found dependent upon other multiple factors. Some researchers report positive association between old age group and post stroke depression. In contrast, others suggest positive relation between post stroke depression and young age group. Yet some others report no relation between age and Post Stroke Depression. Therefore, other factors may also be found responsible in defining relation/association between age and post stroke depression e.g gender, race, ethnicity and other socioeconomic factors. Personality traits of a patient may also play an important role like Rusin M in his study found motivational level of a patient as an important determinant. Old patients have tendency to accept their deficiencies more easily as compare to the young ones and young patients may respond negatively to the deficit occurred and feel unjustly deprived from a portion of healthy life. Studies on association between Gender and post stroke depression have found other risk factors of stroke also responsible in relationship between gender and post stroke depression. In most of the studies, level of depression was found higher among women. Contrary to that some found higher rate of
depression among male patients while some suggest no relation between gender and post stroke depression. One study has found the importance of time factor in association between gender classification and post stroke depression. As during first year after stroke no association between gender and post stroke depression was observed but after 18 months post stroke male were found more depressed as compare to female. One reason of high depression among working age group of male might be that physical disability in that group is of greater importance for male as compare to female or another association of higher depression in men was attributed to their less coping abilities as compare to female. Various studies have reported variations in nature of post stroke depression itself with respect to gender. Wade and Langton in their study found more severe effects of stroke among female and attributed this to the fact that women usually experience stroke in older age then male. This finding was reinforced in a study as they found female more depressed in relatively older age group i.e. greater than 60 years old. Results on association between post stroke depression and other demographic and social factors e.g education level and residence status of patients are also multidirectional. A study has found no association between education level of a patient and post stroke depression which was conducted on 486 ischemic stroke patients, age from 55 to 85 years and the same result is reinforced by some other studies.

Inconsistencies persist in literature regarding association of different risk factors with Post stroke depression which, to some extent, could be minimized by more careful selection of sample, evaluation criteria used for diagnosis of depression and with more follow up studies.

1.7.2 Stroke Characteristics:

1.7.2.1 Lesion Location

In literature on post stroke depression wide divergence exists on the subject of post stroke depression association with lesion location of stroke. Three broad views/researches are: 1. Left Hemisphere lesion plays a vital role in prevalence of post stroke depression. 2. There is no association between lesion of stroke and post stroke depression. 3. Right hemisphere lesion is associated with post stroke depression.

Historically the association of post stroke depression and left hemisphere lesion location was documented by some of the researches followed by the series of studies which endorse this finding and reinforce the hypothesis that left hemisphere lesion plays an important role in creation of post stroke depression. Severe depression after stroke was found associated with left interior cerebral lesion while less severity of post stroke depression was found in left posterior lesion. Further, no significant association was found between the post stroke
depression and left cortical and sub cortical lesions. The researchers who belong to the second group of thoughts, in contrast, found no relationship between the lesion location and post stroke depression as in a systematic review a study has found no significant association between lesion location and depression after pooling the data of 34 primary studies. Further, the third group of thoughts studies found association of depression with right hemisphere lesion location. This vide divergence among different studies findings on the subject of Lesion location association with post stroke depression could be attributed to the methodological differences among study setting e.g small sample size, sample selection criteria, study site, different tools used to measure depression, time passed since stroke. Importance of time elapsed since stroke and study settings in association of depression with lesion location were also proved by researchers. The involvement of left lesion location in development of depression was found only in acute depression during first week after stroke. Post stroke depression was found associated with left hemisphere lesion location in hospital inpatients studies early after stroke while right hemisphere lesion location and post stroke depression were found associated in community based population studies within six months after stroke.

1.8 Country Profile Pakistan:

Pakistan is situated in west of Indian subcontinent. It is a sovereign state in south Asia with India on the east, Afghanistan and Iran on the west, Arabian Sea on the south and China on north east.
1.8.1 Geography:

Area wise Pakistan is the 36th largest country of the world with an area of 796,095 KM$^2$ (307,374 sq mi). Pakistan is rich with varying nature of landscapes like plains, deserts, forests, hills, coastal areas and mountains. Its landscape could be divided into three major geographic areas; the Northern Highlands include Karakoram, Hindu Kush and Pamir mountain ranges, The Baluchistan plateau and the Indus river plain.

Pakistan consists of four provinces (Punjab, Sindh, Baluchistan and Khaiber Pakhtoonkah) and four federal territories (Federal Capital Territory, Federally Administered Tribal Areas, Gilgit Baltistan and Azad Jammu and Kashmir).

1.8.2 Demographic:

Total population of Pakistan is 180,808,000 (WHO) with an annual growth rate of 1.573%. It is the sixth most populous country in the world with second highest population of Muslims. Around 20% of the population lives below poverty line. Crude birth rate is 24.81, crude death rate is 6.92 per thousand population and dependency ratio is 88.3%. Adult literacy rate above 15 years is 53.7% and male literacy rate is 66.8% and female is 40%. About 52% of the total population is male and 48% is female. More than 50% of the population lived in rural areas. Pakistan is a country in which more than sixty languages are spoken; Urdu is the national language while English is being used as official language.

1.8.3 Economy:

Pakistan is a developing country with an annual GDP growth rate of 4.8% and $2500 per capita income. Country’s 43% of the labor force is engaged with agriculture. Structure of the economy has been transformed from an agriculture based to a services based economy. Agriculture comprises of 21.8% of GDP while industry 23.6% and services 54.6%. Economy of the country is facing various challenges including poverty, unemployment (15.4%), high inflation (13.9%), less foreign investment, and high population growth rate (1.573%). Major industries of the country are textiles, apparel, food processing, construction materials, pharmaceuticals, paper products and fertilizer.
1.8.4 **Country’s Health Statistics:**

Health system in Pakistan is administered by the Ministry of Health. Like other developing countries Health care facilities are better in urban areas but in rural areas facilities are very limited. In 2007-08 Government of Pakistan spent an amount of Rs. 14.272 billion for development of health sector and current expenditure during the same period in health sector was 3.791 billion. Total 2.6% of GDP is spent on health sector by the Govt. of Pakistan in 2009. Total life expectancy at birth is 65.4 years, for men it is 65.2 years and in female it is 65.6 years. Infant mortality rate per 1000 live births is 76.7 and maternal mortality per 100,000 live births is 350.

Table-1 showing the detail of health facilities available in Pakistan:

<table>
<thead>
<tr>
<th>Health Facilities And Human Resources In Pakistan (2009)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Health Facilities</td>
<td>13,937 (103,708 beds)</td>
</tr>
<tr>
<td>Hospitals</td>
<td>968 (84,257 beds)</td>
</tr>
<tr>
<td>Dispensaries</td>
<td>4,813 (2,845 beds)</td>
</tr>
<tr>
<td>Rural health centers</td>
<td>572 (9,612 beds)</td>
</tr>
<tr>
<td>Tuberculosis clinic</td>
<td>293 (184 beds)</td>
</tr>
<tr>
<td>Basic health units</td>
<td>5,345 (6,555 beds)</td>
</tr>
<tr>
<td>M.C.H. centers</td>
<td>906 (256 beds)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Human Resource in 2009</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctors</td>
<td>139,555</td>
</tr>
<tr>
<td>Dentists</td>
<td>9,822</td>
</tr>
<tr>
<td>Nurses</td>
<td>69,313</td>
</tr>
<tr>
<td>Midwives</td>
<td>26,225</td>
</tr>
<tr>
<td>Health visitors</td>
<td>10,731</td>
</tr>
<tr>
<td>Registered vets</td>
<td>4,800</td>
</tr>
</tbody>
</table>

Most common infectious diseases which are the main cause of deaths in Pakistan are: acute respiratory infection, malaria, diarrhea, dysentery, scabies and others (goiter, hepatitis and
tuberculosis). Crude rate of mortality due to communicable, non communicable diseases and from injuries in Pakistan is shown in following figure.

![Crude Mortality Rate - Communicable and Non Communicable Diseases.](image)

**Figure-2 Showing crude mortality rate in Pakistan**

1.8.5 **Stroke in Pakistan:**

Incidence of stroke are falling in west but reverse is true in case of south Asia. Fewer studies have been conducted on prevalence of stroke in Pakistan therefore very limited data on the subject is available. However, prevalence of stroke risk factors in country is very high which could be translated into high prevalence of stroke in the country. Estimated incidences of stroke per year are 250/100,000 with 350,000 new cases each year. Prevalence of stroke in much younger age in Pakistan has been observed in some studies as compared to the west. One study reported that 26% of the stroke patients belong to age group of 15-45 years. Another study found one third patients of total sample under the age of 50 years. Similarly 28% frequency of stroke was reported under age of 55 years and approximately 20% of stroke patients are under the age of 45 years\textsuperscript{70,71}. In gender classification higher rate of prevalence was found among women of young age group. However, increasing trend in prevalence rate was observed among male with increase in age as compare to the female\textsuperscript{72}. According to recent study published by Aga Khan
University, one out of four persons in Pakistan suffers from the symptoms of stroke. Stroke now account for around 41 percent of total disease burden in the country\textsuperscript{73}. Above findings of studies revealed that demographic of stroke in Pakistan vary from west to a large extent.

As per an estimate of WHO cerebrovascular diseases accounts for 32% of total crude rate of mortality in Pakistan due to cardiovascular diseases, its classification is as under\textsuperscript{74}:

\begin{figure}[h]
\centering
\includegraphics[width=0.8\textwidth]{figure3.png}
\caption{Figure-3: Showing classification of crude mortality rate in Pakistan due to cardiovascular diseases.}
\end{figure}

Hypertension, smoking and diabetes are the major risk factors of stroke with high prevalence level in Pakistan. Out of these most preventable cause of stroke is hypertension which, as per an estimate, is prevailing in 33% of Pakistani population over the age of 43 year\textsuperscript{75,76}. 
1.8.6 Post Stroke Depression:

Data and research conducted upon post stroke depression in Pakistan is very limited. As this area is under researched so no significant studies/published material is available on the subject in Pakistan. One study conducted in an outpatient clinic at a territory care center report 40% prevalence rate of post stroke depression in Pakistan. Another study conducted at Mayo Hospital Lahore reported 37.6% prevalence of post stroke depression.

However, prevalence of general depression in Pakistan is very high. Its level varies with the age group and during different stages of life. Different studies on the subject have been conducted in Pakistan. One survey reported 22% prevalence of depression in individuals of the country and more than 50% experience depression once during their entire life time. 33.7% experience depression for a shorter period of time, 37.3% experience moderate while 29% experience long term depression.

2. Aim of the Study:

The aim of this study is:

1. To access the prevalence of depression in post stroke patients.
2. To evaluate the relationship between demographic data and post stroke depression.
3. To evaluate the relationship between stroke characteristics and post stroke depression.

3 Method:

3.1 Study Area:

This Study was conducted at Liaquat University Hospital, Hyderabad Sindh. This Hospital has two branches, one at Hyderabad and other at Jamshoro and is attached with Liaquat University of Medical and Health Sciences. This hospital is equipped with modern health care facilities. It has 1293 beds and is also providing services as teaching and research institute for Graduate and Post Graduate students. It is the biggest public sector hospital catering with the needs all people of Sindh province except Karachi. Liaquat University Hospital has four institutes; Nuclear Institute of Medical radiology, Dentistry Institute, Eye Institute and Psychiatric institute. Its Psychiatric institute was inaugurated as C.J Mental Hospital in 1871 which became the part of
Liqauat University in 1960’s. It is the biggest mental health institute of Sindh province with sanctioned strength of 496 beds.

3.2 Study Design:

Cross sectional study.

3.3 Data collection and Measures:

Total 81 patients were recruited in the study that fulfilled the inclusion criteria. This study was carried out at neurology Out Patient Department of Liaquat University Hospital, Hyderabad, Pakistan from Feb, 2011 to May, 2011 with the help of trained neurologist and psychiatric. The consent of patients to participate in study was sought and they were also assured about confidentiality of the information. We promised not to release the data for any other purpose apart from the purpose it was meant for. The study’s criteria and purpose was also explained in detail to all of them and to their relatives/ caregivers.
Afterwards, we conducted the interviews of the patients (who fulfilled our inclusion criteria) using the questionnaire devised for this study, during follow up visits of the post stroke patients to the neurology Out Patient Department. Questionnaire based interviews were conducted during the OPD timing (from 10:00 a.m to 2:00 p.m) in week days. From the response of patients I personally filled in questionnaires with the help of psychiatric of OPD. Response rate of patients was 100%.

Patients **Inclusion criteria:**

a) Male or female of any age.

b) Lesions causing stroke, identified on CT-scan as hypo dense zone in cases of ischemic stroke and hyper dense zone in cases of hemorrhagic stroke.

c) Sensory/motor impairment.

d) No pre existing disabling condition.

**Exclusion criteria:**

a) History of any psychotic disorder.

b) Current treatment with antidepressant medication.

c) Language impairment (severe enough to prevent valid neuropsychiatric assessment).

d) History of some other CNS disease (e.g., head trauma, multiple sclerosis).

e) Significant hyponatremia (Na <130meq).

f) Current hypothyroid state.

g) Medically unstable including symptoms of delirium.

Dependent variable of our study was depression while independent were all demographic and clinical factors such as age, gender, marital status, financial status, residence status, education level and the clinical variables including stroke type and side of stroke.

**3.3.1 Measurement instrument:**

The main instrument used for data collection was a questionnaire. It was designed from *Diagnostic and Statistical Manual of Mental Disorders, IV edition, Text Revision (DSM IV TR)* of American Psychiatric Association 2000 to assess depressive symptoms. Questionnaire of the study was formulated very carefully with multiple choices to get detailed information about lifestyle characteristics of the patients. Questions were arranged sequentially to study the depression symptoms. Every patient was evaluated against the list of 9 predefined depressive symptoms (as per criteria of DSM IV TR) and those patients were identified as depressed who
were having at least five or more of the symptoms out of nine and one of those must include either depressed mood or loss of interest/pleasure. The other seven symptoms were: decrease in weight, decrease in appetite, insomnia, psychomotor agitation or retardation, fatigue, diminished concentration or decision making, feeling of guilt and suicidal ideation.

We have used DSM IV TR as diagnostic criterion because it is being commonly used as a guide to communicate mental illness by the physicians, social workers, psychologists, nurses, family and marriage therapists and by psychiatrists. It has a distinguished feature of classifying mental disorders in different categories of a patient instead of categorizing the patient itself and thus provides a clear picture of a person’s illness. It is fit for all type of researched e.g prevalence studies, clinical trials and outcome researches.45,46,47

3.4 Study variables:

3.4.1 Demography:
- Age: (25-34 years, 35-44 years, 45-54 years, 55-64 years, 65 years and Above)
- Marital Status: (Single, Married, Divorced/ Widow).
- Residence Status: (Urban, Rural).
- Occupation Status: (Employed, Unemployed).
- Education Level: (Illiterate, Primary, Secondary and higher).
- Monthly Income: (< 10,000, 10,000 - 40,000, > 40,000).

3.4.2 Stroke characteristics:
- Stroke Type: (Ischemic, Hemorrhagic).
- Lesion Location: (Right Hemisphere, Left Hemisphere)

3.4.3 Depressive Symptom Variables:
- Depressed mood: (Yes, No).
  Feeling sad, down, empty or having physical conditions like headache, aches or pains continuously for two weeks.
- Diminished interest or pleasure: (Yes, No).
  Losses interests in those activities which previously were enjoyable to them as going out to dinner or a movie, visiting with friends, working, or doing hobbies and this symptoms lasts for at least two weeks continuously.
- Significant weight loss or gain: (Yes, No).
Either the patient had a change of more than 5% in his/her weight within a month or there has been a continuous decrease or increase in his/her usual appetite on almost every day within a two-week period of time.

- **Insomnia**: (Yes, No).
  Either not being able to get enough sleep or having disturbed sleep or having difficulty in falling asleep and these problems are being observed at almost every day during the period of two weeks.

- **Psychomotor agitation or retardation**: (Yes, No).
  Either having symptoms of not being able to sit still (he/she pace the room, twist his/her hands, or jiggle with clothes or objects) or having symptoms of being slow down in his/her behavior (may move across a room very slowly, turn away his/her eyes, and sit slumped in a chair). These symptoms should be present to the extent that they could be observed by the other person.

- **Fatigue or loss of energy**: (Yes, No).
  Feeling tired and fatigued and for diagnosis patient himself reports for experiencing such feeling.

- **Feelings of worthlessness or guilt**: (Yes, No).
  Thinking negatively about them and remained preoccupied with past failures. They also take minor mistakes as a proof of their worthlessness. He/she must be having this feeling continuously for a period of at least two weeks.

- **Diminished ability to think or concentrate**: (Yes, No).
  Patients feeling that his/her ability to think, concentrate and of decision making has become impaired. He/she must be having this feeling continuously for a period of at least two weeks.

- **Suicidal Ideation**: (Yes, No).
  Having frequent thoughts of death, suicide, or even have made suicide attempts. He/she feel that his/her relatives and family members will be better of with his/her death.
3.5 **Statistics:**

IBM SPSS Statistics version 19 was used to analyze the collected data. Description of categorical variables like sex, marital status, employment status, stroke lesion, depression, was presented as numbers and percentages. Analysis to determine the relationship between post stroke depression and Demographic variables and stroke characteristics, were performed by Pearson Chi Square ($X^2$) test at 5% significant level.

A separate logistic regression analysis (simple) was performed to evaluate the strength of association between post stroke depression and demographic & stroke characteristics. Multiple logistic regression analysis of all statistically significant demographic & stroke characteristics was also performed to control for all potential confounders. P-value less than 0.05 were considered statistically significant. Both simple and multiple regression analysis were expressed as odd ratios (OR) with 95% confidence interval (CI).

3.6 **Ethical Consideration:**

Before data collection, formal permission was sought from Board of Advance Studies and Research (BASR) Liaquat University of Medical and Health Sciences, Hyderabad, Pakistan. Additionally approval was also solicited from the Ethical Review Committee of Liaquat University of Medical and Health Sciences. And with respect to patients initially their consent to participate in study was sought and afterwards study’s criteria and purpose was explained in detail to all of them and to their relatives/caregivers.

4 **Results:**

A total of 81 patients met the eligibility criteria and were enrolled in the study. Baseline demographic and stroke characteristics are appended:

4.1 **Baseline Characteristics of Post Stroke Patients:**

4.1.1 **Demography:**

Demographic characteristics of the sample are provided in Table 2. Out of 81 patients 60.5% were male and 39.5% female. The mean age of patients was 53.8 (S.D 12.2) years. All patients were divided into five different age groups ranging from 25-88 years. Highest proportion of the patients belonged to 45-59 years age group (45.7%) and out of them 40.8% were male and 53.1%
were female. The second highest proportion of patients was in the age group 60 years and above i.e 34.6%. Lowest proportion was in the age group < 45 years (19.8%). Most of the patients (66.7%) were married (71.4% male and 59.4% female), while only 9.9% were unmarried and 23.5% fall under the category of widowed, divorced or separated. The majority, 48% of patients had no educational attainment (out of them 57.1% were male and 34.4% female), while low proportion, 27.2% of patients (22.4% male and 34.4% female) were having secondary or higher level of education whereas 24.7% were educated in primary grade. Most of the patients belong to low income group 50.6% (46.9% male and 56.3% female) while 49.4% fall under the category of higher income group > 10,000 per month (53.1% male & 43.8% female). By classification of residence status 56.8% patients (67.3% male and 40.6% female) belongs to the urban area while just 43.2% were living in remote localities (rural areas). Total 37% patients were employed (51% male and 15.6% female) and majority 63% were unemployed.

Table-2: Demographic Characteristics of Sample:

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>MALE</th>
<th>FEMALE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 45 years</td>
<td>12 (24.5%)</td>
<td>4 (12.5%)</td>
<td>16 (19.8%)</td>
</tr>
<tr>
<td>45-59</td>
<td>20 (40.8%)</td>
<td>17 (53.1%)</td>
<td>37 (45.7%)</td>
</tr>
<tr>
<td>60 years and above</td>
<td>17 (34.7%)</td>
<td>11 (34.4%)</td>
<td>28 (34.6%)</td>
</tr>
<tr>
<td>MARITAL STATUS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>4 (8.2%)</td>
<td>4 (12.5%)</td>
<td>8 (9.9%)</td>
</tr>
<tr>
<td>Married</td>
<td>35 (71.4%)</td>
<td>19 (59.4%)</td>
<td>54 (66.7%)</td>
</tr>
<tr>
<td>Divorced/ widow</td>
<td>10 (20.4%)</td>
<td>9 (28.1%)</td>
<td>19 (23.5%)</td>
</tr>
<tr>
<td>RESIDENCE STATUS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>33 (67.3%)</td>
<td>13 (40.6%)</td>
<td>46 (56.8%)</td>
</tr>
<tr>
<td>Rural</td>
<td>16 (32.7%)</td>
<td>19 (59.4%)</td>
<td>35 (43.2%)</td>
</tr>
<tr>
<td>OCCUPATION STATUS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>25 (51%)</td>
<td>5 (15.6%)</td>
<td>30 (37%)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>24 (49%)</td>
<td>27 (84.4%)</td>
<td>51 (63%)</td>
</tr>
<tr>
<td>EDUCATION LEVEL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>28 (57.1%)</td>
<td>11 (34.4%)</td>
<td>39 (48.1%)</td>
</tr>
<tr>
<td>Primary</td>
<td>10 (20.4%)</td>
<td>10 (31.3%)</td>
<td>20 (24.7%)</td>
</tr>
<tr>
<td>Secondary and higher</td>
<td>11 (22.4%)</td>
<td>11 (34.4%)</td>
<td>22 (27.2%)</td>
</tr>
<tr>
<td>MONTHLY INCOME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10,000</td>
<td>23 (46.9%)</td>
<td>18 (56.3%)</td>
<td>41 (50.6%)</td>
</tr>
<tr>
<td>&gt;10000</td>
<td>26 (53.1%)</td>
<td>14 (43.8%)</td>
<td>40 (49.4%)</td>
</tr>
</tbody>
</table>
4.1.2 Stroke Characteristics:

Stroke characteristics of the sample are provided in Table-3. Out of total 81 patients 67.9% (71.4% male and 62.5% female) had Ischemic stroke whereas 32% patients (28.6% male and 37.5% female) had hemorrhagic stroke. The right hemisphere lesion location account for 56.8% patients (53.1% male and 62.5% female) and 43.2% patients had left hemisphere lesion location (46.9% male and 37.5% female)

Table-3 Stroke Characteristics of sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischemic</td>
<td>35(71.4%)</td>
<td>20(62.5%)</td>
<td>55(67.9%)</td>
</tr>
<tr>
<td>Hemorrhagic</td>
<td>14(28.6%)</td>
<td>12(37.5%)</td>
<td>26(32.1%)</td>
</tr>
<tr>
<td>Location of Stroke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Hemisphere</td>
<td>26(53.1%)</td>
<td>20(62.5%)</td>
<td>46(56.8%)</td>
</tr>
<tr>
<td>Left Hemisphere</td>
<td>23(46.9%)</td>
<td>12(37.5%)</td>
<td>35(43.2%)</td>
</tr>
</tbody>
</table>

4.2 Prevalence of Post Stroke Depression:

The overall prevalence of post stroke depression in sample size was 38% (31 out of 81 patients). The prevalence in male was found 47% (23 out of 49) whereas in female it was 25% (08 out of 32). This difference was also found statistically significant (Table-4).

4.3 Post Stroke Depression and demographic factors:

Table -4 is showing post stroke depression with reference to demographic factors. If we look at the age group data, highest depression could be seen in young age group <45 years (68.8%). However, relatively lower post stroke depression was observed among older age groups, in the age group 45-59 years (37.8%) and in age group 60 years and above (21.4%). Statistical significant association has been found between the age group and post stroke depression (P-Value < 0.05). Post Stroke Depression was found higher in male as compare to the female in the sample (Male: 46.9%, Female: 25%), P-value < 0.05. The results reveal a significant association between post stroke depression and residence status (P-Value < 0.05). Level of depression among urban population was higher i.e 47.8% as compare to the rural 25.7%.
Higher level of post stroke depression was observed among married patients (42.6%). However, lower level of Post Stroke Depression was observed among single (25%) and divorced/ widow (31.6%) patients (P-Value > 0.05). (Table-4)

**Table 4**: Prevalence of Post stroke depression with respect to demography:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Categories</th>
<th>Depression N (%)</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes (31%)</td>
<td>No (50%)</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>&lt; 45 Years</td>
<td>11 (68.8%)</td>
<td>5 (31.3%)</td>
<td>16 (100%)</td>
</tr>
<tr>
<td></td>
<td>45-59</td>
<td>14 (37.8%)</td>
<td>23 (62.2%)</td>
<td>37 (100%)</td>
</tr>
<tr>
<td></td>
<td>60 &amp; above</td>
<td>6 (21.4%)</td>
<td>22 (78.6%)</td>
<td>28 (100%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>Male</td>
<td>23 (46.9%)</td>
<td>26 (53.1%)</td>
<td>49 (100%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>8 (25%)</td>
<td>24 (75%)</td>
<td>32 (100%)</td>
</tr>
<tr>
<td><strong>Residence Status</strong></td>
<td>Urban</td>
<td>22 (47.8%)</td>
<td>24 (52.2%)</td>
<td>46 (100%)</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>9 (25.7%)</td>
<td>26 (74.3%)</td>
<td>35 (100%)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td>Single</td>
<td>2 (25%)</td>
<td>6 (75%)</td>
<td>8 (100%)</td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>23 (42.6%)</td>
<td>31 (57.4%)</td>
<td>54 (100%)</td>
</tr>
<tr>
<td></td>
<td>Divorced/ Widow</td>
<td>6 (31.6%)</td>
<td>13 (68.4%)</td>
<td>19 (100%)</td>
</tr>
</tbody>
</table>

**4.4 Post Stroke Depression and Socio Economic variable:**

A significant association has also been found between education level and post stroke depression (P-value < 0.05) showing that post stroke depression was highest among patients having primary level of education (60%) whereas a decreasing trend was observed in level of depression with increase in level of education (Secondary and higher level=18.2%).

In data analysis no significant association between Post Stroke Depression and occupation status of patients was found. Total 46.7% employed patients were found depressed as compare to a lower level of depression in unemployed (33.3%) (P-Value > 0.05). In high income group post stroke patients were less likely to develop depression (only 22.5% were having post stroke depression) whereas patients with low income group were more likely to develop post stroke depression.
depression (53.7% were found depressed) with significant association (P-Value < 0.05). (Table - 5)

**Table 5: Prevalence of Post stroke depression with respect to Socio Economic Variables:**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Depression N (%)</th>
<th>Total 81 (100%)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes 31(%)</td>
<td>No 50 (%)</td>
<td></td>
</tr>
<tr>
<td>Education Level</td>
<td>Illiterate</td>
<td>15 (38.5%)</td>
<td>24 (61.5%)</td>
<td>39 (100%)</td>
</tr>
<tr>
<td></td>
<td>Primary</td>
<td>12 (60%)</td>
<td>8 (40%)</td>
<td>20 (100%)</td>
</tr>
<tr>
<td></td>
<td>Secondary and higher</td>
<td>4 (18.2%)</td>
<td>18 (81.8%)</td>
<td>22 (100%)</td>
</tr>
<tr>
<td>Occupation Status</td>
<td>Employed</td>
<td>14 (46.7%)</td>
<td>16 (53.3%)</td>
<td>30(100%)</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>17 (33.3%)</td>
<td>34 (66.7%)</td>
<td>51(100%)</td>
</tr>
<tr>
<td>Monthly Income</td>
<td>&lt; 10,000</td>
<td>22 (53.7%)</td>
<td>19 (46.3%)</td>
<td>41(100%)</td>
</tr>
<tr>
<td></td>
<td>&gt;10,000</td>
<td>9 (22.5%)</td>
<td>31 (77.5%)</td>
<td>40 (100%)</td>
</tr>
</tbody>
</table>

### 4.5 Post Stroke Depression and Stroke Characteristics:

Table-6 describes the stroke type and localization in patients with and without Post Stroke Depression. Out of total 81 patients 31 were having post stroke depression. Out of those 31 patients, post stroke depression was found comparatively higher in patients with Ischemic stroke 47.3% than hemorrhagic stroke (19.2%). Post stroke depression and stroke type had significant association (P-value <0.05).

Localization of stroke characteristics, which was taken from the CT scan reports of the patients revealed a higher level of post stroke depression in right hemisphere lesion location (43.5%) as compared to left hemisphere (31.4%). However, post stroke depression and Stroke localization had no significant association.
Table-6: Stroke type and Localization in patients with and without PSD

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>Depression N (%)</th>
<th>Total 81 (100%)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes 31(%)</td>
<td>No 50 (%)</td>
<td></td>
</tr>
<tr>
<td>Stroke Type</td>
<td>Ischemic</td>
<td>26 (47.3%)</td>
<td>29 (52.7%)</td>
<td>55 (100%)</td>
</tr>
<tr>
<td></td>
<td>Hemorrhagic</td>
<td>5 (19.2%)</td>
<td>21 (80.8%)</td>
<td>26 (100%)</td>
</tr>
<tr>
<td>Location of Stroke</td>
<td>Right Hemisphere</td>
<td>20 (43.5%)</td>
<td>26 (56.5%)</td>
<td>46 (100%)</td>
</tr>
<tr>
<td></td>
<td>Left Hemisphere</td>
<td>11 (31.4%)</td>
<td>24 (68.6%)</td>
<td>35 (100%)</td>
</tr>
</tbody>
</table>

4.6 Factors that Differentiate Post Stroke Patients With And Without Depression:

Chart-1 illustrates the factors that differentiate post stroke patients with and without depression. Some of the demographic factors (e.g. age, education level, gender, residence status and income) were found statistically significant with respect to PSD and differentiated post stroke patients with and without depression. Further, in our study, for neurological factors, we found that stroke type had significant association with post stroke depression and differentiated post stroke patients with and without depression.
4.7 **Simple Logistic Regression Analysis:**

In simple logistic regression analysis Table -7 the age of patients was positively associated with post stroke depression. Compare to the oldest age group 60 years and above the youngest age group < 45 years had about 8 times higher odd ratio (8.07) for reporting of post stroke depression. The residence status of patients was also positively associated with post stroke depression. The odds for reporting of post stroke depression was high (65%) among urban resident patients as compare to the rural ones. Education level of the patients was also positively associated with post stroke depression with highest odd ratio in primary level of education (6.75) as compare to the higher education. Monthly income was found
positively associated with post stroke depression. As compare to the higher income group the lower income group had four times higher odd ratio. Besides age, residence status, education level and monthly income, no other demographic and socio economic variable yielded significant results.

In stroke characteristics, stroke type was positively associated with post stroke depression. The odds for reporting of post stroke depression was high (76%) among ischemic stroke patients as compare to the hemorrhagic stroke patients.

**Table -7** Simple logistic regression showing the influence of demographic, socio economic variables and stroke characteristics on post stroke depression among stroke patients.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>OR</th>
<th>CI (95%)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEMOGRAPHIC VARIABLES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;45 Years</td>
<td>8.07</td>
<td>2.01-32.39</td>
<td>0.003</td>
</tr>
<tr>
<td>45-59</td>
<td>2.23</td>
<td>0.73-6.85</td>
<td>0.160</td>
</tr>
<tr>
<td>60 Years &amp; Above</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.65</td>
<td>0.99-7.05</td>
<td>0.050</td>
</tr>
<tr>
<td>Female</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MARITAL STATUS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>0.72</td>
<td>0.11-4.69</td>
<td>0.733</td>
</tr>
<tr>
<td>Married</td>
<td>1.61</td>
<td>0.53-4.87</td>
<td>0.401</td>
</tr>
<tr>
<td>Divorced/ widow</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESIDENCE STATUS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>2.65</td>
<td>1.02-6.87</td>
<td>0.045</td>
</tr>
<tr>
<td>Rural</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOCIO ECONOMIC VARIABLES</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>EDUCATION LEVEL</td>
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4.8 Multiple Logistic Regression Analysis:
The results obtained in multiple logistic regression analysis (Table-8) shows the influence of demographic, socio economic & stroke variables on post stroke depression. The multiple logistic regression analysis was performed on all statistically significant variables of simple logistic regression model. In adjusted multiple logistic regression positive relationship was observed between post stroke depression and age, education level, monthly income and stroke type. Odd ratio for age was 10.98 & is still significant. Odd ratio for education level (primary level) was 5.44, for monthly income it was 3.65 & for stroke type it was 3.62 and they all remained significant. However, no statistical significance was observed between residence status and post stroke depression (P Value > 0.05).

Table-8: Multiple logistic regression showing the influence of demographic, socio economic variables and stroke characteristics on post stroke depression among stroke patients.

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<td>&lt;45 Years</td>
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<td>45-59</td>
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<td>Urban</td>
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<tr>
<td>Ischemic</td>
<td>3.62</td>
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<td>Hemorrhagic</td>
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5 Discussion:

5.1 Main Findings:

Post stroke depression was diagnosed using DSM IV TR criteria. Our study endorsed the fact that depression is a common outcome of stroke. In this study we found more than one third of the stroke patients depressed. Depression was found more frequent in our sample in young age group and for males.

Post stroke depression was found significantly related and more frequent among primary educated, unemployed patients with lower level of monthly income. However, in terms of residence status depression among urban population was found more frequent as compare to the rural ones. No significant relation was found between the marital status of the patients and depression.

In terms of stroke related factors, ischemic stroke type was found statistically associated with depression while no significant relation was observed between lesion location of stroke and depression.

Multiple logistic regression analysis was used to eliminate the potential confounders.

To sum up factors contributing to increased risk of depression after stroke include advancement in age, male sex, primary level of education, urban residence, unemployment, lower income levels and Ischemic stroke type.

5.2 Prevalence of Depression:

Prevalence of depression among Pakistani population is reported to be very high and found among one third of the population. Risk of developing depression in stroke survivors is also very high which affect their recovery after stroke. Depression after stroke was found very frequent in our sample and more than one third of the sample was found depressed which was found related with many other studies. The presence of depression in our patients was high as compared with that in studies conducted in developed countries but this is in line with studies conducted in developing countries and in South East Asia. Our results reflect the dilemma of Pakistan and of most developing countries. It shows the picture of socio-demographic profile of a developing country, where very low per capita expenditure is made on health and few, if any, benefits provided to the disabled population.
5.3 Associated Factors of Post Stroke Depression:

5.3.1 Demographic factors:

Demographic variables are important determinants of post stroke depression. Depressive symptoms were found statistically associated with young age group in our study. Our result has similarity with previous studies \(^{25,32,59,82}\). However, most of the studies on significance between age and post stroke depression show contradictory findings and reveals complex relationship between age and post stroke depression which could be found dependent upon other multiple factors.

Post stroke depression was found significantly associated with male sex in this study. This is in accordance with many other studies \(^{62-64,83}\). One reason of high depression among working age group of male might be that physical disability in that group is of greater importance for male as compare to female or another explanation of higher depression in men was attributed to their less coping abilities as compare to female\(^{64}\). In specific case of Pakistan high post stroke depression among male could also be attributed to the cultural norms as high level of responsibilities and expectations are attached with male gender. Males are responsible to earn bread and butter for large families. Joint family system in the country adds fuel to the fire and in such scenario physical impairment by stroke carries a higher risk of developing depression.

Similarly, our study found education level, employment status, monthly income and residence status as the other most important demographic determinants of post stroke depression. We have found our study unique in exploring these factors as determinants of post stroke depression. As per our knowledge no previous study in Pakistan has explored association of above mentioned four demographic factors in developing post stroke depression. In our study post stroke depression was found significantly associated with primary level of education, unemployment, lower monthly income and urban residence locality. The significant association of urban locality in post stroke depression has also been proved by other studies\(^{83}\). Logic of above four factors as being determinant of post stroke depression in particular case of Pakistan, as found in our study, could be traced out behind culture, economic, socio economic and political conditions of the country. Pakistani population since last three decades is experiencing sociopolitical instability, economic uncertainty, violence, terrorism, regional conflict, and dislocation. Pakistan is facing biggest problems of poverty, unemployment and illiteracy. Very
little resources are devoted to socio-economic development of the country which in addition to high birth rate contributes to persistence of poverty. Currently 32% of Pakistani population is living below poverty line^4^ and Unemployment rate is 15.4% with 49.9% literacy rate^6^6. All these factors are interlinked and produce synergy affect in causing post stroke depression when combined in a stroke patient.

5.3.2 Stroke characteristics:

A significant association was found between post stroke depression and Ischemic stroke type in our study. This finding is in congruence with other studies^24,81,85,86^24. An earlier study reported high depression among patients having ischemic stroke in the left hemisphere as compare to those having it in the right hemisphere^85^85. However, many studies do not agree with this and report contradictory results^33,56^33. No significant association was found between stroke localization and post stroke depression in the study and this finding is in line with many other studies^23,24,39,56,83^23. In a systematic review a study has found no significant association between lesion location and depression after pooling the data of 34 primary studies^39^39. However, some studies disagree with this finding and report significance of left lesion location in causing post stroke depression^14,38,53,54^14. This vide divergence among different study findings on the subject of Lesion location association with post stroke depression could be attributed to the methodological differences among study settings e.g. sample size, sample selection criteria, study site, different tools used to measure depression and time passed since stroke.

6 Limitations:

Our study has several potential limitations. First being a cross sectional study, this study inherits in itself the limitation to test the temporal sequence of these events. Secondly our study was limited to one public sector hospital which might be biased in stroke type, stroke severity and demographic characteristics of the patients. Thirdly, our entire sample was based on those who had no cognitive and psychiatric impairment. Therefore, the results cannot be generalized to those stroke patients who have any cognitive and psychiatric impairment.
7 Conclusion:

It is concluded that prevalence of post stroke depression is high and frequent. It usually remained under recognized. Demographic and Stroke variables are associated with post stroke depression and are the most important determinants of post stroke depression. Young patients with male sex are more vulnerable to develop depression. Those who usually have primary level of education, low monthly income, urban residence, unemployed and having Ischemic stroke are at higher risk of developing depression after stroke.

8 Recommendations:

As to our knowledge this study is unique of its type and has evaluated the relationship between demographic factors, stroke factors and post stroke depression in Pakistan. We recommend that the population which has been identified in this study requires immediate attention of the health care providers with respect to post stroke care. Well planned training sessions for dissemination information about stroke and its related risk factors are suggested for health professionals. At community level awareness sessions for general public are recommended. Further, a community based study is also recommended on the subject. In addition more studies using detailed information about sample like time elapsed after stroke, severity of stroke and type of medical services used may also be explored in further studies which may help to enhance the interpretation of the study findings.
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QUESTIONNAIRE

PREVALENCE OF DEPRESSION AMONG POST STROKE PATIENTS IN LIAQUAT UNIVERSITY HOSPITAL HYDERABAD

Name: ____________________________________________________________
Age : ________________________
Sex:  □ Male  □ female.
Marital Status:  □ Single. □ Married. □ Divorced/Widow
OPD Registration No._________________
Residence Status:  □ Rural  □ Urban.
Employment Status: □ Employed  □ Unemployed.
Education Level: □ Illiterate. □ Primary □ Secondary and Higher
Monthly Income: □ < 10,000. □ 10,000 - 40,000. □ > 40,000.

Assessment of Stroke Characteristics:
1. Type of Stroke: □ Hemorrhagic. □ Ischemic

Assessment of Depressive symptoms:
1. Depressed mood: YES NO □
2. Loss of interest in activities previously enjoyed: YES NO
3. Significant weight loss/ gain:
   a) Weight loss of 5% when not dieting YES NO
   b) Weight gain of 5% when not overeating. YES NO
4. Sleep disturbance (Insomnia)
a) Late onset sleep
   b) Feels un-fresh in the morning.

5. Psychomotor agitation or retardation:
   a) Agitation
   b) Retardation

6. Loss of energy:

7. Feelings of worthlessness:

8. Diminished ability to concentrate:

9. Recurrent thoughts of death or suicidal ideation

Number of factors presents: ______

DEPRESSION: YES NO
A list of master theses from previous years, 1996-2007, is available at: www.phmed.umu.se/english/divisions/epidemiology/research/publications

Centre for Public Health Report Series
(ISISS 1651-341X)

2009


2009:25 **Yihuai Liang.** Parental corporal punishment and emotional maltreatment (PCPEM) in childhood, mental health and risk behaviors among youth students in Beijing and Hebei, China. *Master thesis*
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