INTRODUCTION
Alzheimer's disease is a progressive degenerative neuropathology. Today, more than 25 million people in the world are affected by dementia, most suffering from Alzheimer's disease. The etiological factors, other than older age and genetic susceptibility, remain to be determined.1 As the life expectancy is increasing in various regions of the world, dementia is becoming a growing public health concern.2
Depression is the most frequent psychiatric co-morbidity in Alzheimer's disease, with a negative impact on the progression of the illness. Experts estimate that clinically significant depression occurs in about 20-40% of people with Alzheimer's disease.3 More than half suffer from one or more depressive symptoms such as anxiousness, sadness, irritability, agitation or psychomotor retardation, sleep problems or loss of interest.4
Risk factors associated with development of depression include family history, female gender, lack of social support, medical and neurological co-morbidity, prior depressive episodes, and prior suicide attempts. Stressful life events such as; loss of someone, financial stress, chronic and painful medical conditions, and social isolation, all contributed to the risk of depression. Isolation and loneliness are known key risk factors for depression.5
Several studies have reported an increased risk of Alzheimer's disease among less-educated persons.5,6-10 A number of studies have reported either a higher risk for Alzheimer's disease in people with less education, or a lower risk in those who remain mentally active. Some evidence suggests that early malnutrition, which is more likely to occur in lower income and educational groups, has been associated with smaller brains and with Alzheimer's disease in old age. The socioeconomic status of societies also influence, the incidence and duration of mental illnesses in old age by influencing life expectancy and availability of appropriate healthcare services and treatments.2,6,7,11-13
In Pakistan, there is a dearth of literature on various aspects of Alzheimer's disease.
This study was planned to determine the frequency of depression among patients suffering from Alzheimer's disease.

METHODOLOGY
Consecutive patients with Alzheimer's disease reporting to the Department of Psychiatry, Sir Ganga Ram Hospital, Lahore, form August 2007 to December 2008 were included. The diagnosis of Alzheimer's disease...
was based on the results of clinical presentation and information from the patients. Due to severe cognitive impairment, 27 patients, who had severe Alzheimer's disease could not provide the required data and got excluded. Mini-Mental State Examination (MMSE) was used to characterize severity of cognitive impairment with a maximal score of 30. Subtests representing 5 different domains of cognition were analyzed; orientation, memory, attention and calculation, language and copying design. Any score over 27 (out of 30) was considered normal. Scores between 20 and 26 indicates some cognitive impairment; 10-19 moderate to severe cognitive impairment, and below 10 very severe cognitive impairment.

Hamilton rating scale for depression (Ham-D) was used to assess the severity of the illness in patients suffering from depression. Any score 0-7 indicates none/minimal depression, 8-17 mild depression, 18-25 moderate depression and 26 or above severe depression.

Educational level was categorized by years of schooling as low (< 8 years), middle (8-11 years), or high (≥ 12 years). The socioeconomic status was determined according to monthly income. Monthly income of less than Rs. 5000/- was categorized as low socioeconomic status, income between Rs. 5000-30,000/- as middle socioeconomic status and income of Rs 30,000/- or higher as high socioeconomic status.

The data was analysed through SPSS-12. Descriptive statistics were calculated. For comparing percentages between two studies/groups, Chi-square test was used. Level of significance was kept at 5%. P ≤ 0.05 was taken as significant.

**RESULTS**

The clinical and demographic characteristics of 76 patients (34 males and 42 females) are summarized in Table I. The age of the participants ranged from 64 to 83 years. The mean age at assessment was 67.74 ± 6.71 years. Nearly two third of the patients (66%) were married, 14% were single and 20% were widowed. Majority of the patients (73.7%) had a low socio-economic status and 23.7% were illiterate.

Out of 76 patients assessed, 24 patients (31.5%) had a MMSE score of 20-26, thus showing mild Alzheimer, 42 (55.3%) patients had a score of 10-29 indicating a moderate disease and 10 patients (13.1%) had severe disease as manifested by an MMSE score of ≤ 9 (Table II).

Family history of depression was present in 47% cases and 48% had medical co-morbidities (Table I). Based on the Hamilton rating scale, 57 (75%) patients showed some form of depression, the remaining 19 (25%) patients, were free from any manifestation of depression. The frequency of depression was significantly higher (p=0.001) among females (90%) as compared to males (55.9%).

**DISCUSSION**

Alzheimer’s disease begins with loss of memory, sadness and anxiety. Later on, more symptoms including marked depression and irritability develop. Depression and depressive symptoms are reported to occur frequently in patients with Alzheimer’s disease, which may range from 6% to 30%, depending on the diagnostic criteria employed. In fact, depression itself is often an early symptom of Alzheimer’s disease. Depressive symptoms can be present in Alzheimer’s disease in the absence of major depression.

In the present study, 25% subjects were free from any depression. Out of those 75% who were suffering from depression, nearly one fifth (19.7%) were suffering from mild depression, 27.6% from moderate depression and another 27.6% from severe depression. These results are also consistent with the findings of many previous studies from different countries. Strober and Arnett observed that 87% Alzheimer patients were suffering from depression. Tractenberg et al. quoted similar prevalence. Ballard et al. studied 124 patients at University of found 52.4% Alzheimer’s patients suffering
from depression.\textsuperscript{11} This was significantly lower than the present figure of 75\%. In Israel, Bowirrat \textit{et al.} studied 168 Arabs with Alzheimer and found 57\% of them to be suffering from depression.\textsuperscript{12} According to another study from California, USA, 101 Alzheimer patients were studied for the presence of depression and 44\% were having depression.\textsuperscript{13}

Isolation and loneliness are known key risk factors for depression. A study from Finland published in 2009 has highlighted the beneficial effect of co-habiting with a partner in mid-life. Hakansson \textit{et al.} used a population based design with participants from two regions in eastern Finland. Participants were examined in mid-life, with mean age of 50.4 years and then again, around 21 years later. The main variables were marital status (married/co-habiting, single, divorced, or widowed) measured at mid-life and follow-up and additional diagnostic measures of cognitive impairment (mild cognitive impairment, Alzheimer's disease, and other forms of dementia) at follow-up. By combining marital status at both times, they created several categories of marital transition (such as married at both times, married in mid-life and widowed later in life, etc.). They related mid-life marital status and transitions in marital status from mid-life to later life to cognitive status later in life and adjusted the estimations of these associations for several other variables from the mid-life measurements. They found that people co-habiting with a partner in mid-life (mean age 50.4) were less likely than all other categories, i.e. single, separated, or widowed, to show cognitive impairment later in life at ages 65-79 years. Those widowed or divorced in mid-life and still so at follow-up had three times the risk compared with married or co-habiting people. Those widowed both at mid-life and later life had an odd ratio of 7.67 (1.6-40.0) for Alzheimer's disease compared with married or co-habiting people. In this study, 14\% of the sample were single i.e. unmarried and 20\% were widowed. Lack of support, whether it is family or spouse makes coping with stress more difficult at old age.

Low level of education has been a risk factor for Alzheimer's disease. Older subjects or those, who had fewer years of education, were at greater risk of Alzheimer's disease. Results of this study have shown low level of education and low socioeconomic status as other risk factors of depression in the older population. Low level of education and a low occupation-based main socioeconomic status are individually associated with increased risk of Alzheimer's disease, but only low education remains as a risk factor when both variables are examined simultaneously. The present results are in agreement with previous findings of a positive association between a low level of education and increased risk of Alzheimer's disease.\textsuperscript{5,6-10} Alzheimer's Disease Research at NIA, says, that there are certain psychosocial factors related to Alzheimer's disease and that, the cause of Alzheimer is not any single factor, rather a host of factors that interact in many ways in different people. Women had a significantly higher prevalence of major depression than men. One theory about depression is, that it leads to the loss of cells in two areas of the brain, the hippocampus and the amygdala, which then contributes to Alzheimer's disease. Dutch researchers found that Alzheimer was 2.5 times more likely in people with a history of depression. But it found that people who showed signs of depression before the age of 60 were four times more likely to develop Alzheimer. Similarly, US researchers, examining Catholic clergy, found those with signs of depression were more likely to go on to develop Alzheimer's disease.\textsuperscript{16}

 Forty seven percent of the subjects, including men and women had similar frequencies of family histories of depression. Co-morbidity also has an important role. Diseases such as; diabetes mellitus, stroke and cardiovascular diseases predispose the individual, more to depression along with Alzheimer's disease. Patients with diabetes often have high blood pressure, lipid imbalances, and circulatory disorders, that affect the heart and vascular system. Research suggests that diabetes can also affect cognitive function and increase the risk of developing Alzheimer's disease. These findings suggest that family history and depression alone may not fully explain the high rate of depression in Alzheimer patients and that other factors including; level of education, socioeconomic class of Alzheimer patients should also be considered.

**CONCLUSION**

The frequency of depression among patients of Alzheimer's disease in Pakistan is fairly high. Depression, being a risk factor of Alzheimer's disease should not be ignored and must be treated as early as possible.

**REFERENCES**


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