# RESULTS AND DISCUSSIONS

# RESULTS AND DISCUSSIONS

The present study was carried out with the broad objective to assess the diet, nutritional, physical and mental health profile of adult and older women suffering from depression and carry out interventional studies on folic acid and brahmi supplementation. Related objectives of the study included i) Assessment of socio-demographic profile, diet, nutritional, mental and physical health status and psychosocial profile of adult and older depressed women. ii) Evaluation of intervention effects of folic acid and brahmi supplementation on nutritional, mental and physical health profile of adult and older depressed women above the age of 60 years. For this purpose the adult and older women were screened for depression from free living population of Vadodara city and total 180 women were identified for present study.

The study has been carried out in three phases as mentioned below:

| | |
|---|---|
| **Phase I** | **COLLECTION OF BASELINE DATA ON SOCIO-DEMOGRAPHIC PROFILE, DIET PROFILE, NUTRITIONAL STATUS, MORBIDITY PROFILE AND PSYCHOSOCIAL PROFILE IN ADULT AND OLDER DEPRESSED WOMEN.** |
| **Phase II** | **FOLIC ACID SUPPLEMENTATION FOR A PERIOD OF EIGHT WEEKS AND EVALUATION OF THE POST INTERVENTION EFFECT OF SUPPLEMENTATION ON OLDER WOMEN WITH DEPRESSION.** |
| **Phase III** | **BRAHMI SUPPLEMENTATION FOR A PERIOD OF TWELVE WEEKS AND EVALUATION OF THE POST INTERVENTION EFFECT OF SUPPLEMENTATION ON OLDER WOMEN WITH DEPRESSION** |

The results of the study are discussed and interpreted in accordance with the below mentioned phases.

## PHASE I

### COLLECTION OF BASELINE DATA ON SOCIO-DEMOGRAPHIC PROFILE, DIET PROFILE, NUTRITIONAL STATUS, MORBIDITY PROFILE AND PSYCHOSOCIAL PROFILE IN ADULT AND OLDER DEPRESSED WOMEN.

This part of the study was carried out using following steps: 1) Screening of depression using Beck's depression inventory scale and information on socio-demographic attributes and lifestyle factors. 2) Collection of information on diet related aspects and dietary intake of adult and older women with depression. 3) A study of physical health profile and nutritional status of adult and older women with depression. 4) Collection of data on morbidity profile of adult and older women with depression. 5) Assessment of psychosocial parameters in adult and older women with depression..

Vadodara city was divided into 25 areas. A sub-sample was taken from each area of Vadodara, ensuring representation of each locality in the study. Using the snowball sampling technique, subjects were identified from each locality of the city. The Beck's Depression Inventory (BDI) was used for screening women for depression. The study design for this phase was both descriptive and experimental.

The present study was proposed to understand depression in relation to nutrition of aging women. Therefore women who were above the age of 40 years were included in the study. After screening, all 180 respondents who fulfilled the inclusion criteria i.e., 40 years and above of age and had a moderate degree of depression, were selected for the in-depth interviews based on their consent and willingness to participate.

The data obtained from the following parameters were analyzed using appropriate statistical tests. Results are presented and discussed on the basis of moderately depressed women of two age groups 40-60 years and above 60 years under following headings:

| SR NO | PARAMETERS | PARTICULARS |
|---|---|---|
| 1. | **SCREENING FOR DEPRESEEION USING BECK'S DEPRESSION INVENTORY (BDI) SCALE** | |
| 2. | **SOCIO DEMOGRAPHIC PROFILE** | |
| 3. | **LIFESTYLE FACTORS** | a. Activity pattern |
| | | b. Addiction pattern |
| 4. | **DIET SURVEY** | a. General dietary aspects |
| | | b. Dietary Intake |
| | | i. 24-Hour dietary recall |
| | | ii. Food frequency questionnaire |
| 5. | **NUTRITIONAL STATUS** | a. Anthropometric measurements |
| | | b. Clinical Parameter |
| | | i. Blood pressure measurements |
| 6. | **MORBIDITY PROFILE** | a. Major health problems |
| | | b. Minor health complaints |
| | | c. Menopausal aspects |
| 7. | **PSYCHOSOCIAL PARAMETERS** | a. Power structure |
| | | b. Loneliness and Isolation |
| | | c. Stressful life event scale |
| | | d. Self Esteem |

The results of the above parameters are discussed below:

## 1. SCREENING FOR DEPRESSION

The Beck's Depression Inventory (BDI) is a standardized and most feasible tool for screening women for depression. The 21-itemed BDI was used for screening women for depression during actual data collection. The screening process was continued till the required sample of total 180 women with moderate depression was completed. Thus 426 women were screened. On the basis of their scores on the BDI they were identified as having 'minimal', 'mild', 'moderate' and 'severe' depression. For the purpose of analysis, women were categorized into two age groups viz., 40-60 years and above 60 years.

The distribution of women with various grades of depression by their age and economic status is presented in table 4.1.1

**Table 4.1.1: Distribution of the women screened for depression belonging to age and income group**

| Level of depression | Score range | 40-60 yrs | | | >60 yrs | | | |
|---|---|---|---|---|---|---|---|---|
| | | LIG | MIG | HIG | LIG | MIG | HIG | Total |
| Minimal | 0-12 | 12 | 66 | 41 | 4 | 37 | 13 | 173 |
| Mild | 13-19 | 5 | 20 | 8 | 8 | 19 | 2 | 62 |
| Moderate | 20-28 | 30 | 30 | 30 | 30 | 30 | 30 | 180 |
| Severe | 29+ | 2 | 0 | 1 | 4 | 2 | 2 | 11 |
| **Total** | - | **49** | **116** | **80** | **46** | **88** | **47** | **426** |

As per the aim of the study all the subjects in the "moderate" range of depression were selected for in-depth interview, their demographic, economic and socio-cultural profile has been discussed separately in the next section. This section presents the demographic, economic and socio-cultural profile of the remaining 246 women who had minimal (n=173), mild (62), and severe (n=11) depression. Out of 246 women, almost 70 % were in the age group of 40-60years and 40% of the women were above the age of 60years.

Amin et al (1998) conducted a two-stage study of depression in which 200 patients male and female attending primary care in Baroda city were selected. It was found that moderate or severe depression was present in 30% patients using BDI scale whereas 21% were having depression according to clinical interview scale for depression in stage 2.

## 2. SOCIO–DEMOGRAPHIC PROFILE

Pre-tested questionnaire was used to obtain socio-demographic profile of 180 adult and elderly women belonging to age group of 40 years and above. The assessment included socio-demographic information on marital status, education, occupation, religion, ethnic group, per capita income, economic status and living arrangement. The data is presented in table 4.1.2.

In addition to providing demographic, socio-economic and cultural background of 180 women, this section also provides information on their health status, history of mental illness and family history of addiction.

Table 4.1.2 below presents the Socio demographic profile and background characteristics of the 180 women identified as moderately depressed by age and income levels.

**Table 4.1.2: Background characteristics of women with depression, belonging to age and income level**

| Characteristic | 40 – 60 years | | | >60 years | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| **Marital Status** | | | | | | |
| Unmarried | - | 3.3 | 10 | 10 | 10 | 3.3 |
| Married | 73.3 | 86.7 | 76.7 | 50.0 | 46.7 | 76.7 |
| Widowed | 20.0 | 6.6 | 10.0 | 30.0 | 43.3 | 20.0 |
| Separated | - | 3.4 | - | 6.7 | - | - |
| Divorced | 6.7 | - | 3.3 | 3.3 | - | - |
| **Level of Education** | | | | | | |
| Illiterate | 20.0 | 3.3 | - | 23.3 | 6.7 | - |
| Primary | 16.7 | 3.3 | 10.0 | 33.3 | 16.7 | 13.3 |
| Secondary | 26.7 | 3.3 | - | 10.0 | 33.3 | 20.0 |

| Characteristic | 40 – 60 years | | | >60 years | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| Higher secondary | 20.0 | 23.3 | 10.0 | 16.7 | 10.0 | 13.3 |
| Graduation | 10.0 | 36.7 | 23.3 | 10.0 | 10.0 | 6.7 |
| Post graduation | 6.7 | 6.7 | 40.0 | 6.7 | 10.0 | 13.3 |
| Ph.D. | - | 16.7 | 16.7 | - | 10.0 | 33.3 |
| Any other | - | 3.3 | - | - | - | - |
| No response | - | 3.3 | - | - | 3.3 | - |
| **Occupational Status** | | | | | | |
| Service | 33.3 | 23.3 | 13.3 | 26.7 | 6.7 | 3.3 |
| Professional | 6.7 | - | 6.7 | - | - | 3.3 |
| Business | - | - | - | 3.3 | - | - |
| Self employed | 10.0 | - | 16.7 | 13.3 | 3.3 | 6.7 |
| Homemakers | 46.7 | 70.0 | 53.3 | 46.7 | 70.0 | 60.0 |
| Retired | 3.3 | 6.7 | 10.0 | 10.0 | 20.0 | 26.7 |
| **Religion** | | | | | | |
| Hindu | 86.7 | 100 | 93.3 | 93.3 | 93.3 | 93.3 |
| Muslim | 6.7 | - | - | 6.7 | - | - |
| Christian | - | - | 3.3 | - | - | 6.7 |
| Sikh | - | - | 3.4 | - | - | - |
| Parsi | 3.3 | - | - | - | 6.7 | - |
| No response | 3.3 | - | - | - | - | - |
| **Caste** | | | | | | |
| Scheduled caste | 56.7 | 10.0 | - | 50.0 | - | 10.0 |
| Scheduled tribe | - | - | - | 3.3 | - | - |
| Other backward class | - | 6.7 | - | - | - | - |
| Other castes | 30.0 | 80.0 | 100 | 43.3 | 93.3 | 90.0 |
| No response | 13.3 | 3.3 | - | 3.4 | 6.7 | - |
| **Language** | | | | | | |
| Gujarati | 60.0 | 86.7 | 66.7 | 63.3 | 83.3 | 70.0 |
| Hindi | 13.3 | 3.3 | 6.7 | 10.0 | 10.0 | 3.3 |
| Marathi | 26.7 | 3.3 | 6.7 | 20.0 | 6.7 | 6.7 |
| Bengali | - | 3.3 | 6.7 | 3.3 | - | 6.7 |
| Sindhi | - | 3.3 | 3.3 | - | - | - |
| English | - | - | - | - | - | 10.0 |
| Malayalam | - | - | 6.7 | - | - | 3.3 |
| Punjabi | - | - | 3.3 | - | - | - |
| Marwari | - | - | - | 3.3 | - | - |

As observed from above table, it was found that in case of marital status, widowhood category ranked higher among women belonging to middle income group above 60 years of age (43.3 percent)than among women in the age group of 40-60 years (6.6 percent). For these women, widowhood may have been a causative factor for depression in addition to other psychosocial

and nutritional factors. Further it was also observed that majority of the younger depressed women belonging to middle income group were married (86.7 percent) than older depressed women (46.7 percent).

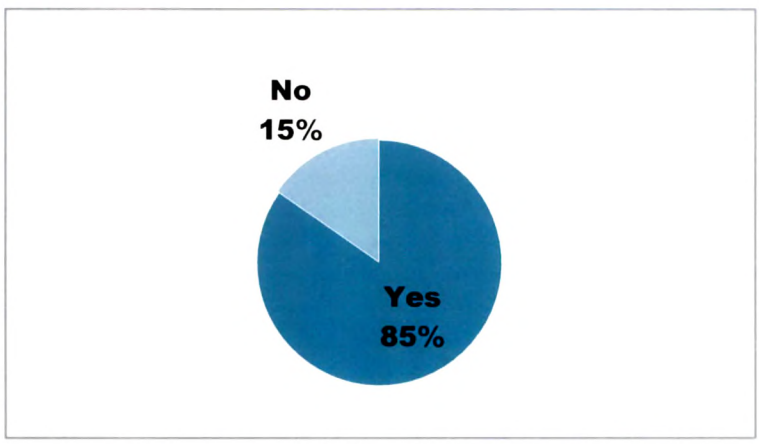
Single women, including those unmarried, separated and divorced constituted only 10 percent of the total 180 women. As per review being single is not an important causative factor for depression as most of the women who were interviewed under the present study were found to be married. The educational level amongst women from 40-60 years of age from higher income group had completed post graduation (40 percent) followed by graduation (36.7 percent) in middle income group, whereas in case of depressed women above 60 years of age (33.3 percent) from higher income group had completed doctoral and secondary education from middle income group women. Illiteracy rate were higher amongst both the group in the lower income class indicating that education does not necessarily act as a protective factor against depression in women. Although the association between common mental disorders and socio-economic problems correlation with educational status has been established, fact is that majority of women who live in poverty are illiterate. Undergoing through stress in their lives regularly, yet they tend to cope up with their existence and do not surrender to the stress they face (Mission Report 2003, Government of Gujarat).

In case of Occupation majority of moderately depressed women from middle income women were identified as are housewives (70 percent). It was also observed that younger depressed women belonging to middle income group were still employed compared to elderly women. About one third of the depressed women amongst lower income group from both the age groups were still working as they were considered to be responsible for the source of income in their families.

Majority of the women with moderate depression from both the age groups were Hindus (93.3 percent). Further, nearly three fourth of the women (72.8 percent) belonged to "other" castes and about one fifth of the women (21.1

percent) were from scheduled castes. Women from scheduled tribes and other backward classes constituted a negligible percentage (1.7 percent).

**Figure 4.1: Presence of physical ailments in women with depression (n=180)**




Regarding their mother tongue, Gujarati was the highest spoken language amongst (71.6 percent) of the women followed by Marathi (11.6 percent) and Hindi (7.8 percent). Women who speak Bengali, Sindhi, English and Malayalam together constituted small percentage (7.8 percent).

Thus, majority of the women identified with moderate depression were Hindus, belong to upper castes and had Gujarati as their mother tongue.

✓ **Physical Ailments**

Figure 4.1 above shows, 85.6 percent of the 180 adult and older women identified with moderate depression reported for some physical ailments, which was due to the fact that all of them were over 40 years of age.

Arthritis and blood pressure were the two most common physical ailments (42.8 percent and 42.3 percent respectively) followed by body ache (12.2 percent) and diabetes (9.5 percent). Other ailments reported by women were: spondylitis (3.8 percent), thyroid malfunction (5.5 percent), cardiac problems (4.4 percent) and osteoporosis (4.1 percent). Many subjects reported for multiple physical ailments as depicted from table 4.1.3 below.

**Table 4.1.3: Types of physical ailments reported by women with depression, belonging to age and income level**

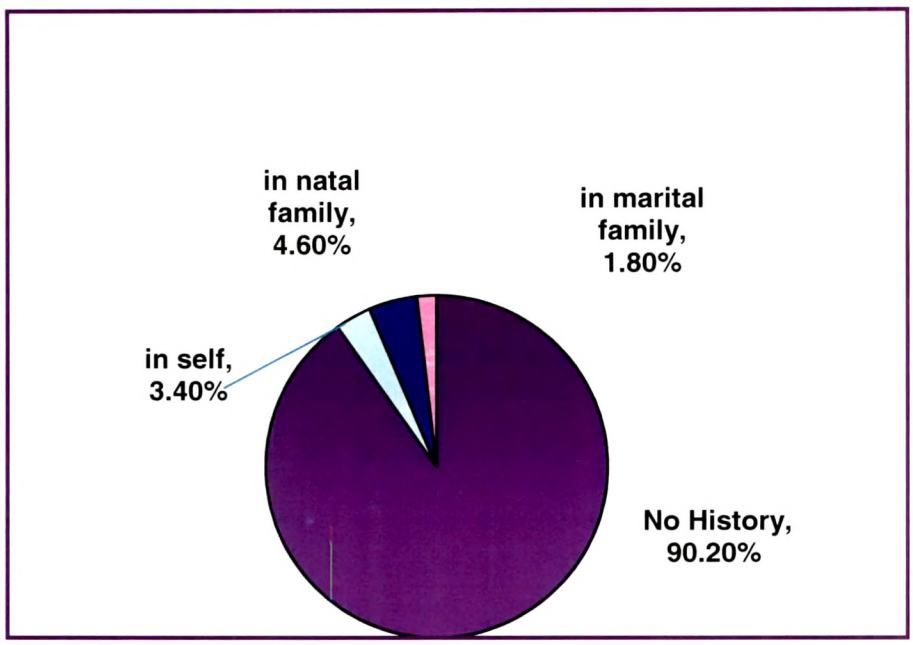
| Type of illness | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| Blood Pressure | 43.3 | 36.7 | 36.7 | 36.7 | 46.7 | 53.3 |
| Arthritis | 53.3 | 43.3 | 46.7 | 36.7 | 43.3 | 33.3 |
| Spondylitis | 3.3 | 3.3 | 3.3 | 13.3 | 10.0 | - |
| Diabetes | - | 10.0 | 16.7 | 3.3 | 20.0 | 6.7 |
| Thyroid malfunction | - | 3.3 | 6.7 | 6.7 | 6.7 | 10.0 |
| Cardiac problem | - | 3.3 | 3.3 | 3.3 | 16.7 | 10.0 |
| Backache/body ache | 16.7 | 13.3 | 10.0 | 16.7 | 3.3 | 13.3 |
| Osteoporosis | 3.8 | 3.8 | - | 6.7 | 6.7 | 3.3 |

***Note:*** percentages do not add up to a total of 100 percent due to multiple responses. Only the most frequently reported ailments have been listed in the table. Several other ailments (35 in number) which the respondents reported, e.g. hernia, tuberculosis, skin disease, piles, etc., have not be presented because their percentages were negligible.

✓ **History of mental illness**

Figure 4.2 below reveals that most of the women (90.2 percent) with moderate depression did not have a history of mental illness in self, in their natal or marital family. Only 3.4 percent of women reported history of mental illness in self, while 4.6 percent reported the same in their natal family and 1.8 percent reported its presence in their marital family. These percentages throw light on the fact that depression for long has not been associated with mental illness. Its symptoms (e.g. lack of sleep or appetite or low moods) are considered to be a part of the aging process. Therefore depression largely remains unreported and untreated.

**Figure 4.2: History of mental illness in women with depression (n=180)**




**History of alcohol dependence**

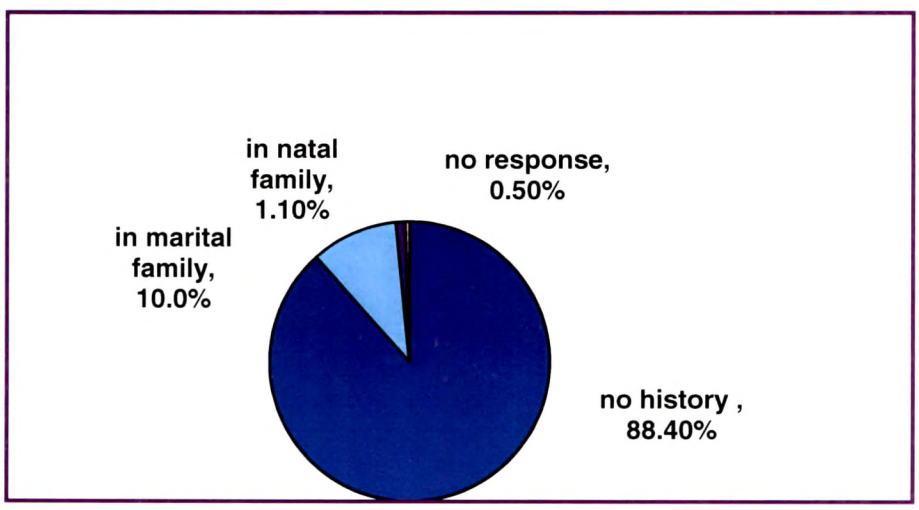
Figure 4.3 shows that majority of the women with moderate depression (88.4 percent) had not faced the problem of alcohol dependence in their homes (natal or marital). Ten percent of them had faced this problem in their marital family (alcohol dependence of the husband/ son/ in-laws), while only one percent had alcohol dependent member(s) in their natal family.

Family history of alcohol dependence was reported more by women in both low and high income group. Very few women in the middle income group reported the same (Table 4.1.4).

**Table 4.1.4: Family history of alcohol dependence in women with depression, belonging to age and income level**

| History of alcohol dependence | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| In natal family | 3.3 | 3.3 | - | - | - | - |
| In marital family | 20.0 | - | 10.0 | 10.0 | 3.3 | 16.7 |
| No history of addiction | 76.7 | 96.7 | 90.0 | 86.7 | 96.7 | 83.3 |
| No response | - | - | - | 3.3 | - | - |

**Figure 4.3: Family history of alcohol dependence in women with depression (n=180)**




Alcohol dependence of the spouse had been associated with poor quality of marital relationships and a frequent trigger of domestic violence – both of which cause mental distress and depression in women (Vankar, 2005; Mehetaliya, 2005).

Thus we can conclude that the data on the background characteristics of 180 women having moderate depression showed that majority of these women were belonging to middle income group, upper castes, were married and homemakers. Though nearly a one third of them were employed and 10 percent have retired. Arthritis and blood pressure were the two most frequently reported physical health problems followed by diabetes and body

ache. Most of the women with moderate depression did not had a history of mental illness in self, in their natal or marital family.

### 3) LIFESTYLE FACTORS

#### i. ACTIVITY PATTERN

Several reviews examining observational and intervention studies have assessed the relationship between physical activity and depression/depressive symptoms these reviews generally draw a similar conclusion: that physical activity is positively associated with reduced likelihood of depression or depressive symptoms. However, little is known about the specific components of physical activity that are important, particularly the dose, domain or social context of physical activity that might confer mental health benefits (Saxena S, Ommeren MV, 2005).

The data on activity pattern was collected using 24-hour recall method.Information on activity pattern included the time spent on physical, recreational/social and religious activities. The mean time spent on each of the above mentioned activities by all the subjects are presented in the table 4.1.5 below.

**Figure 4.1.4: Activity pattern of Adult & Older depressed women**

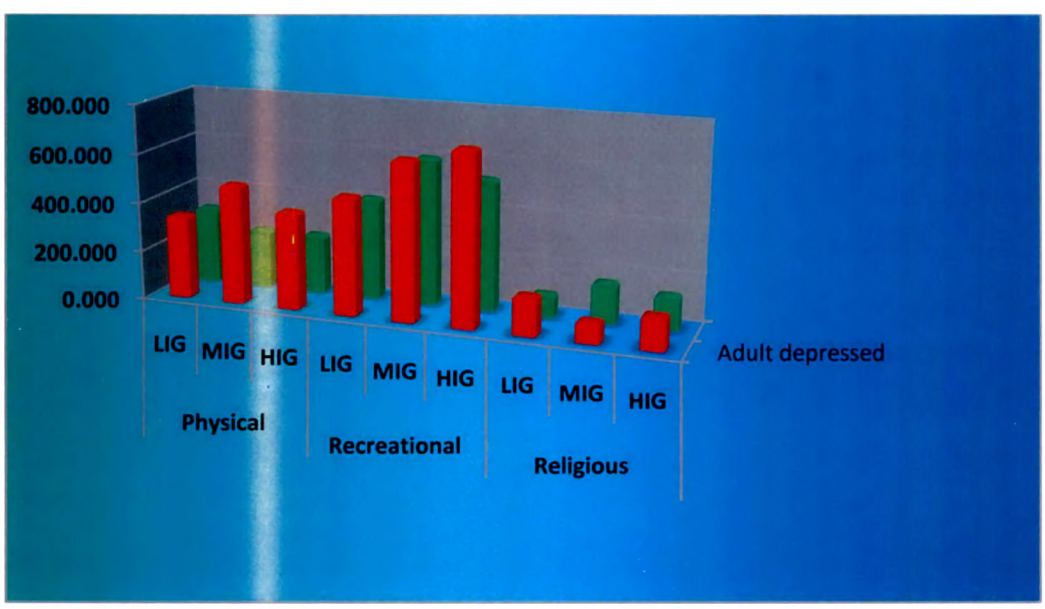


**Table 4.1.5: Mean time (in minutes) spent by women with moderate depression in a day for physical, recreational/social and religious activities, by age and income level**

| Type of activity | 40 – 60 yrs | | | >60 yrs | | | f ratio | *p. value |
|---|---|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | | |
| Physical | | | | | | | | |
| Mean | 344.50 | *489.47 | 400.83 | 316.67 | *243.33 | 243.33 | 3.1971 | .0051 |
| S.D. | 198.68 | 325.27 | 215.92 | 269.47 | 164.29 | 164.29 | | |
| Recreational / Social | | | | | | | | |
| Mean | 482.63 | 647.13 | 706.80 | 417.80 | 601.53 | 535.97 | 2.0341 | .0630 |
| S.D. | 383.59 | 386.43 | 482.90 | 447.43 | 438.26 | 412.80 | | |
| Religious | | | | | | | | |
| Mean | 158.43 | 86.17 | 135.83 | 93.47 | 165.67 | 139.43 | .6585 | .6832 |
| S.D. | 299.82 | 112.75 | 253.16 | 148.58 | 179.87 | 364.23 | | |

* Significant P ≤ 0.05 level

From the above table it can be depicted that most of the women from both the age groups were engaged in some or the other forms of the activities. The physical activities include: dusting, sweeping/mopping, laundry, cooking, other indoor and outdoor chores, child care, shopping, gardening, yoga, going for walks, sports, etc. Recreational or social activities include: listening to music, watching TV, reading, visiting theatre/exhibition, arts and crafts, chatting with friends and neighbors, visiting friends and relatives, attending any association, going to clubs, kitty party/ mahilamandal, etc. Religious activities include: visiting religious places, praying at home, reciting *mantras*, meditation, etc.

A Study done by Shah and Mehta (2006) on 150 elderly depressed women reported that as the age increases the physical activity was found to be decreased. With respect to activity of daily living it was found that subjects from 50-59 yrs were more indulged in activities of daily living whereas subjects from oldest group 70+ yrs spent more time in social/religious activities, sleep/rest and idle time.

Figures 4.1.4 above shows that in recreational/social activities and religious activities no two groups were significantly different at the (P<.05 level). There was a significant difference found between younger women (40-60 years) and older women (above 60 years) in the middle income group with regard to the time spent on physical activities in a day. The younger women in the middle

income group spend more time in physical activities in a day compared with the older women in the same group (489.47 minutes as compared to 243.33 minutes). The type of physical activity was different for women in the low income group and their counterparts in the high income group. Women in the high income group spent more time doing physical exercise, yoga, shopping, or sports, while women in the low income group spend more time in cleaning, cooking and doing other household chores. Mix types of physical activities were carried out by older depressed women in the middle income group. Also younger women in the high income group spent more time in recreational/social activities as compared to other groups, particularly those from low income group, though the difference was not significant. Physical activity may delay age-related neuron dysfunction and degeneration which causes cognitive decline and personality changes which are often linked to Alzheimer's Disease (Cotman, C. W. &Engesser-Cesar, C, 2002).

Physical activity has been found to enhance the self concept of women who are depressed. Social activities also reflect the support network of a person. It has been shown that social support and the availability of a confiding relationship can offset the negative effect of disability (Schoevers et al., 2000). Religious affiliation has generally been observed to have a protective effect on proneness to depression (Helm et al., 2000). Research studies indicate that majority of women spend a minimum of 6-10 hours every day on domestic tasks (Kanhare, 1987; Sriram, 1995). Shukul's (1994) study on a middle class sample showed that employed women had 14.1, hours of work, 0-6 hours of rest and 3.9 hours of leisure, whereas unemployed women had 8.4 hours of work, 8 hours of rest and 7.6 hours of leisure. Daftuar's (1996) reported women spending 8-10 hours on work, 2-4 hours on household jobs, less than three hours on children and less than one hour on themselves. Rural women spend about 8 hours on work, about three hours on self and childcare, 2-3 hours on indoor and outdoor household tasks and get to sleep not more than 6 hours.

In continuation further more information was obtained on whether the subjects were having any difficulty in carrying out their daily activity routine pattern

independently or they were dependants on the caretakers. Table 4.1.6 below represents the ability of women with depression to carry out daily activities independently.

**Table 4.1.6: Ability of women with depression to carry out daily activities independently**

| Whether independent in daily/personal activities | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| Yes | 83.3 | 86.7 | 80.0 | 86.7 | 76.7 | 63.3 |
| No | 16.7 | 13.3 | 20.0 | 13.3 | 23.3 | 36.7 |
| **Women who need help in** | **n=5** | **n=4** | **n=6** | **n=4** | **n=7** | **n=11** |
| Cooking/domestic work | - | 1 | 1 | - | 2 | 1 |
| Climbing stairs | 1 | - | - | 3 | 3 | 3 |
| Lifting heavy objects | 2 | - | - | 1 | 1 | - |
| Walking/ going out | - | 1 | - | - | - | - |
| Any other | - | - | - | - | - | 2 |
| No response | 2 | 2 | 5 | - | 1 | 5 |

Most of the women across all income groups and both the age groups were found to be independent in their daily activities as per table 4.1.6. A greater percentage of older women in the high and middle income groups were not independent in their daily activities as compared to their younger counterparts in the same income group, due to increasing age and number of physical health problems development. Moreover, 42.8 percent of the women were found to be suffering with arthritis.

Among those subjects who required help in their daily activities was (13.3 percent) in both age groups for domestic chores, (6.7 percent) of the younger depressed women and (40.9 percent) in the older age group required help for climbing stairs, which was mainly due to the fact that a significant number of women had complained for having arthritis. A small percentage of women, 13.3 percent in the younger age group and 9 percent in the older age group, needed help in lifting heavy objects.

Activity Reduces the Risk of Premature Mortality. In the year 2000 approximately 134,611 men and 89,756 women died prematurely from all-

causes in the United Kingdom (BHF,2004).Moderate to high levels of physical activity are associated with lower all-cause mortality rates for both older and younger adults. Compared with people who are most active, sedentary people experience between a 1.2-fold to a 2-fold increased risk of dying prematurely (WHO, 2002). Besides mortality being active in life promotes Psychological Well-Being. According to the Office of National Statistics (2000), mixed anxiety and depression is experienced by 9.2% of adults in Britain. This is followed by general anxiety at 4.7 % and depression (without the symptoms of anxiety) at 2.8%. Regular physical activity appears to relieve symptoms of depression and anxiety and improve mood and improved self-esteem.

**ii. ADDICTION PATTERN**

Poor mental health status leads to indulge a person into an addiction. Women who engage in unhealthy lifestyle practices tend to work against many treatment effects and delays time required for overcoming depressive episodes than healthier people. Negative lifestyle factors that can contribute to a depressive episode or drag one out include: Abusing drugs and alcohol, overwork, poor diet, including excess caffeine or sugar, chewing tobacco or gutka or smoking etc. The table 4.1.7 shows the addiction pattern of the depressed women belonging to two different age groups in terms of percentage of subjects.

Table 4.1.7 below indicates that despite of having a depression most of the women did not turn to any addictive substance. Among the few who had addictions were in the past which was not practiced again. There was a negligible percent (3.3 percent, i.e., only one woman) who consumed alcohol, cigarette, tobacco, snuff or tea and coffee at present. The consumption of these substances was reported only among younger women in the high income group and older women in the low income group. Though several women had consumed tea in the past, currently only one of them reported of consuming tea at present.

**Table 4.1.7: Addiction(s) in women with depression to various substances, by age and income level**

| Substance | | | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|---|---|
| | | | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | | | % | % | % | % | % | % |
| **1) Alcohol** | Yes | Past | - | - | 6.7 | 3.3 | 3.3 | 3.3 |
| | | Present | - | - | 3.3 | - | - | - |
| | No | | 100 | 100 | 90.0 | 96.7 | 96.7 | 96.7 |
| **2) Cigarette/Bidi** | Yes | Past | 3.3 | 3.3 | - | 3.3 | - | - |
| | | Present | - | - | 3.3 | - | - | - |
| | No | | 96.7 | 96.7 | 96.7 | 96.7 | 100 | 100 |
| **3) Tobacco Powder** | Yes | Past | 3.3 | - | - | 6.7 | - | - |
| | | Present | - | - | 3.3 | 3.3. | - | - |
| | No | | 96.7 | 100 | 96.7 | 90.0 | 100 | 100 |
| **4) Tobacco Paste** | Yes | Past | 3.3 | 3.3 | - | 6.7 | - | - |
| | | Present | - | - | 3.3 | 3.3 | - | - |
| | No | | 96.7 | 96.7 | 96.7 | 90.0 | 100 | 100 |
| **5) Snuff** | Yes | Past | 13.3 | - | - | 3.3 | 3.3 | 6.7 |
| | | Present | - | - | 3.3 | - | - | - |
| | No | | 86.7 | 100 | 96.7 | 96.7 | 96.7 | 93.3 |
| **6) Coffee** | Yes | Past | 10.0 | - | 3.3 | - | 6.7 | - |
| | | Present | - | - | 3.3 | - | - | - |
| | No | | 90.0 | 100 | 93.4 | 100 | 93.3 | 100 |
| **7) Tea** | Yes | Past | 23.3 | 36.7 | 23.3 | 23.3 | 40.0 | 6.7 |
| | | Present | - | - | 3.3 | - | - | - |
| | No | | 76.7 | 63.3 | 73.3 | 76.7 | 60.0 | 93.3 |

The findings indicated that women did not turn to any addictions though faced with stressors or traumas in life but tend to ruminate over their problems (This is a different reaction from men who try to react to emotional distress by not thinking about it or turning to substance abuse) thereby increases the likelihood of their developing depression.

## 4) DIET RELATED ASPECTS AND DIETARY INTAKE

Depression does not have a single causative factor, but is caused by several factors, which may be genetic, biochemical, psychological, health related nutritional and environmental factor. Depression may be caused by any one or a combination of all these factors. Nutrition, however, can play a key role, both in the onset, severity, and duration of depression.

In addition to the total180 moderately depressed women under study,20 non depressed women above 60 years of age from the middle-income group were selected as controls. These women were selected from among those who were classified as non-depressed, i.e., had a score of 0-2 points on the BDI scale during the screening. The findings from the interviews with these 20 women have been used primarily for the purpose of comparing the nutritional status of depressed and non-depressed women.

Results of detailed information on diet survey, nutritional status and morbidity profile of adult and older depressed women and non-depressed are presented below:

**a. General dietary aspects**

i. Water intake
ii. Meal pattern
iii. Fasting practices
iv. Skipping meals
v. Special health foods
vi. Craving for special food
vii. Reduction in food consumption
viii. Changes in food consumption pattern
ix. Food causing allergy
x. Food preference

In our current society, there are many factors that can cause or contribute to depression. Food is another major factor that greatly affects one's behavior as many nutrients are involved in brain function and hormone function. It is

unnoticed and most of the populations are unaware about their food habits, which upsets mental health. This section covers all aspects related to food habits, lifestyle, and meal pattern causing depression directly, which greatly influence an individual behaviour.

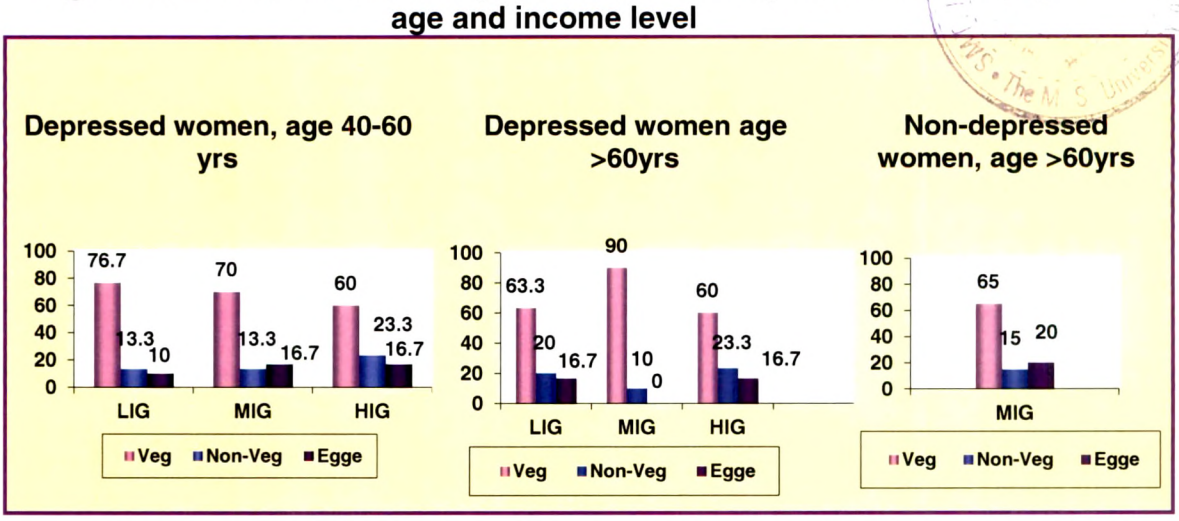
As mentioned above, the dietary intake of the depressed and non-depressed women was assessed through a diet survey which included questions on general dietary aspects such as: water intake, meal pattern, fasting practices, skipping meals, intake of special health foods, craving for special food, reduction in food consumption, changes in food consumption pattern, food causing allergy, and food preference.

The nutrient intake of the women was assessed through 24-hour dietary recall method and frequency of consumption of foods, using the food frequency questionnaire.

**A. GENERAL DIETARY ASPECTS**

As can be observed from figure 4.5, majority of the women with depression in the 40-60 years as well as the 60 years and above age group were vegetarians. The percentage of vegetarians was highest among middle income women above 60 years of age (90 percent). The percentages of non-vegetarians and eggetarians were relatively higher among women in the high income group in both age groups. A comparison between middle income women in the depressed and non-depressed group showed that the percentage of vegetarians was much higher among depressed women (90 percent) as compared to those in the non-depressed group (65 percent).

**Figure 4.5: Food choices of depressed and non-depressed women, by age and income level**




**1. Water intake:** Recommendation for at least 10-12 glasses of water consumption in a day should be practiced. According to more recent guidelines, the recommended amount of water intake for adults aged 51 years and above is 3.7 liters per day for men and 2.7 liters per day for women with moderate physical activity (Dietary Reference Intake, Washington 2004). However, conservative estimate for older adults is that daily intake of fluid should not be less than 1.6 liters per day in order to ensure hydration (Hodgkison et al., 2003).

Food contains an abundance of toxins, which both increases your need for nutrients and destroys nutrients that have been consumed. Drinking water also contains many toxins, which have the same impact on nutritional needs. Table 4.1.8 below presents information on actual water consumption among two depressed and above 60 yrs non-depressed group.

**Table 4.1.8: Daily water intake of depressed and non-depressed women, belonging to age and income group**

| Quantity No. of glasses | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | > 60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| 1-5 | **10.0** | **10.0** | 6.7 | 13.3 | **16.7** | 6.7 | - |
| 6-10 | **73.0** | 46.7 | 56.7 | 53.3 | **63.3** | 56.7 | 5.0 |
| >10 | 10.0 | 30.0 | **36.7** | 23.3 | 20.0 | **33.3** | 20.0 |
| Don't know | 6.7 | 13.3 | - | 10.0 | - | 3.3 | **75.0** |

It can be observed from the above table, majority of the women across all age and income groups did not consume the recommended amount of water, i.e. at least 10 to 12 glasses, every day. Majority of the low income women (73 percent) aged 40-60 years consumed between 6 and 10 glasses of water as compared with only 53.3 percent of women age 60 years and above in the same income group. Two thirds (63.3 percent) of middle income women above 60 years of age consumed 6 to 10 glasses of water as compared to only (46.7 percent) of women aged 40-60 years in the same income group. Overall, consumption of the recommended quantity of water was reported more among high income women in both age groups (36.7 percent in 40-60 age group; 33.3 percent in the above 60 age group).

Whereas, as high as (75 percent) of the non-depressed women aged 60 years and above could not provide any information on their actual consumption of water in a day. Rest (20 percent) of them reported consuming more than 10 glasses of water in a day. Non-depressed women had better water consumption compared to their depressed counterparts. Similar study was conducted by Benton, et al (1997). Among fifty depressed and non-depressed women from Boston. The findings revealed that depressed women had much lower water consumption (300ml per day) as compared to non-depressed women (2272 ml per day).

Mainly the reasons for low consumption of water cited by depressed women aged 40-60 years were: 'no thirst', 'engaged in work so forget', 'low mood', 'laziness', 'lost interest' and 'no time'. As per elderly women physical disability and immobility due to advancing age were reasons for consuming less water. Similar findings were obtained by Mehta and Ray (2005) from their study to assess fluid intake, thirst pattern and urine excretion pattern in adult and elderly women, study reported that majority of the women consumed only about 6 glasses of water per day. Also, the most common reasons for limiting fluid intake was 'laziness', 'limited mobility', 'workload' and 'forgetfulness' in drinking water.

Thus overall, the water intake of women was less than the recommended amount of 10-12 glasses per day. Reasons such as 'engaged in work so forget' and 'no time' clearly indicate that women tend to neglect their own needs in fulfilling the demands of their families. Further, elderly women having limited mobility had low intake of water mainly as they were dependent on their caregivers for drinking water and decreasing the water intake was also to reduce the frequency of urination.

**2. Meal Pattern:** The influence of food on mood is related to one's attitudes towards particular foods, in addition to the oro-sensory, predigest and post absorptive actions of dietary constituents. The lifestyle of an individual greatly influences his or her health expectations. Any changes in the proposed mechanisms of eating and food choice are motivational differences (reduced concern about weight control), physiological (reduced appetite caused by the process associated with stress) and practical changes in eating opportunities, food availability and meal preparation all this leads to depression.

Table 4.1.9 below shows the meal pattern of depressed and non-depressed women across age and income group. As can be observed from the table, majority of the depressed women from both the age groups had fair meal pattern of lunch and dinner (80-100 percent). The habit of regular breakfast was reported more by women in the middle and high income groups in both age groups of depressed women. Also, intake of any other meal, i.e., mostly

evening snacks was reported by a higher percentage of younger depressed women from high income group (42.9).

**Table 4.1.9: Meal pattern of depressed and non-depressed women, by age and income group**

| Meals | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **Breakfast** | | | | | | | |
| a. Always | 33.3 | 51.7 | 75.9 | 33.3 | 55.2 | 50.0 | 50.0 |
| b. Sometimes | 26.7 | 24.1 | 6.9 | 50.0 | 17.2 | 40.0 | 45.0 |
| c. Never | 40.0 | 24.1 | 17.2 | 16.7 | 27.6 | 10.0 | 5.0 |
| **Lunch** | | | | | | | |
| a. Always | 100 | 93.3 | 100 | 100 | 89.7 | 100 | 100 |
| b. Sometimes | - | 6.7 | - | - | 6.9 | - | - |
| c. Never | - | - | - | - | 3.4 | - | - |
| **Dinner** | | | | | | | |
| a. Always | 86.2 | 96.7 | 96.6 | 73.3 | 86.2 | 80.0 | 94.7 |
| b. Sometimes | 13.8 | 3.3 | 3.4 | 26.7 | 6.9 | 20.0 | 5.3 |
| c. Never | - | - | - | - | 6.9 | - | - |
| **Any other** | | | | | | | |
| a. Always | 21.4 | 25.0 | 42.9 | - | 29.4 | 16.7 | 64.7 |
| b. Sometimes | 50.0 | 33.3 | 21.4 | 81.8 | 52.9 | 58.3 | 23.5 |
| c. Never | 28.6 | 41.7 | 35.7 | 18.2 | 17.7 | 25.0 | 11.8 |

Overall, table indicated that low income women did not follow the typical three-meal pattern. Majority of the low income women in the younger age group did not take breakfast, or any other meal, such as evening snacks, and some of them did not take dinner (13.8 percent) because they could not afford more meals in a day, had large families, or were not aware of the importance of following the three-meal pattern. A similar meal pattern was followed by low income women above 60 years of age as one-fourth of them (26.7 percent) did not take dinner regularly, probably due to health problems related to aging.

Only (5 percent) of the non-depressed women did not take regular breakfast or sometimes dinner along with substantial percentage of these women opt for evening snacks (64.7 percent) regularly. On comparison of following meal patterns, amongst middle income women over 60 years of age in both the depressed and non-depressed groups showed that non-depressed women had more regular meal pattern than their counterparts

**3. Fasting Practices:** Table 4.1.10 presents the fasting practices followed by depressed and non-depressed women. As can be observed from the table, among women with depression, fasting practices are followed more by older depressed women compared to their counterparts. Among younger depressed women (50 percent) of the women from middle income group, (43.3 percent) from high income group practiced fast more often as compared to women from the low income group (39.3 percent). Comparatively more of the older depressed women (63.3 percent) was fasting compared to non-depressed women (40 percent) only.

Mainly reasons cited for fasting by women were physiological changes due to age, health problems and inclination towards religion and rituals. Due to the declining capacity to digest, experience of digestive disorders and other health problems like diabetes, hypertension, and cardiac problems women tend to reduce their food intake and prefer fasting. Women fast to practice austerity due to increased inclination towards religion and advancing age. It was also observed that besides the above reasons, lack of choices in matters of food (their family did not take into consideration their choice of food), dependence on family members for food, loss of interest in food or development of aversion, loss of appetite and forgetfulness (sometimes women sit in prayer or other activities and forget to eat food on time and counted it as fast) were main reasons given by older depressed women for fasting. For younger depressed women, the reasons for fasting were mainly busy schedule of housework and being alone at home (no one at home to give company), due to which they either did not had time or dint feel like cooking and preferred to fast.

**Table 4.1.10: Fasting practices followed by depressed and non-depressed women, belonging to age and income level**

| Fasting | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG N=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **Whether women fast** | | | | | | | |
| Yes | 39.3 | 50.0 | 43.3 | 60.0 | 63.3 | 63.3 | 40.0 |
| No | 60.7 | 50.0 | 56.7 | 40.0 | 36.7 | 36.7 | 60.0 |
| **Frequency of fasting** | | | | | | | |
| Once in week | 18.2 | 26.7 | 36.4 | 47.1 | 26.3 | 27.8 | 25.0 |
| More than twice a week | 45.5 | 40.0 | 27.2 | 23.5 | 15.8 | 38.9 | 50.0 |
| Once in month | 27.3 | 26.7 | 36.4 | 17.6 | 52.6 | 27.8 | 25.0 |
| Twice in year | 9.0 | 6.6 | - | 11.8 | 5.3 | 5.5 | - |
| **Meal pattern during fasting** | | | | | | | |
| a. Cereals | 30.0 | 13.3 | 16.7 | 50.0 | 33.3 | 33.3 | 50.0 |
| b. Non- cereals | 20.0 | 20.0 | - | 44.4 | 27.8 | 27.8 | - |
| c. Pulses/dals | 20.0 | 26.7 | 8.3 | 33.3 | 26.3 | 16.7 | 25.0 |
| d. Green leafy vegetables | 30.0 | 53.3 | 25.0 | 44.4 | 36.8 | 33.3 | 75.0 |
| e. Other vegetables | 20.0 | 33.3 | - | 33.3 | 31.6 | 22.2 | 87.5`` |
| f. Roots & tubers | 40.0 | 80.0 | 50.0 | 61.1 | 33.3 | 77.8 | 100 |
| g. Milk & products | 60.0 | 73.3 | 58.3 | 61.1 | 63.2 | 88.9 | 87.5 |
| h. Fruits | 50.0 | 93.3 | 75.0 | 66.7 | 84.2 | 83.3 | 100 |
| i. Sweets | 22.2 | 46.7 | 50.0 | 16.7 | 10.5 | 33.3 | 62.5 |
| j. Dry fruits | - | 26.7 | 8.3 | 5.6 | 15.8 | 16.7 | 37.5 |
| k. Any other | - | - | - | - | - | 7.1 | - |

With respect to frequency of fasting among depressed women in the age group of 40-60 years, low and middle income women fast more frequently, i.e. more than twice a week (40-46 percent), while (36.4 percent) from high income women fast once in a week. Among depressed women above 60 years of age, frequency of fasting once a week was highest among low income women (47.1 percent), while frequency of fasting more than twice a week was highest among high income women (38.9 percent). A comparison between non-depressed and depressed middle income women aged 60 years and above showed that non-depressed women tend to fast more frequently

(50.5 percent) i.e. more than twice a week, than depressed women, even though a lesser percentage of non-depressed women follow fasting practices.

With regard to meal pattern during fasting, amongst depressed women of both age groups, majority of them showed higher preference for roots and tubers, milk and milk products and fruits. They preferred eating dry fruits, sweets and pulses the least. The consumption of roots and tubers were highest (80 percent) amongst younger depressed women compared to only (33.3 percent) by the older depressed subjects. The reasons cited by the lower consumption by the older subjects were the digestion problems which could lead to flatulence, constipation and indigestion.

Intake of cereals (50 percent), pulses (33.3 percent) and (44.4 percent) of non-cereals and green leafy vegetables were higher among low income women above 60 years of age, indicating that they may be taking a onetime meal when they fast.

A comparison between meal pattern of depressed and non-depressed women showed that 75 to 87 percent of the non-depressed women consumed green leafy and other vegetables and majority of them consumed roots and tubers and fruits, while depressed women consumed mostly fruits (84.2 percent) and milk and milk products (63.2 percent).

**4. Skipping Meals:** Women were asked if they skipped meals, other than fasting. As can be observed from table 4.1.11 below, about half of the low income women age 40-60 years and as high as 60-68 percent of low income women above 60 years of age are in the habit of skipping breakfast, lunch and dinner, while women in the middle and high income groups were less likely to skip meals. Middle and high income women in the younger age group, i.e. 40-60 years skip breakfast more than lunch or dinner, while older women in the same income groups skip lunch and dinner.

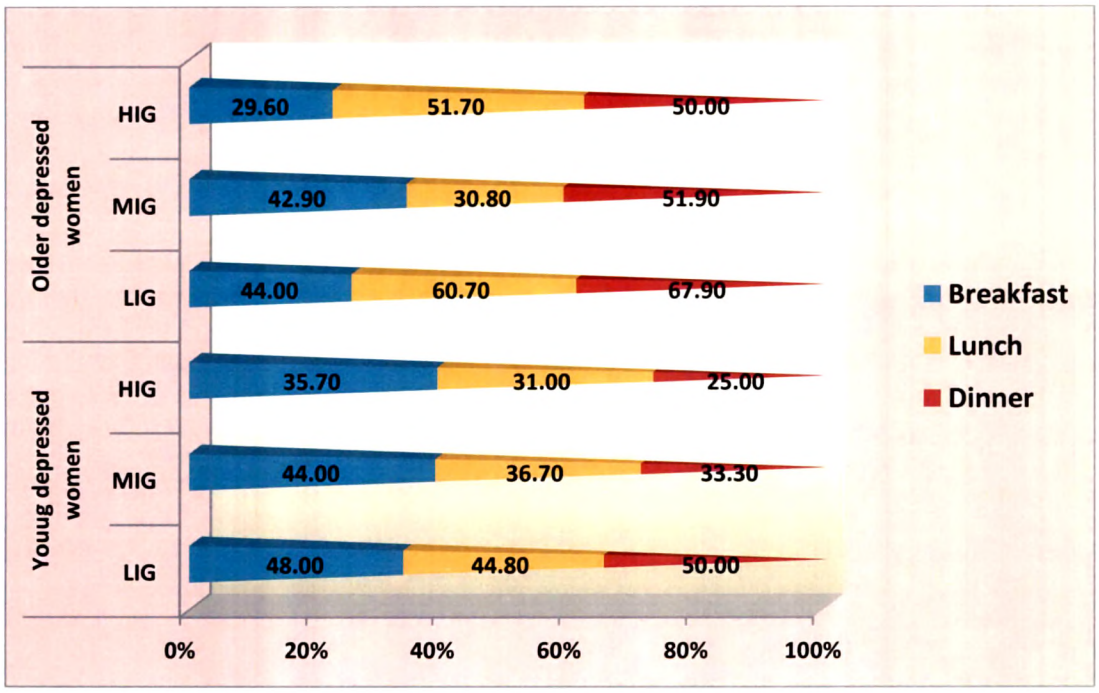
**Table 4.1.11: Skipping of meals by depressed and non-depressed women, by age and income level**

| Meal skipped | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| Breakfast | 48.0 | 44.0 | 35.7 | 44.0 | 42.9 | 29.6 | 10 |
| Lunch | 44.8 | 36.7 | 31.0 | 60.7 | 30.8 | 51.7 | - |
| Dinner | 50.0 | 33.3 | 25.0 | 67.9 | 51.9 | 50.0 | - |

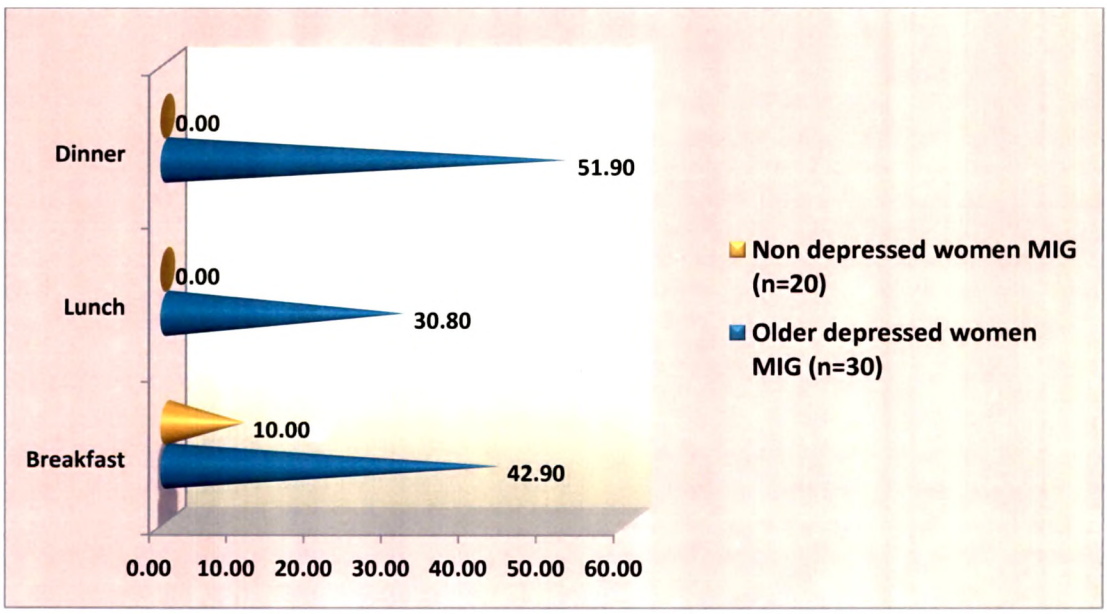
As can be observed from figure 4.6 a & b below, majority of the non-depressed women did not skip meals, only 10 percent of them were found to skipped breakfast. The reasons for skipping meals by depressed women were: busy schedule (completing household chores), low mood, digestive disorders or other complaints like headache, body ache and many others. Lower income women mentioned that inability to afford more meals or unavailability of food as the main reasons for skipping meals. It was also observed that feeling of isolation or loneliness, fatigue, resulting in lack of interest in preparing meals and undesirable or unfavorable environment in the family were also responsible for skipping meals by younger depressed women. Among older depressed women, the reasons for skipping meals were: lack of support from the family, quarrels, arguments and conflicts in the family, lack of choices in matters of food cooked, physical disability or locomotor complaints impeding ability to prepare meals, financial dependence on other family members, and austerity practices on account of widowhood.

**Figure 4.6 (a&b): - Percentage of women skipping meals in Depressed group and Non-depressed subjects.**

**a) Depressed group as per income group.**




**b) Depressed and non-depressed group.**




Overall it was observed that depressed women were irregular in taking breakfast. Burns (2002) reported that eating breakfast regularly improves performance and leads to a more positive mood, better memory and feelings

of calmness. Further researchers compared three studies involving breakfast, memory function and blood glucose levels and concluded that "Eating breakfast benefits memory". They found that a high blood glucose level after eating breakfast was one of the key factors for the improvement in mental performance, particularly the speed of recalling new information. Preliminary results in small groups suggest that omitting breakfast and dinner negatively affects cognitive functioning, and that afternoon snacks may improve cognitive performance.

However, it is important to note there are a number of variables, which had not been measured adequately, which can interact with the effects of food intake on subsequent tasks (Austin, 2000).

The benefits of practicing three-meal pattern have been established by another study conducted among French women. The findings revealed that women did not put on weight as they were taking three meals a day. Skipping meals tends to cut calories, which further evoke a primal "fear of hunger response" that causes overeating later. It also affects the brain functioning mechanism deteriorating the overall appearance (Kartz, 2004).

Information on consumption of special health foods was assessed in order to find whether they were undergoing any treatments or using different kind of medications for any ailments. The data obtained is mentioned below.

**5. Special Health Foods:** Women were asked if they were consuming any special health foods either as food supplements or as remedy for ailments. As it can be observed from table 4.1.12 below, among depressed women aged 40-60 years, consumption of special health foods was highest in the high income group (62.1 percent), and lowest in the low income group (16.7 percent). Similarly in depressed women aged 60 years and above, intake was much lower in women from the middle income group (35.7 percent) compared to their younger counterparts in the (44.4 percent). On other hand the intake

of special health foods was much higher amongst non-depressed women (55 percent) compared to their depressed counterparts (35.7 percent).

**Table 4.1.12: Consumption of special health foods belonging to depressed and non-depressed women by age and income level**

| Whether special health foods are consumed | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| Yes | 16.7 | 44.4 | 62.1 | 30.0 | 35.7 | 56.7 | 55.0 |
| No | 83.3 | 55.6 | 37.9 | 70.0 | 64.3 | 43.3 | 45.0 |

The type of special health foods consumed by women were mainly multivitamin tablets, as reported by 42 to 54 percent of depressed women in the 40–60 years of age group, and intake of ayurvedic supplements as reported by 30 to 78 percent of depressed women above 60 years of age. While hardly any women consumed items like herbs or medicines. Depressed women also reported that they used commonly available cooking ingredients as kitchen or home remedies for different ailments. For example they used garlic to control cholesterol levels, blood pressure, *methi* (fenugreek) seeds for arthritis and diabetes, ginger for respiratory problems, asofoetida for gastric troubles, clove for toothaches, and turmeric for cough.

Half of the non-depressed women were found to have special health foods for different ailments and avoid heavy medications compared to their depressed counterparts where only (35.7 percent) of them were taking the same.

The main reasons for not consuming any special health foods were that many of these women considered decline in their physical health and fitness as a natural part of the process of aging, therefore did not consume any special health foods or medicines. Also other reasons such as lack of family support, care and attention were mentioned for non-consumption. Low income depressed women did not consume any special health foods due to financial constrain.

From various studies it has been found that possibilities of cravings are mostly observed, as minds are always preoccupied in different world by which productivity levels are reduced, lethargy and unbalanced sleep are major symptoms which leads to develop craving in depression.

**6. Craving for Special foods:** Serotonin is responsible for the calmness and relaxation states with a general sense of well-being. High levels of serotonin can cause a person to feel sluggish and drowsy. Low levels of serotonin will cause intense food cravings. Serotonin is released in the brain as a result of eating carbohydrates for e.g. foods such as fruits, bread and grains. In depression a person resorts to consistent eating, which results in excessive weight gain. The reason behind this is supposed to be consumption of carbohydrates, which stimulates serotonin production and eases out the state of depression. Thus, eating them is an attempt to self-medicate for depression. This results in craving of sugary foods and chocolate, which raise the serotonin level in the body considerably.

Women more commonly reported food cravings than do men, and depressed mood appears to influence the severity of these cravings. Food cravings are more common in the premenstrual phase, a time when total food intake increases and a parallel change occur in the basal metabolic rate. However, studies do not consistently show that carbohydrate-rich foods, thought to alleviate depressed mood, are preferentially chosen at this time. Restrained eaters, who suffer from premenstrual mood changes, are particularly prone to food cravings.

In the present study, women were asked whether they had any special craving for certain types of food. Table 4.1.13 presents the responses of women. As it can be observed from the table, craving for certain foods was most frequently reported by middle income women in the 40-60 age group (71.4 percent), followed by high income women (66.7 percent) in the same age group. Even among low income depressed women, craving for certain

food items were reported by a substantial percentage of women in both age groups (40-47 percent).

Craving for food items was reported less by non-depressed women (20 percent) than by depressed women (51.7 percent). This could be attributed to more regular meal pattern, better care of health needs among non-depressed women.

**Table 4.1.13: Craving for food items in depressed and non-depressed women, belonging to age and income group**

| Whether women crave for any foods items | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| Yes | 46.7 | 71.4 | 66.7 | 40.0 | 51.7 | 50.0 | 20.0 |
| No | 53.3 | 28.6 | 33.3 | 60.0 | 48.3 | 50.0 | 80.0 |

Overall most of the women with depression in both age groups had craving for foods like sweets, salty and crispy food items, and chocolates. When probed further, women reported that they experienced cravings for such foods when they felt lonely, neglected, or if they had skipped meals, or they had lost interest in other foods after menopause.

A Study conducted by Stuart (1999) on 300 nurses was canvassed by questionnaire concerning food cravings, menstrual periods, and depression. The results confirmed the initial impression and demonstrated associations between (1) craving for food and sweets and premenstrual tension, (2) craving at specific times (i.e. during menstrual periods or depression) and the occurrence of premenstrual fluid retention, and (3) the desire to eat compulsively and the tendency to be depressed more frequently. Further author strongly put forward the suggestion that there may be a common physiologic basis for the food cravings, the premenstrual fluid retention, and some recurrent depressions.

**7. Reduction in Food Consumption:** Dietary habits are a major aspect of people's lifestyles that influence health, morbidity, and mortality for a range of conditions. Hence, patterns of food consumption and their relation to mental health have received some attention in research. Reduction of food intake due to loss of appetite, low mood, and other psychological reasons has been associated with depression. To see whether women's depressed state had any effect on their food intake, in the present study, women were asked whether there has been any reduction in food consumption as compared to the past few years due to any of the reasons such as lost appetite, no mood, development of aversion or dislike or any other reasons. Table 4.1.14 presents the responses of women. As can be observed in the table, reduction in food consumption due to any of the above reasons was higher among low income women in the age groups of 40-60 years and above 60 years, with 80 to 87 percent. For low income women, besides loss of appetite and low mood, inability to afford food of their choice, no choice in the matter of what to eat were reasons for reduction in food consumption. Besides low income women, reduction of food consumption due to lost appetite and low mood was highly reported by high income depressed women, particularly those above 60 years of age (83 percent). Nearly two-thirds of middle income younger and older depressed women reported reduction in food consumption due to lost appetite, low mood and aversion to food were also reported by 38-53 percent of the women.

**Table 4.1.14: Reduction in food consumption as compared to past few years of depressed and Non-depressed subjects.**

| Reasons | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| Lost appetite | 86.7 | 60.0 | 66.7 | 86.7 | 60.0 | 83.3 | 25.0 |
| No mood | 86.7 | 53.3 | 63.3 | 86.7 | 37.9 | 83.3 | - |
| Developed aversion/ dislike | 58.6 | 44.8 | 46.7 | 75.0 | 50.0 | 63.3 | 10.0 |
| Any other | 80.0 | 100 | 100 | 87.5 | 22.2 | 87.5 | 50.0 |

It is interesting to observe that majority of the women (80-100 percent), except older depressed women from middle income stated other reasons such as isolation, loneliness, unpleasant situation/environment at home, lack of family support, loss of interest in cooking, lack of choice in what to eat, dominance of spouse/in-laws, etc., for the reduction in their food consumption.

In contrast, only one-fourth of the non-depressed women reported reduction in food consumption due to lost appetite and an even lesser percentage reported reduction due to development of aversion or dislike. As a matter of fact, half of the women stated other reasons such as advancing age, health consciousness, fasting, illness and major health problems, etc. for reducing their food consumption. Clearly, women who were non-depressed reduced their food intake due to health related reasons rather than psychological or social reasons as mentioned by women who were depressed. Reduction in food consumption due to loss of appetite and low mood was reported by a much higher percentage of subjects in depressed group(72% and 70% respectively) as compared to the non-depressed group where only 38% of subjects showed reduction in food intake due to loss of appetite and 20% due to low mood in a study carried out by Patil and Chauhan(2007) on 120 elderly subjects.

**8. Changes in Food Consumption Pattern since 5-10 years:** Besides reduction in food consumption women were asked whether they had made any changes in the consumption of food over the past 5- 10 years. They were also asked to specify whether they had completely stopped, or decreased or increased the intake of foods read out to them. Table below presents the responses of women.

**Table 4.1.15: Changes made in food consumption pattern belonging to depressed and non-depressed women, by age and income level**

| Whether changes have been made | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| 1. Yes | 100 | 91.3 | 100 | 88.0 | 100 | 100 | 47.4 |
| 2. No | - | 8.7 | - | - | - | - | 52.6 |
| If yes: | | | | | | | |
| **Cereals & cereal Products** | | | | | | | |
| a. Stopped | - | 3.4 | - | - | 6.7 | - | - |
| b. Decreased | 44.8 | 24.1 | 30.0 | 74.1 | 20.0 | 60.0 | - |
| c. Increased | 3.4 | 10.3 | 6.7 | 3.7 | 3.3 | 6.7 | 44.4 |
| d. No Change | 51.7 | 62.1 | 63.3 | 22.2 | 70.0 | 33.3 | 55.6 |
| **Pulses/ Dals** | | | | | | | |
| a. Stopped | 3.4 | - | - | 14.8 | - | 16.7 | - |
| b. Decreased | 44.8 | 27.6 | 40.0 | 55.6 | 36.7 | 46.7 | 11.1 |
| c. Increased | - | 3.4 | 16.7 | 7.4 | 6.7 | 10.0 | 55.6 |
| d. No Change | 51.7 | 69.0 | 43.3 | 22.2 | 56.7 | 26.7 | 33.3 |
| **Milk & its products** | | | | | | | |
| a. Stopped | 7.1 | 3.4 | 3.3 | 11.1 | 6.7 | - | - |
| b. Decreased | 42.9 | 31.0 | 33.3 | 66.7 | 23.3 | 56.6 | 11.1 |
| c. Increased | 14.3 | 17.2 | 16.7 | 3.7 | 33.3 | 20.7 | 66.7 |
| d. No Change | 35.7 | 48.3 | 46.7 | 18.5 | 36.7 | 20.7 | 22.2 |
| **Non-veg foods** | | | | | | | |
| a. Stopped | 50.0 | 50.0 | 22.2 | 33.3 | 78.6 | 11.1 | - |
| b. Decreased | 12.5 | 12.5 | 22.2 | 44.4 | 7.1 | 33.3 | - |
| c. Increased | - | - | 22.2 | - | - | - | - |
| d. No Change | 37.5 | 37.5 | 33.4 | 22.2 | 14.3 | 55.6 | - |
| **Fried foods** | | | | | | | |
| a. Stopped | - | - | - | 7.4 | 3.4 | 6.7 | - |
| b. Decreased | 62.1 | 59.3 | 66.7 | 66.7 | 69.0 | 73.3 | 55.6 |
| c. Increased | - | 11.1 | - | 3.7 | 3.4 | 6.7 | 22.2 |
| d. No Change | 37.9 | 29.6 | 33.3 | 22.2 | 24.1 | 13.3 | 22.2 |
| **Ghee** | | | | | | | |
| a. Stopped | 17.9 | - | - | 3.7 | 13.3 | 10.0 | - |
| b. Decreased | 50.0 | 46.4 | 33.3 | 70.4 | 40.0 | 63.3 | 55.6 |
| c. Increased | - | 10.7 | - | 3.7 | 3.3 | 6.7 | 22.2 |
| d. No Change | 32.1 | 42.9 | 66.7 | 22.2 | 43.3 | 20.0 | 22.2 |
| **Masalas** | | | | | | | |
| a. Stopped | 6.9 | - | - | 7.4 | 6.7 | 10.0 | - |
| b. Decreased | 44.8 | 48.3 | 34.5 | 63.0 | 56.7 | 63.3 | 44.4 |
| c. Increased | - | 3.4 | - | 3.7 | 3.3 | 6.7 | 22.2 |
| d. No Change | 48.3 | 48.3 | 65.5 | 25.9 | 33.3 | 20.0 | 33.3 |

| Whether changes have been made | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **Pickles** | | | | | | | |
| a. Stopped | 20.7 | 3.4 | 13.3 | 29.6 | 13.3 | 10.0 | - |
| b. Decreased | 48.3 | 48.3 | 40.0 | 51.9 | 63.3 | 66.7 | 55.6 |
| c. Increased | - | 6.9 | 3.3 | 3.7 | - | 6.7 | 11.1 |
| d. No Change | 31.0 | 41.4 | 43.3 | 14.8 | 23.3 | 16.7 | 33.3 |
| **Sweet foods** | | | | | | | |
| a. Stopped | 13.8 | 3.4 | 3.3 | 3.7 | 13.8 | 3.3 | - |
| b. Decreased | 37.9 | 34.5 | 50. | 74.1 | 48.3 | 70.0 | 55.6 |
| c. Increased | - | 17.2 | 3.3 | 3.7 | 3.4 | - | - |
| d. No Change | 48.3 | 44.8 | 43.3 | 18.5 | 34.5 | 26.7 | 44.4 |
| **Sugar** | | | | | | | |
| a. Stopped | 10.0 | - | 6.9 | 3.7 | 13.3 | 3.3 | - |
| b. Decreased | 40.0 | 35.7 | 41.4 | 74.1 | 46.7 | 70.0 | 55.6 |
| c. Increased | - | 10.7 | 3.4 | 3.7 | 3.3 | 3.3 | - |
| d. No Change | 50.0 | 53.6 | 48.3 | 18.5 | 36.7 | 23.3 | 44.4 |
| **Vegetables** | | | | | | | |
| a. Stopped | - | - | 3.6 | - | 3.3 | | - |
| b. Decreased | 34.5 | 10.3 | 17.9 | 66.7 | 23.3 | - | - |
| c. Increased | - | 20.7 | 17.9 | 3.7 | 6.7 | 20.7 | 55.6 |
| d. No Change | 65.5 | 69.0 | 60.7 | 29.6 | 66.7 | 34.5 | 44.4 |
| **Green leafy vegetables** | | | | | | | |
| a. Stopped | - | - | 3.4 | 3.7 | 3.3 | 3.3 | - |
| b. Decreased | 34.5 | 13.8 | 17.2 | 66.7 | 23.3 | 30.0 | 11.1 |
| c. Increased | 3.4 | 17.2 | 20.7 | 3.7 | 6.7 | 36.7 | 55.6 |
| d. No Change | 62.1 | 69.0 | 58.6 | 25.9 | 66.7 | 30.0 | 33.3 |
| **Vitamin C rich fruits** | | | | | | | |
| a. Stopped | 11.1 | - | 3.4 | 19.2 | 6.9 | 3.4 | - |
| b. Decreased | 44.4 | 35.7 | 13.8 | 65.4 | 44.8 | 31.0 | 11.1 |
| c. Increased | 3.7 | 3.6 | 13.8 | 3.8 | 6.9 | 34.5 | 55.6 |
| d. No Change | 40.7 | 60.7 | 69.0 | 11.5 | 41.4 | 31.0 | 33.3 |
| **Other fruits** | | | | | | | |
| a. Stopped | 5.6 | - | 5.3 | 9.1 | 5.3 | - | - |
| b. Decreased | 50.0 | 50.0 | 10.5 | 77.3 | 52.6 | 47.8 | 12.5 |
| c. Increased | 5.6 | - | 15.8 | 4.5 | 10.5 | 30.4 | 62.5 |
| d. No Change | 38.9 | 50.0 | 68.4 | 9.1 | 31.6 | 21.7 | 25.0 |

As evident from the table, nearly 80-100 percent of the women with depression across age and income groups had made changes in their food consumption in the past 5-10 years.

Between 48 to 52 percent of adult depressed women showed no change in consumption of cereals, pulses, *masalas*, sweet and sugars compared to 22.2 percent of older depressed women. Further 43 to 60 percent of the subjects had decreased the consumption of milk and milk products, fried foods, ghee, pickles, citrus and other fruits. Reasons for decreasing consumption of these foods were: lack of awareness about the importance of milk and milk products and fruits, inability to afford these foods.

Similar findings were observed for women in the middle income group. Among women in the high income group, more than half of the women over 60 years of age reported decrease in the consumption of various foods such as cereals, milk and milk products, fried foods, ghee, *masalas*, pickles, sweets, and sugar.

Overall a striking reduction in food consumption was reported by majority of women above age 60. The reasons given by them were lack of appetite, aging, indigestion, major health problems, disregard for their choice of foods by their family and no power to decide what to eat. Other explanations included female perceptions of self- and body-image and self-esteem, which have been associated with depression and might be associated with reduction in food consumption.

Majority of the non-depressed women reported increased consumption of foods such as cereals, fried foods, ghee, *masalas*, vegetables and citrus fruits, whereas only 6-10 percent of depressed women reported an increase in the consumption of these foods. Complete omission of non-vegetarian foods was reported by the non-depressed women, whereas 14 percent of women with depression reported no change in the consumption of non-vegetarian food.

Derrick (2001) found from this study done on 100 subjects that certain individuals may be particularly vulnerable to patterns of unhealthy eating-for example, those under stress. The effect of stress on food intake depends on the individual, the stressor and the circumstances. The proposed mechanisms

for stress-induced changes in eating and food choice are motivational differences (reduced concern about weight control), physiological (reduced appetite caused by the processes associated with stress) and practical changes in eating opportunities, food availability and meal preparation.

***9.* Food Causing Allergy:** Studies have shown that prevalence of allergic manifestations from food is higher in people with depression because they become superstitious; they lose interest from the surroundings and become skeptical about eating and find problems.

In the present study women were asked whether they consume any foods which cause allergic manifestations. Those who responded in the affirmative were asked to specify the foods that they perceived were causing allergic manifestations.

**Table 4.1.16: Percentage of women who experienced allergic manifestation caused by foods in depressed and non-depressed groups belonging to different age groups and income level**

| Whether there are foods that cause allergic manifestations | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | > 60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| Yes | 33.3 | 51.7 | 36.7 | 16.7 | 46.7 | 50.0 | 5.0 |
| No | 66.7 | 48.3 | 63.3 | 83.3 | 53.3 | 50.0 | 95.0 |

As can be observed from table 4.16, allergic manifestations caused by food have been reported more by adult depressed women from the middle income group (51.7 percent) and by high income women (50 percent) and middle income women (46.7 percent) in the older depressed women. Thus about 50 percent of the middle and high income older depressed women were more prone to food allergy, whereas food allergy is reported least in by low income women. Also, while nearly half of the middle income women with depression (47 percent) reported allergic manifestations caused by food, the same was reported by hardly 5 percent of their non-depressed counterparts.

The intake of foods like pickles, curd, green chilly, lemon, banana, etc. were perceived by women to cause physiological symptoms like itching, difficulty in breathing, sneezing, acidity, swelling, piles, nausea, cold cough, dryness of skin, headache, cramps, indigestion, etc. Behavioral changes like agitation, hyperactivity, anger, irritability, crankiness, restlessness, difficulty in falling asleep, insomnia, waking up at night, lethargy, fatigue, drowsiness were the allergic manifestations that women attributed to the intake of such foods.

A study by Antonia (1999) conducted in the UK reports that although food allergy can have serious health consequences little is currently known about people's perceptions. The study examined the differences in awareness and perceptions of food allergy and depression between young people with and without a food allergy. Out of the 162 participants of the study, 24 reported they were allergic to at least one food; these people perceived that their allergy had significantly less of an impact on their lives. Allergy status was found influenced by perceived health competence to affect anxiety leading to depression. People with an allergy and with high health competence reported the greatest depression levels. Very few of the subjects however, knew the meaning of the term 'allergy'.

Thus, food allergy signs and symptoms can also be very esoteric, and can impact the thought process and concentration, and this can change behavior or mood leading to depression, agitation or may even cause dizziness. Food allergy symptoms can also cause seemingly unrelated symptoms, making the diagnosis ever harder.

**10. Food Preference:** To know the food preference of women, they were read out a list of foods and asked whether they liked eating any of them. Women's responses have been presented in Table 4.1.17.

As evident from table 4.1.17 below, consumption of ghee and milk-based sweets, *farsan* (a wide variety of snacks) both oily and dried, salted items, and dry fruits was the highest among middle income women age 40-60 years, with about 70-83 percent of these women reporting preference for these foods.

**Table 4.1.17: Food preference reported by depressed and non-depressed women by age and income level**

| Type of food items | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60yrs | | | > 60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **1. Sweets** | | | | | | | |
| a. Ghee Based | 58.6 | 73.3 | 51.7 | 57.7 | 58.3 | 62.1 | 50.0 |
| b. Milk Based | 55.2 | 70.0 | 50.0 | 59.3 | 56.5 | 58.6 | 50.0 |
| **2. Farsan / Snacks** | | | | | | | |
| a. Oily | 69.0 | 80.0 | 48.1 | 51.9 | 69.2 | 60.0 | 64.7 |
| b. Dried | 62.1 | 82.8 | 67.9 | 48.1 | 69.0 | 62.1 | 50.0 |
| **3. Baked Items** | 31.0 | 46.7 | 60.0 | 20.7 | 31.0 | 53.3 | 52.9 |
| **4. Milk based** e.g. Cheese, Paneer | 20.0 | 46.7 | 60.0 | 20.7 | 31.0 | 43.3 | 70.6 |
| **5. Fast Food** | 13.3 | 43.3 | 50.0 | 6.9 | 10.3 | 31.0 | 70.6 |
| **6. Dry fruits** | 10.0 | 70.0 | 60.0 | 24.1 | 43.3 | 53.6 | 47.1 |
| **7. Processed items** e.g. noodles, pasta, etc. | 3.3 | 33.3 | 26.7 | 3.4 | 13.8 | 17.2 | 47.1 |
| **8. Instant mixes** | 6.7 | 26.7 | 26.7 | 6.9 | 13.8 | 13.3 | 47.1 |
| **9. Salted items** e.g. pickles, papads | 30.0 | 73.3 | 46.7 | 48.3 | 43.3 | 31.0 | 52.9 |
| **10. Any other** | - | - | - | 6.3 | 20.0 | 16.7 | 28.6 |

High income women from both age groups reported higher preference for baked items, milk based items, and fast food. Preference for processed items (noodles, pasta, etc.) and instant mixes was markedly higher among younger depressed women as compared to older depressed women. This could be due to the fact that younger women were still responsible for cooking for the family. They may be making use of processed foods and instant mixes to save time or because these foods are preferred by family members. The threshold for all tastes (e.g. salt, sweet) is raised in older people. Studies of sensitivity in taste among older people show a gradual decline with age (Schiffman, 1994) and this may have an impact on food selection. The loss of acuity of taste and / or smell is highly variable. Certain medical conditions,

and some drugs, may also impair the senses of taste or smell or reduce appetite, and may hence affect food intake (Horwarth 2002).

A comparison between the food preferences of depressed and non-depressed middle income women above the age of 60 showed that the majority of non-depressed women had greater preference for salted and baked items (53 percent each), milk based foods and fast foods (71 percent each), as well as dry fruits, processed items and instant mixes compared to their depressed counterparts. Whereas depressed women showed higher preference for sweets and farsan compared to their counterparts,

A study conducted by Geary (1998) on 200 depressed individuals between the ages of 26 and 55 in England carried out a survey showing relation between food and mood. The results showed that those individuals who changed their meal pattern by cutting down or avoiding potential food stressors like sugar (80%), caffeine (79%), alcohol (55%) and chocolate (53%) and having more food supporters like water (80%), vegetables (78%), fruit (72%) and oil rich fish (52%) had the most beneficial effects on mental health and showed reduction of depression.

Food choice is influenced by various physiological, social and cultural factors and is not determined solely by whether people consider a food to be healthy or not. Mood is just one factor that can impact on food preferences, food cravings, dietary behavior and short and long term responses to dietary intervention.

## B. DIETARY INTAKE

Depression is more typically thought of as strictly emotional or biochemical. People are unaware about the connection between nutrition, dietary intake and depression. Therefore an attempt was made in the present study to assess the nutrient intake of women. Nutrient intake was assessed using the (i) 24-hour dietary recall method and (ii) the food frequency questionnaire, which had an exhaustive list of foods rich in nutrients that play an important role in depression.

### (i) 24-hour dietary recall method

Diet modification can help in mood change in depression, if it is caused due to a deficiency of some nutrients. Data on dietary intake was obtained using 24-hour dietary recall method. All calculations of nutrient intake were based on the Recommended Dietary Allowance (RDA) which is standardized for all the nutrients involved. The assessment of nutrient intake was in terms of energy, protein, fat, iron, folic acid, isoflavone, Vitamins (C, B6, B12), minerals (Calcium, Choline, Potassium and Selenium), and Amino acids (Methionine, Phenylalanine and Tryptophan). The mean nutrient intake of depressed and non-depressed women by age and income group is presented in table 4.1.18.

As can be observed from the table 4.1.18 below, there was significant difference ($p \leq 0.05$) by income level in the nutrient intake of depressed women in both 40-60years and above 60 years of age groups. Among depressed women, least nutrient intake was observed more amongst lower income older depressed women (aged above 60 years). A study by Boston (1999) involving 724 elderly revealed that low-income women did not have sufficient nutrients and were more likely to have major depression.

Mean intake of all nutrients were found to be significantly higher in high income younger depressed women compared to older depressed women ($p<00.5$). Further, younger depressed women belonging to middle income group showed higher significant difference ($p \leq 0.05$) and better nutrient intake with respect to energy, iron, folic acid, tryptophan, methionine and vitamin C

compared to older depressed women of the same income group (fig 4.7,4.8 and 4.9).Total energy intake decrease varied substantially with age, by 1200 to 1000 kcal in women. This resulted in concomitant decline in most nutrient intake (Wakimoto and Block, 2001). The mean intake of energy was found to be similar amongst younger depressed women belonging to high income group and middle income non-depressed women (fig 4.10). Effect on depression leading to reduction in food intake, loss of appetite and advancing age altogether has affected the energy intake of older depressed women which was found to be lower and statistically significant. Result obtained by study carried out Chauhan and Mehta (2006) showed that older elderly women living alone had low intake of energy compared to younger elderly women who had significant higher amounts of nutrients consumption in terms of energy, protein and iron($p<0.001$).

Depression was associated with significantly higher daily caloric intake (1831 vs. 1543) among those with BMI over 30. A strong conclusion was derived from the study that among middle-aged women, depression is strongly and consistently associated with obesity, lower physical activity and (among the obese) higher caloric intake.

Figure 4.7:- Mean Iron intake of adult and older depressed women and non-depressed women belonging to middle income group.

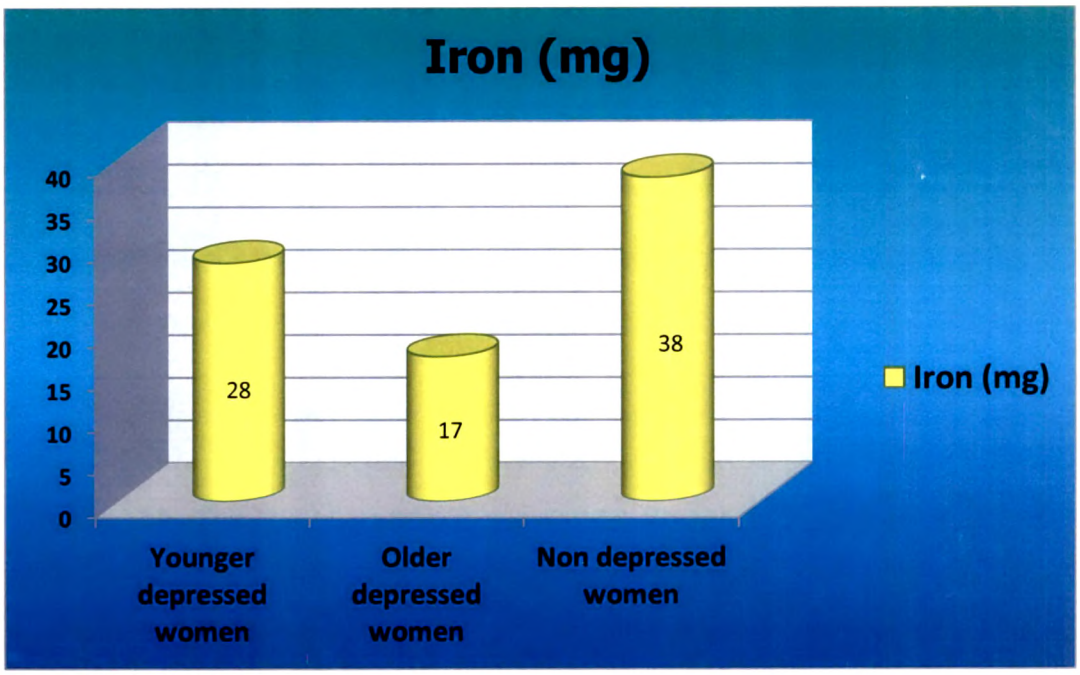



Figure 4.8:- Mean folic acid intake of adult and older depressed women and non-depressed women belonging to middle income group.

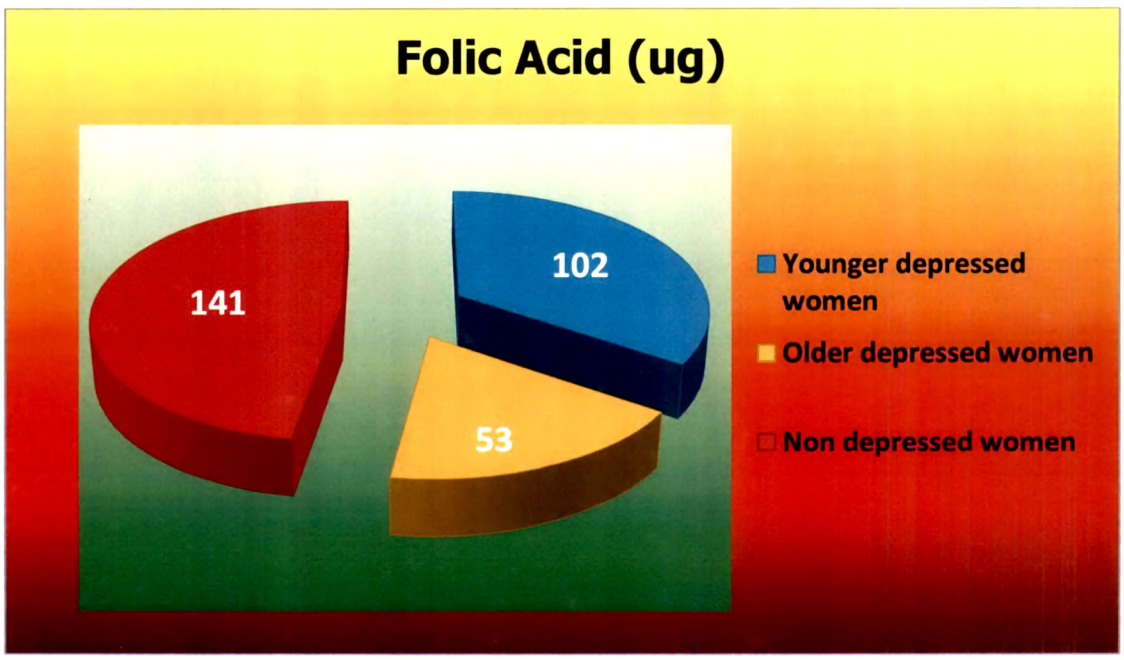


**Figure 4.9:- Mean vitamin C intake of adult and older depressed women and non-depressed women belonging to middle income group.**

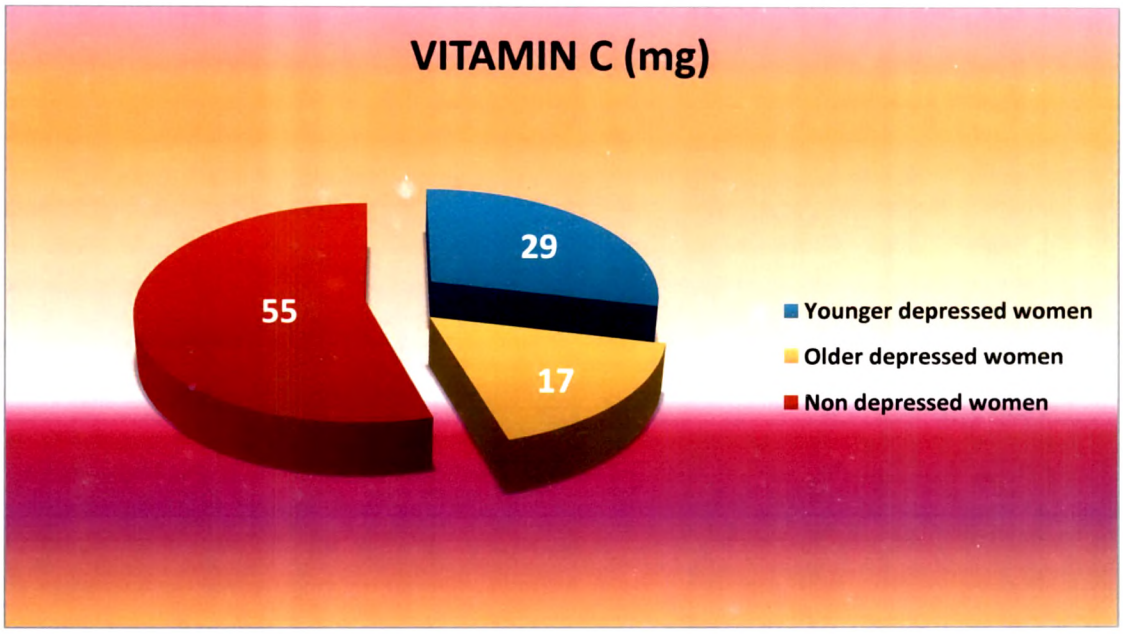
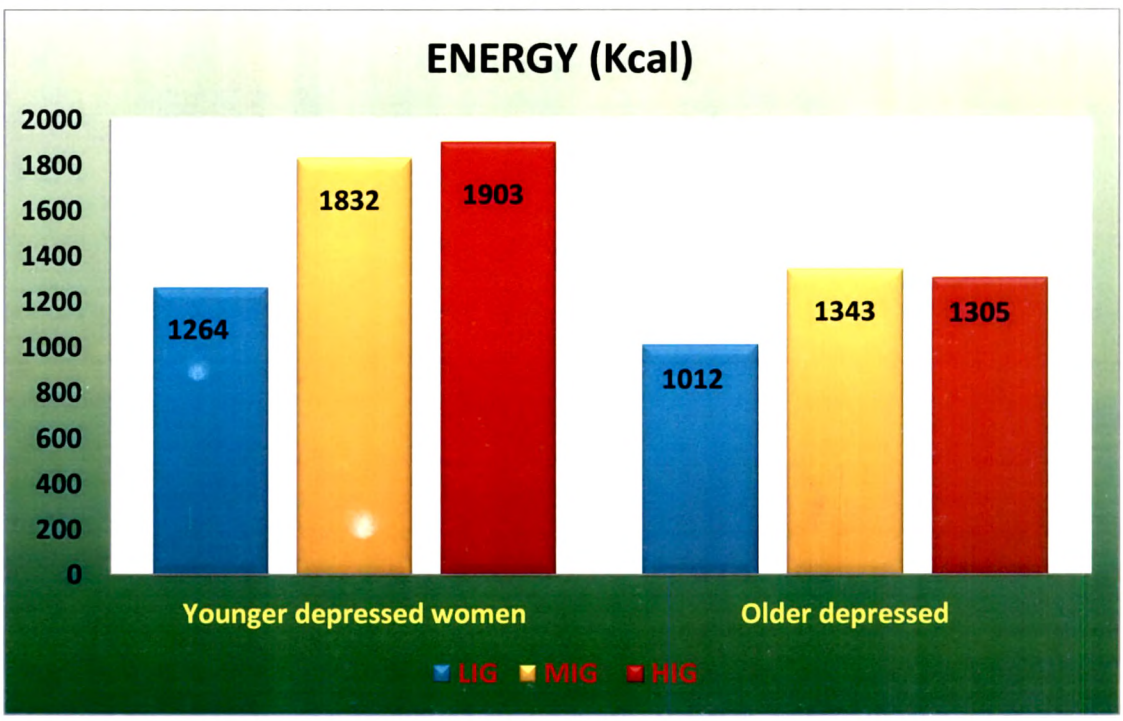



**Figure 4.10:- Mean energy intake of adult and older depressed women amongst three different income group.**



Shamali Ayyar (2000) in her study on 60 elderly subjects above 70yrs of age, compared the elderly women to the women of the pre-geriatric age group (45-59yrs) and revealed that 25% of the pre-geriatric women remained depressed due to menopause leading to withdrawal from proper food intake.

The mean nutrient intake of the key nutrients responsible for depression i.e. choline and selenium was found to be significantly lower ($P<0.05$) among depressed older women compared to their non-depressed counterparts. There were marginal differences in the intake of nutrients like isoflavone, choline and Vitamin-C within the depressed group (fig 4.11). The findings also revealed significant difference ($p\leq0.05$) with poor intake of folic acid, Vitamin B6 and Vitamin-B12 in both the depressed groups.

Similar results were obtained by (Pallavi, M and Swati, P, 2010) in a study conducted on 150 male depressed subjects aged more than 50 years. The results revealed that diet profile of the subjects had shown a positive association between low food intake and poor cognitive function. Low food intake resulted in low intake of nutrients like choline, folic acid, tryptophan, methionine, vitamin B6, vitamin B12 and vitamin C which plays a significant role in mental health of an individual.

A study conducted by Shah and Mehta (2008) on 150 depressed women between three age groups (50-59, 60-69 and >70 yrs), the results showed that the frequency of consumption of all the nutrients which are related to mental health was low among all the three age groups except for the subjects belonging to 50 –59 yrs. where frequency of choline intake was found to be 52% compared to their counterparts which was only 40%. Therefore low intake of such nutrients could be the risk factor in the development of depression and cognitive impairment.

A study conducted by Mehta and Laddu (2002) on depressed subjects, aged 45-60 years, and revealed that the consumption of Vitamin-C, Vitamin-B6 and Vitamin-B12 was 25% lower than the normal RDA.

Thus, overall the intake of all the nutrients was found to be significantly higher ($p \leq 0.05$) and healthy by non-depressed older women compared to their counter parts. Amongst depressed group younger women from high income group showed better intake.

Therefore, the present study suggests that low intake of such nutrients could be a risk factor for the development of depression and impairment of cognitive function in elderly group. Reduction in the consumption due to depressive symptoms decreases motivation for food intake.

**Figure 4.11:- Mean Isoflavone intake of adult and older depressed women and non-depressed women belonging to middle income group.**

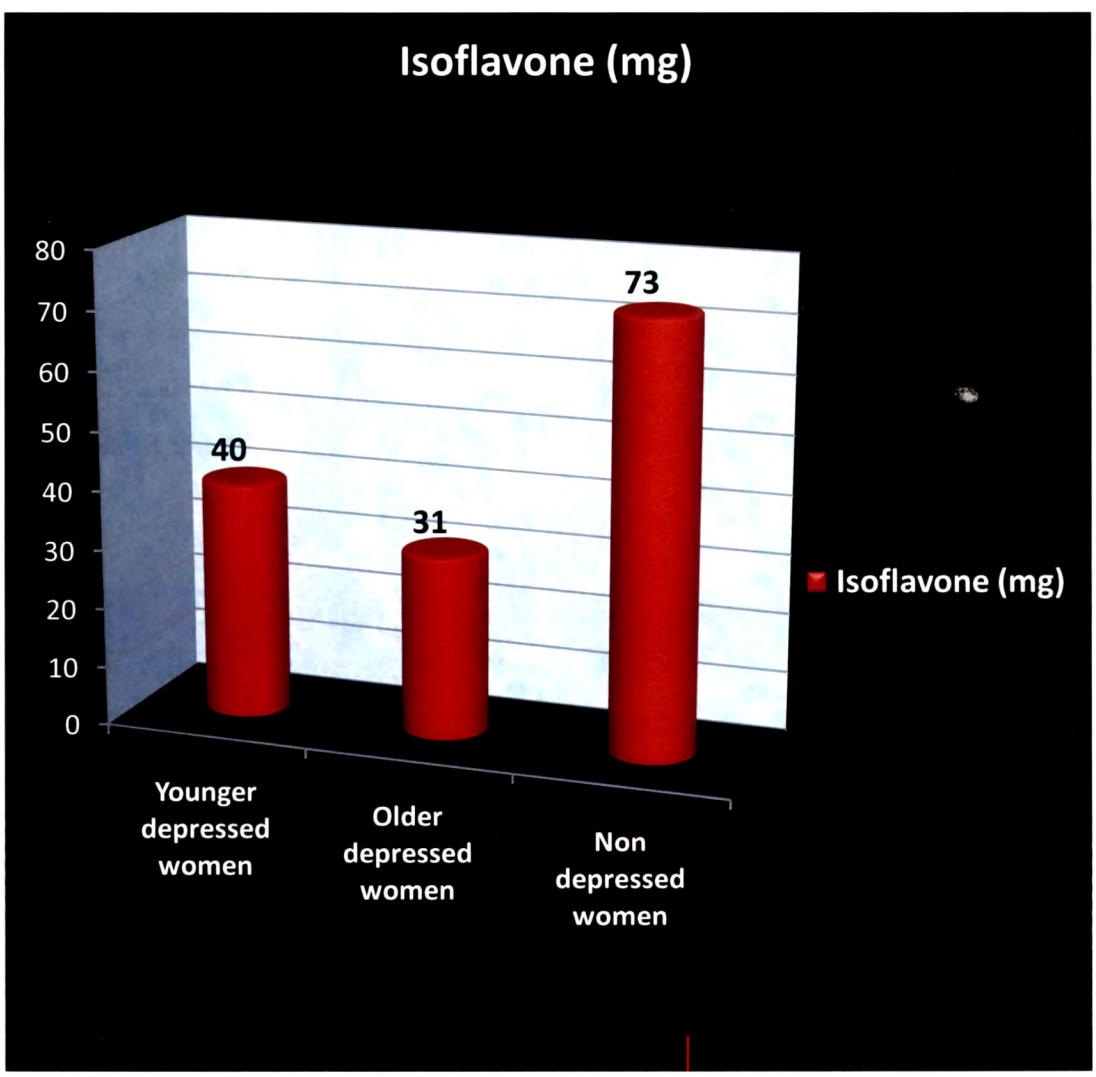


**Table 4.1.18: Mean nutrient intakes of depressed and non-depressed women, by age and income level**

| Nutrients | Depressed | | | | | | Non-depressed | f-value | p-value |
|---|---|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs | | |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 | | |
| Energy (Kcal) | 1264 + 303 | 1832 + 369 | 1903 + 541 | 1012 + 357 | 1343 + 334 | 1305 + 337 | 1906 + 341 | 25.8717 | *0.0000 |
| Protein (gms) | 22 + 10 | 35 +10 | 35 + 10 | 19+ 8 | 30+9 | 27+8 | 56+9 | 32.6112 | *0.0000 |
| Fat (gm) | 18 + 7 | 28+ 8 | 29+ 11 | 18+ 8 | 23+ 8 | 28+ 8 | 45+ 9 | 27.2939 | *0.0000 |
| Iron (mg) | 19 + 6 | 28+ 9 | 22+ 9 | 14+ 9 | 17+ 7 | 20+ 8 | 38+ 6 | 25.0492 | *0.0000 |
| Folic acid (ug) | 83 + 37 | 102+32 | 80+39 | 59+29 | 53+17 | 70+37 | 141+23 | 20.7691 | *0.0000 |
| Vitamin B6 (mg) | 1.47 +1.16 | 1.76+1.05 | 1.50+0.69 | 0.90+0.91 | 0.96+0.70 | 1.18+0.53 | 2.98+0.90 | 14.9898 | *0.0000 |
| Vitamin B12 (ug) | 0.81+0.77 | 0.79+0.70 | 0.86+0.43 | 0.53+0.57 | 0.44+0.46 | 0.61+0.40 | 1.48+0.31 | 8.0870 | *0.0000 |
| Calcium (mg) | 189 + 111 | 266+94 | 235+76 | 177+86 | 228+93 | 255+86 | 508+76 | 33.4221 | *0.0000 |
| Choline (mg) | 23 + 10 | 24+12 | 28+11 | 20+8 | 18+9 | 27+9 | 46+11 | 20.0195 | *0.0000 |
| Isoflavone (mg) | 35+ 14 | 40+13 | 41+10 | 31+12 | 31+11 | 40+11 | 73+9 | 34.6444 | *0.0000 |
| Tryptophan (mg) | 120 +30 | 143+36 | 136+39 | 115+30 | 121+28 | 133+34 | 276+43 | 58.6545 | *0.0000 |
| Methionine (mg) | 373 +127 | 481+116 | 387+150 | 343+136 | 409+115 | 443+118 | 657+45 | 16.7916 | *0.0000 |
| Phenylalanine (mg) | 138 +54 | 148+44 | 130+44 | 110+37 | 125+36 | 113+34 | 249+26 | 29.7908 | *0.0000 |
| Vitamin C (mg) | 22 +13 | 29+10 | 25+8 | 23+8 | 17+8 | 23+8 | 55+8 | 38.0134 | *0.0000 |
| Potassium (mg) | 1720 +690 | 1826+882 | 1905+690 | 1990+690 | 1930+799 | 2016+1074 | 5219+855 | 46.6175 | *0.0000 |
| Selenium (ug) | 8.09+10.51 | 6.79+8.14 | 8.53+9.00 | 7.33+7.09 | 7.47+9.86 | 6.89+6.40 | 42.75+12.15 | 45.7992 | *0.0000 |

*significant at p≤0.05

### *(ii) Food frequency*

The food frequency questionnaire included an exhaustive list of foods rich in isoflavone, folic acid, amino acids (tryptophan, phenylalanine, and methionine), Vitamin C, Vitamin B complex and Vitamin B12. The foods, which were included to evaluate the association between frequent intake of these nutrients and occurrence of the disease, were cereals, pulses, vegetables, fruits, nuts and oilseeds, isoflavone, folicacid, iron, amino acid and vitamin B6.

Consumption of milk and milk products was included to assess the role of folic acid, amino acid and Vitamin B12 with the occurrence of depression. Consumption of fruits and vegetables were investigated to evaluate the relationship between these foods and Vitamin C. Craving for sweets and sugars stimulate the production of neurotransmitter and work as antidepressant therefore sugar dense foods were also included in the list of foods in the questionnaire. The consumption of all these food items was noted in terms of daily intake, once a week, twice a week, fortnightly, monthly, occasionally and never.

Higher consumption of fruits/vegetables was associated to lower levels of depressive symptoms among females in our study. The direction of this association seems to be due to the behavioral consequences of higher depressive symptoms and is consistent with the correlation between depressive symptoms and perceived stress (Maxwell AE, 2008).The analysis is presented in Table 4.1.19.

**Table 4.1.19: Food frequency of depressed and non-depressed women, by age and income level**

| Food groups | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG N=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **Cereals and grains** | | | | | | | |
| a.Non- Frequent | 13.3 | - | - | 23.3 | 6.7 | 23.3 | 10.0 |
| b. Frequent | 86.7 | 100 | 100 | 76.7 | 93.3 | 76.7 | 90.0 |
| **Pulses** | | | | | | | |
| a. Non- Frequent | 70.0 | 36.7 | 6.7 | 60.0 | 43.3 | 23.3 | 15.0 |
| b. Frequent | 30.0 | 63.3 | 93.3 | 40.0 | 56.7 | 76.7 | 85.0 |
| **Green leafy vegetables** | | | | | | | |
| a. Non- Frequent | 80.0 | 33.3 | - | 33.3 | 33.3 | 10.0 | 15.0 |
| b. Frequent | 20.0 | 66.7 | 100 | 66.7 | 66.7 | 90.0 | 85.0 |
| **Fruits** | | | | | | | |
| a. Non- Frequent | 70.0 | 43.3 | 23.3 | 86.7 | 43.3 | 36.7 | 10.0 |
| b. Frequent | 30.0 | 56.7 | 76.7 | 13.3 | 56.7 | 63.3 | 90.0 |
| **Milk/Milk products** | | | | | | | |
| a. Non- Frequent | 76.7 | 36.7 | 30.0 | 90.0 | 70.0 | 60.0 | 15.0 |
| b. Frequent | 23.3 | 63.3 | 70.0 | 10.0 | 30.0 | 40.0 | 85.0 |
| **Spices** | | | | | | | |
| a. Non- Frequent | 20.0 | - | 6.7 | 23.3 | 13.3 | 23.3 | 10.0 |
| b. Frequent | 80.0 | 100 | 93.3 | 76.7 | 86.7 | 76.7 | 90.0 |
| **Roots and tubers** | | | | | | | |
| a. Non- Frequent | 26.7 | 56.7 | 10.0 | 50.0 | 86.7 | 30.0 | 5.0 |
| b. Frequent | 73.3 | 43.3 | 90.0 | 50.0 | 13.3 | 70.0 | 95.0 |
| **Other vegetables** | | | | | | | |
| a. Non- Frequent | 60.0 | 23.3 | - | 46.7 | 40.0 | 16.7 | 5.0 |
| b. Frequent | 40.0 | 76.7 | 100 | 53.3 | 60.0 | 83.3 | 95.0 |
| **Animal foods** | | | | | | | |
| a. Non- Frequent | 83.3 | 90.0 | 76.7 | 86.7 | 90.0 | 86.7 | 80.0 |
| b. Frequent | 16.7 | 10.0 | 23.3 | 13.3 | 10.0 | 13.3 | 20.0 |
| **Sea foods** | | | | | | | |
| a. Non- Frequent | 96.7 | 100 | 86.7 | 96.7 | 93.3 | 86.7 | 85.0 |
| b. Frequent | 3.3 | - | 13.3 | 3.3 | 6.7 | 13.3 | 15.0 |
| **Fats and oils** | | | | | | | |
| a. Non- Frequent | 76.7 | 86.7 | 3. 3 | 100 | 93.3 | 86.7 | 55.0 |
| b. Frequent | 23.3 | 13.3 | 96.7 | - | 6.7 | 13.3 | 45.0 |
| **Nuts and** | | | | | | | |

| Food groups | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG N=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **oilseeds** | | | | | | | |
| a. Non- Frequent | 83.3 | 40.0 | 20.0 | 90.0 | 60.0 | 53.3 | 25.0 |
| b. Frequent | 16.7 | 60.0 | 80.0 | 10.0 | 40.0 | 46.7 | 75.0 |
| **Sugar dense foods** | | | | | | | |
| a. Non- Frequent | 53.3 | 36.7 | 20.0 | 66.7 | 40.0 | 53.3 | 20.0 |
| b. Frequent | 46.7 | 63.3 | 80.0 | 33.3 | 60.0 | 46.7 | 80.0 |

From the above table it can be observed that depressed women in both age groups opted for non-frequent consumption of all food groups compared to non-depressed counterparts. Similarly, majority of the lower income women showed non-frequent consumption compared to their counterparts in the middle and high income group.

With respect to milk and milk products, frequent intake was noted in case of women belonging to middle income (40-60years) of age group (63.3percent) compared to only (30 percent) of older depressed women. As age advances inadequate calcium intake, decreased calcium absorption, and increased calcium loss in urine can decrease total calcium in the body, with the potential of producing osteoporosis and the other consequences of chronically low calcium intake. As age advances, the elderly form a vulnerable group for multiple morbidities: physical, mental and social among others. This arises from biochemical and morphological changes in the aging brain and other organs, compromised immunity and not too favorable psycho-socio-economic milieu.

In dietary form, older women can fulfill their increased demands for calcium by drinking enough milk, yoghurt, cheese, paneer and many others which was not frequently consumed by depressed subjects. On frequent consumption of milk and milk products can further lead to vitamin B12 deficiency in elderly.

At present, it is known that vitaminB12 deficiency is common and that its prevalence increases with age. It is estimated to affect 5–40% of the aged, depending on the diagnostic criteria used. (Wolters M, 2004)

A marked difference was observed among younger and older depressed women within the middle income group, 43.3 percent of the younger depressed women showed frequent consumption of roots and tubers compared to only 13.3 percent of the older depressed women. A similar trend was observed also among younger and older depressed women in the high income group. The difference was observed among the low income group younger depressed women and their counterparts, where the younger subjects were consuming majority of the foods groups more frequently. Majority of the low income group depressed subjects were having non-frequent consumption of fruits, milk, nuts and oilseeds, fats and oils and animal foods due to financial constraints.

Regardless of age or income level or depression status, animal foods and sea foods, were consumed less frequently by most women, indicating that important sources of "good mood" minerals such as choline and selenium were not being consumed by most women.

A comparison between frequency of consumption of various foods by depressed and non-depressed women aged 60 years and above belonging to the middle income group showed higher percentage of non-depressed women consumed most of the food items, including animal foods, milk and milk products, more frequently than their counterparts who were depressed.

Higher percentage (95 percent) was observed in terms of frequent consumption of vegetables (others and roots& tubers) amongst non-depressed women followed by younger high income depressed women (90 percent). Very poor consumption was observed amongst older depressed women. A study carried out by Limaye (1999) on institutionalized elderly living in Baroda city concluded that there was gross deficiency of nutrients like

iron, calcium and β- carotene because of poor consumption of foods rich in the nutrients life vegetables and fruits in the institution.

Rafael. T (2009) in a cross-sectional survey was conducted among first-year students in Germany (N = 696), Poland (N = 489) and Bulgaria (N = 654). The Results of the study revealed that food consumption frequencies differed by country and gender, due to depressive symptoms and perceived stress. For male students, none of the food consumption groups were associated with perceived stress or depressive symptoms. In females, perceived stress was associated with more frequent consumption of sweets/fast foods and less frequent consumption of fruits/vegetables. Additionally, depressive symptoms were associated with 'less frequent consumption of fruits/vegetables and meat.

The data showed consistent associations between unhealthy food consumption and depressive symptoms and perceived stress among female students from three European countries, but not among male students. This suggests that efforts to reduce depressive symptoms and stress among female students may also lead to the consumption of healthier foods and/or vice-versa.

A number of studies have shown an association between low selenium intake and a significantly greater incidence of depression and other negative mood states. A study by Benton and Cook (2000) in UK showed that a supplement of 100 mg/day of selenium significantly improved mood and decreased anxiety and depression. The beneficial effect of selenium was marked in those consuming lesser amounts in the diets. Older people may be particularly susceptible to depressed mood, so ensuring adequate intakes of selenium seems sensible.

There is some evidence to support the various claims that the balance of protein and carbohydrate consumed in a meal can affect the synthesis and activity of the brain neurotransmitter serotonin that improves mood. Studies have shown that the ratio of fat to carbohydrate in a meal significantly affects

mood, alertness and mental performance, albeit with optimal effects occurring when the composition of the experimental meals matched that of the participant's habitual diet.

The bottom line is that food plays a key role in maintaining mental health. Older adults are at greater risk of nutritional deficiencies than are younger adults due to physiological changes associated with ageing, acute and chronic illnesses, prescription and over-the-counter medications, financial and social status, and functional decline. Among the significant age associated changes in nutrient requirements, the need for energy decreases and the need for protein increases with age. Among the micronutrients, the significant ones that may be associated with deficiencies in elderly women include Vitamin (B-12, A, C and D), calcium, iron, zinc and other trace minerals these in general throws light on the increasing need for research to determine appropriate recommendations.

Hence from the above results of the present study and other studies reviewed here it may be concluded that there is significant difference in the mean nutrient intake of depressed women and non-depressed women. Vulnerability to depression is greater in the case of elderly women, who were found to be deficient in proper nutrient intake. This deficient intake is often associated with untreated and undiagnosed physical illnesses, which are commonly believed to be a natural part of the process of ageing, loss of spouse, dependence on others in food habits and dietary intake, lack of family support and isolation, all of which have affected the appetite and nutritional status of elderly women.

## 5) TO ASSESS PHYSICAL HEALTH PROFILE AND NUTRITIONAL STATUS OF OLDER WOMEN WITH DEPRESSION.

Nutritional status and physical health was assessed in terms of anthropometric measurements. The clinical parameters included blood pressure assessment to know the prevalence of hypertension. Anthropometric and clinical parameters were analyzed using f-test. The mean levels of all the anthropometric and clinical parameters and *f*-values of depressed and non-depressed women are discussed in the section below.

### A. ANTHROPOMETRIC MEASUREMENTS

Anthropometric measurements such as height, weight, mid-upper arm circumference (MUAC) and body mass index (BMI) were assessed using bathroom scale and measuring tape. The mean levels of all the anthropometric measurements and *f*-values of depressed and non-depressed women are shown in Table 4.1.20.

**Table 4.1.20: Mean anthropometric and clinical measurements of depressed group and non-depressed women, by age and income level**

| Parameters | Depressed | | | | | | Non-depressed | *f*-ratio | *f*-value |
|---|---|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs | | |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 | | |
| **Anthropometric** | | | | | | | | | |
| Height (cm) | 153.0± 12.0 | 158.0 ± 11.0 | 159.2 ± 11.9 | 157.7 ± 8.6 | 154.8 ± 8.0 | 156.6 ± 12.4 | 154.4 ±10.4 | 0.83 | 0.54 |
| Weight (kg) | 57± 11 | 62±10 | 64±7 | 58± 13 | 61±10 | 61± 10 | 64± 7 | 1.98 | 0.07 |
| MUAC (cm) | 32± 12 | 40±15 | 33±8 | 32±9 | 39±11 | 31±8 | 43±9 | 4.12 | 0.007 |
| BMI ($kg/m^2$) | 22.82± 7.09 | 25.16 ± 4.57 | 25.79 ± 5.55 | 23.26 ± 4.60 | 25.46 ± 3.72 | 25.10 ± 3.80 | 27.04 ± 3.87 | 2.18 | 0.046 |

As can be seen from the above table, there is no significant difference ($p \leq 0.05$) by income or age in the case of weight, height, MUAC and BMI in

depressed women. In terms of BMI, except women from low income group, depressed women in both age groups as well as non-depressed women were overweight.

Women can be put too much stress, especially as they are expected to manage both work and home issues and matters. Familial, professional and hormonal changes can come to the point of being distressing for this gender. The distress, called "stress" in simple terms has massive consequences, emotionally and health- wise.

One of the most common consequences of stress is weight gain. Obesity is a common dilemma among the fairer sex. And this again causes further emotional health problems such as depression. According to Shah and Mehta (2006) in a study conducted on 150 depressed women between three age groups (50-59, 60-69 and >70 yrs), the results on BMI classification found that 34% of the total subjects were falling under over weight category and 9% were found to be obese. It was confirmed that the prevalence of degree of overweight and obesity was higher in 50-59 yrs (40%) and in 60-69 yrs (34%). The obesity prevalence in the 70 + yrs age group was (10%).

Roberts *et al* conducted a 5-year prospective study of 2123 adults, aged 50 years and older, enrolled in the Alameda. Depression was diagnosed using 12-item questionnaire (DSM-IV) criteria for a major depressive episode; 'cases' were defined as those responding affirmatively to five or more items 'almost every day for the past 2 weeks'. Logistic regression analyses indicated that individuals who were obese at baseline were 2.09 times more likely to be depressed 5 years later compared with individuals who were non-obese at baseline.

A study conducted by Mehta and Desai (2004) on 20 adult depressed women found that majority (60%) of the depressed subjects were overweight, 35% were in the normal category and 5% of the subjects were obese.

Obesity is a significant and growing public health concern, accounting for approximately 300,000 excess deaths per year and approximately 9% of US health care expenditures. Prevalence of obesity has steadily increased, with an estimated rate among middle-aged women exceeding 30%. Obesity has a substantial impact on medical morbidity and health-related quality of life. Public health approaches to the prevention and treatment of obesity must consider the substantial overlap with depression. Women with a history of depression or depression treatment are over-represented among those seeking obesity treatments. Current or past depression is also associated with less success in losing weight or maintaining weight loss (Clinical trials.Gov, Board, 2009).

G.Simon (2008) conducted a study on a total of 4641 female health aged 40–65 years. The results revealed that Prevalence of moderate or severe depression increased from 6.5% among those with body mass index (BMI) fewer than 25 to 25.9% among those with BMI over 35. Prevalence of obesity increased from 25.4% among those with no depressive symptoms to 57.8% among those with moderate to severe depression. Independent of obesity, depression was associated with significant reductions in frequency of moderate (4.6 vs. 5.4 times per week) or vigorous (2.8 vs. 3.7 times per week) physical activity. Public health approaches to reducing the burden of obesity or depression must consider the strong association between these two common conditions.

**B) CLINICAL PARAMETER:**

Patients with hypertension are at a higher risk for depression than those with normal blood pressure. It has also been noticed that controlling blood pressure for people who have been diagnosed with depression is difficult. Further, there are indications that suggest that certain hormonal changes in people with depression can activate high blood pressure.

There are many studies that point towards a definite link between blood pressure medication and depression. Depression that is not treated may lead

to hypertension. The medications used to treat hypertension can cause depression. Therefore, it is necessary that patients suffering from depression be checked for hypertension and vice versa to enable better prescription therapy (Thompson, 2008). Hypertension is found to be a significant cause of morbidity and mortality among women. Depression and stress have been linked to several adverse outcomes (Nancy T, 2004).

Blood pressure was assessed to know the prevalence of hypertension. The mean blood pressure levels of all the depressed subjects belonging to different age groups are shown in the Table 4.1.21. below

**Table 4.1.21: Mean blood pressure of depressed subjects belonging to different age groups.**

| Parameters | Depressed | | | | | | Non-depressed | *f*- ratio | *f*- value |
|---|---|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs | | |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 | | |
| Systolic MmHg | 118 + 18 | 127 + 14 | 122 + 15 | 127 + 12 | 121 + 17 | 133 + 17 | 121 + 9 | 2.9297 | 0.0097 |
| Diastolic MmHg | 81 + 14 | 86 + 10 | 91 + 13 | 108 + 156 | 86 + 15 | 117 + 157 | 115 + 138 | 0.5318 | 0.7835 |

It is evident from the above table that no significant difference was found in the systolic and diastolic blood pressures in both age groups of depressed groups. A few women, but with marginal difference had hypertension. Similar results emerged for non-depressed women.

A study done by Lobo-Escolor (2008) on a large, stratified random sample of individuals from the census list aged 55 and over was selected. An epidemiological screening design was implemented, at the end of the investigation, hypertension was documented in 2,523 individuals (61.0%; 41.7% were stage 1 and 19.3% were stage 2 hypertensive), and 314 of them (12.4%) were depressed. The results support the hypothesis that depression is secondary, since the association was found with moderate/severe hypertension (stage 2), but not with mild hypertension (stage 1).

Researchers evaluated 31 hypertensive patients on blood pressure medicines but without recorded histories of psychiatric disease. They found that 13 patients with poor control of their blood pressure had high scores for depression; eight patients with poorly controlled blood pressure did not suffer depression; one patient had depression and poor hypertension control; nine patients had good blood pressure control and no depression.

It has been proven that people suffering from depression are three times more likely to develop hypertension than those who don't suffer depression. Also worth noting is that it is thought that people suffering from depression are more likely to engage in other contributors such as smoking, drinking and over eating. People suffering from depression are also less likely consistently treating hypertension.

The association of relatively low diastolic blood pressure with higher depressive symptom scores and rates of categorical depression was independent of age or weight loss. Since fatigue is a prominent symptom of depression, any association of low blood pressure with fatigue could reflect depressive disorders or clinically important depression.

A cross sectional, population based study conducted on 846 men aged 60-89 years. The main outcome measured the Mean scores on Beck depression inventory and prevalence of scores > or = 13. The results showed that Men with diastolic blood pressure < 75 mm Hg had significantly higher depression scores (mean scores 6.35 v 4.96; $P < 0.001$) and more categorical depression (7.6% v 1.8% with scores > or = 13; $P < 0.01$) than men with diastolic blood pressure levels between 75 and 85 mm Hg. Men with diastolic blood pressure levels > 85 mm Hg had higher depression scores than men with intermediate blood pressure levels (mean scores 5.85 v 4.96; $P < 0.05$). Men with diastolic hypotension scored significantly higher on both affective and somatic item subscales of the Beck depression inventory and on individual measures of fatigue, pessimism, sadness, loss of appetite, weight loss, and preoccupation with health. Low diastolic blood pressure was a significant predictor of both mean depression score and prevalence of categorical depression,

independent of age and change in weight since the baseline visit. The presence of several chronic diseases was associated with depressed mood and higher blood pressure but not with low blood pressure (Barrett, 1994).

## 6) TO COLLECT DATA ON MORBIDITY PROFILE OF OLDER WOMEN WITH DEPRESSION.

Morbidity profile of older women with depression and non-depressed were assessed in terms of a. Major health complaints, b. Minor health complaints and c. Menopausal aspects.

Using an exhaustive checklist and free listing method information was collected from the women on the prevalence of various major and minor health problems and diseases in them with age groups and depression.

### A. MAJOR HEALTH COMPLAINTS

The morbidity profile of adult and older depressed women along with non-depressed women, the types of major health problems prevalent in them is shown below in table 4.1.22.

**Table 4.1.22: Major health problems in depressed and non-depressed women, by age and income level**

| Type of health problem | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **1. Oral cavity problems** | | | | | | | |
| a. Yes | 16.7 | 13.3 | 26.7 | 16.7 | 43.3 | 26.7 | - |
| b. No | 83.3 | 86.7 | 73.3 | 83.3 | 56.7 | 73.3 | 100 |
| **2. Gastrointestinal problems** | | | | | | | |
| a. Yes | 20.0 | 10.0 | 23.3 | 6.7 | 26.7 | 13.3 | - |
| b. No | 80.0 | 90.0 | 76.7 | 93.3 | 73.3 | 86.7 | 100 |
| **3. Respiratory problems** | | | | | | | |
| a. Yes | 13.3 | 16.7 | 26.7 | 16.7 | 20.7 | 26.7 | 5.0 |
| b. No | 86.7 | 83.3 | 73.3 | 83.3 | 79.3 | 73.3 | 95.0 |
| **4.Cardiovascular problems** | | | | | | | |
| a. Yes | 13.3 | 20.0 | 16.7 | 10.0 | 31.0 | 16.7 | - |
| b. No | 86.7 | 80.0 | 83.3 | 90.0 | 69.0 | 83.3 | 100 |

| Type of health problem | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | >60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **5. Genito-urinary problems** | | | | | | | |
| a. Yes | 16.7 | 6.7 | 13.3 | 6.7 | - | 6.7 | - |
| b. No | 83.3 | 93.3 | 86.7 | 93.3 | 100 | 93.3 | 100 |
| **6. Locomoter problems** | | | | | | | |
| a. Yes | 46.7 | 40.0 | 30.0 | 53.3 | 51.7 | 30.0 | 10.0 |
| b. No | 53.3 | 60.0 | 70.0 | 46.7 | 48.3 | 70.0 | 90.0 |
| **7. Neurological problems** | | | | | | | |
| a. Yes | 6.7 | 6.7 | 6.7 | 10.0 | 10.3 | 10.0 | - |
| b. No | 93.3 | 93.3 | 93.3 | 90.0 | 89.7 | 90.0 | 100 |
| **8. Psychiatric problems** | | | | | | | |
| a. Yes | 20.0 | 3.3 | 20.7 | 10.0 | 3.4 | 20.0 | - |
| b. No | 80.0 | 96.7 | 79.3 | 90.0 | 96.6 | 80.0 | 100 |
| **9. Endocrine problems** | | | | | | | |
| a. Yes | 3.3 | 16.7 | 3.3 | 6.7 | 13.8 | 3.3 | 5.0 |
| b. No | 96.7 | 83.3 | 96.7 | 93.3 | 86.2 | 96.7 | 95.0 |
| **10. Any other** | | | | | | | |
| a. Yes | 4.5 | 4.3 | 10.0 | 8.3 | 16.7 | 13.0 | - |
| b. No | 95.5 | 95.7 | 90.0 | 91.7 | 83.3 | 87.0 | 100 |

From the table it can be clearly observed that the prevalence of major health problems was higher in older depressed women. Among them, prevalence was higher in middle income women. The difference of the major health problems related to locomotor problems ranked first (52 percent) followed by oral cavity problems (43.3 percent) and cardiovascular (31 percent) compared to adult depressed women which was found to be very low (fig4.12). The difference obtained could be due to the advancing age older women cited problems of arthritis, pain in limbs, tooth ache and many more. Prevalence of arthritis increases drastically with age. This is primarily due to the high incidence of osteoarthritis in the elderly. The socio-economic burden of this disease is substantial. Knee osteoarthritis, a problem that is much more prevalent in India than in West, accounts for at least as much disability as any other chronic obstructive airway disease or depression (Yung, 2001)

Poor dentition and tooth loss increase with age. Many older people wear dentures that may affect or limit the type of foods eaten because of chewing

difficulties. Nutrient dense foods such as raw fresh fruits, nuts, lightly cooked vegetables and meats may be avoided because they require chewing, and this may reduce intakes of many essential micronutrients (British Nutrition Foundation, 1996).

Neurological problems were reported least in depressed women of both age groups. Nearly one-third of adult depressed high income women reported respiratory (16.7 percent) and gastrointestinal (23.3 percent) problems and also complaint for initiation of endocrinal problems. The most common cause of depression in women due to hormonal fluctuation takes place after the fourth decade of life. Major endocrine changes occur in women around the age of 40-45 years. There is a marked decline in estrogen production that leads to a series of changes commonly known as menopausal changes. Women may be at increased risk for depression during perimenopause, the stage leading to menopause when reproductive hormones rapidly fluctuate.

Patel and Mehta (2008), Singh et al (2008) studied 130 female and male subjects respectively from villages of Baroda and broadly classified them as LIG and MIG. The study showed that there was higher prevalence of oral problems in both males (81.7%) and females (83.1%) followed by locomotors problems in males and cardiovascular problems (49.2%) in females, gastrointestinal problems and respiratory problems were common and prevalent among all subjects. It was also reported by them that majority of elderly males were falling below the normal level of hemoglobin. The prevalence of anemia in LIG was 73.85% which was higher than that of elderly males belonging to MIG (47.69 %). In case of females LIG had 20% subjects suffering from severe degree of anemia while MIG had 15% of subjects who have severe degree of anemia.

Upadhyaya and Chaturvedi (1988) conducted a 3-month study on women aged 25-35 years and 40-50 years attending an outpatient clinic. A total of 24 women were in the group of 40-50 years and 24 were in 25-35 years age groups. Thirty three percent of the perimenopausal women had depression and 20 percent of them had physical diagnosis associated with their

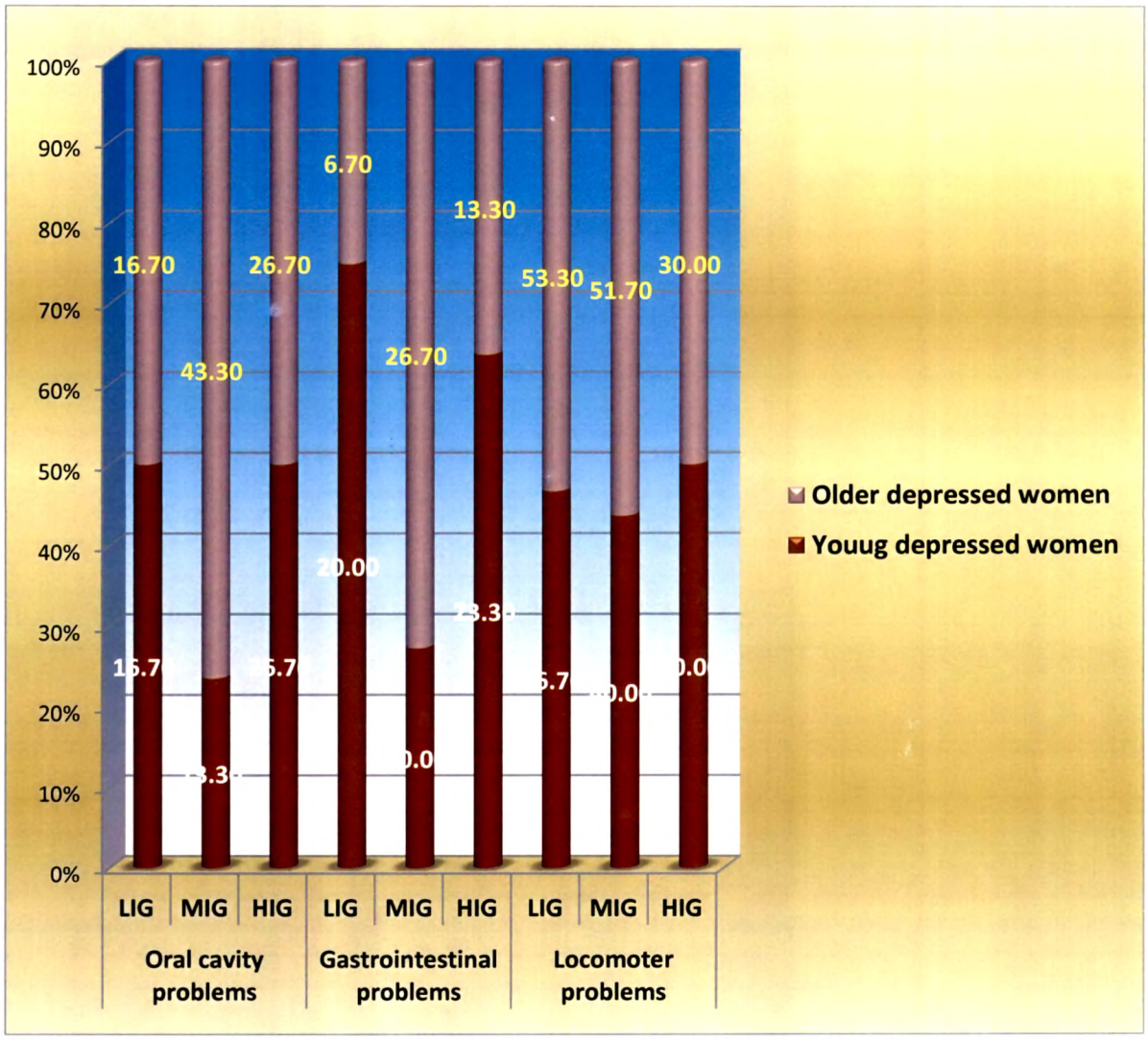
psychiatric problem, like hypothyroid features, hypertension, malignancy and diabetes.

In the non-depressed group, it was interesting to note that hardly (10 percent) of the women reported locomotor problems and still fewer reported endocrine and respiratory problems (5 percent each) compared to their depressed counterparts. Other than these, non-depressed women did not had any major health complaints. A study by Sharma (1999) found that locomotor disability and amnesia/senility (loss of memory) are also quite common among the aged.

Morbidities acquired at each stage accentuate those in the next, the old age being the manifestation of all morbidities compounded with each other. In addition, the tell-tale signs of old age impairment of vision and hearing, osteoarthritis with impairment of mobility and osteoporosis with vulnerability to hip and femur fracture, are common complaints among aged women (Bagchi K, 1999).

From the old studies to the latest studies the commonest findings are prevalence of oral cavity problems, cardio-vascular related problem, gastrointestinal system related problems, respiratory tract problems, which range from 19% to 80% in the elderly subjects (Mehta P, 1999).The prevalence of locomotor disability among the aged is as high as 11,107 per 100,000 in rural areas, while it is 8,781 per 100,000 in urban areas. The elderly females are more likely to have suffered from this problem than elderly males.

**Figure 4.12: Major health problems in depressed women, by age and income level**




In a recent study carried out by Rayand Mehta (2006) on 50 elderly women aged 65 years and above showed higher occurrence of oral cavity problems (84%), GIT problems (46%) and locomotor problems (40%).Similar findings were noticed from a study conducted by Mehta and Desai (2004) on adult depressed women aged (40-50 years), the data on disease profile revealed that nervous system problems ranked first (85%) in the depressed group followed by locomotor (75%) and gastrointestinal tract problems (55%). The nervous system problems included mainly tension, migraine and sleep disturbance. While locomotor problems included mainly of pain in joints.

A study on 90 elderly subjects with dental problems showed a trend of increased problems related to gastrointestinal system, locomotor and central nervous system. Another finding reported was that genito-urinary problems were more prevalent among women compared to men. (Panchal,2000).

In a study conducted by Deoki (1999) in Agra district, it was found that the aged constituted 6.5 percent of the total population and 79 percent had some morbidity, with an average prevalence of 1.6 morbidities per person. The most common morbidities were locomotor, gastrointestinal, respiratory and musculoskeletal problems (48.8 percent, 29.5 percent, 23.3 percent and 10.2 percent respectively). A similar study carried out on the health care of the aged in rural areas by Guha Raj (1994) in the district of Madurai, Tamil Nadu, reported that out of the 1910 elderly screened, 88 percent had vision related complaints, 40 percent had locomotor problems, followed by symptoms of nervous system (19 percent), cardiovascular disease (17 percent), respiratory problems (16 percent), gastrointestinal (10 percent) and psychiatric (9 percent) problems.

**B. MINOR HEALTH COMPLAINTS**

A person in a depressed phase always complains more often about minor illnesses out of curiosity which are the symptoms of depression altogether and needs to be given attention. Therefore an attempt was made to assess the prevalence of minor health complaints in women. Table 4.1.23 below shows the prevalence of minor illnesses in the depressed and non-depressed women.

As can be observed from Table 4.1.23 below, Prevalence of psychological complaints and complaints related to the digestive system was reported in most of the depressed women. Complaints like acidity, indigestion, flatulence, constipation and lack of appetite is mainly reported by elderly depressed women compared to those in the younger counterparts.

More than 50 percent of the younger depressed women reported loss of interest, fluctuation in blood pressure, lack of sleep, low mood and lethargy -

all psychosomatic complaints. Low mood was highly prevalent in the entire group of depressed women.

Also, physical complaints like body ache, ulcers, headache and dryness of skin are more prevalent in older depressed subjects, which is combination of ageing and depression. Conversely, in younger group acidity, psychosomatic problems, dizziness and headaches were reported more, which may be due to menopausal problems, anxiety, and isolation that women face at this stage. Comparatively lower income women amongst adult and older depressed group ranked higher in majority of the minor complaints. The ratio is tend to be higher in women in lower income group because of poverty, lack of accessibility to medical facilities, male dominance, illiteracy , lack of decision making power and many more.

Among women in the non-depressed group the prevalence of all minor complaints was ranged between 5 to 35 percent. Only cough and cold was reported by 50 percent of these women. This shows that prevalence of minor health problems was lesser in non-depressed women as compared to those who are depressed.

Findings of similar study done by Mehta and Desai (2004) showed that the prevalence of feeling of tiredness ranked highest in women who were depressed (85 percent). Problems like acidity (60 percent), backache (55 percent), headache (45 percent) and difficulty in doing daily activities (45 percent) were also more prevalent in this group of women. In the non-depressed group, the only complaints were headache (40 percent) and feeling of tiredness (40 percent), but their prevalence was much lower than that in the depressed group.

**Table 4.1.23: Prevalence of minor health problems in depressed and non-depressed women, by age and income level**

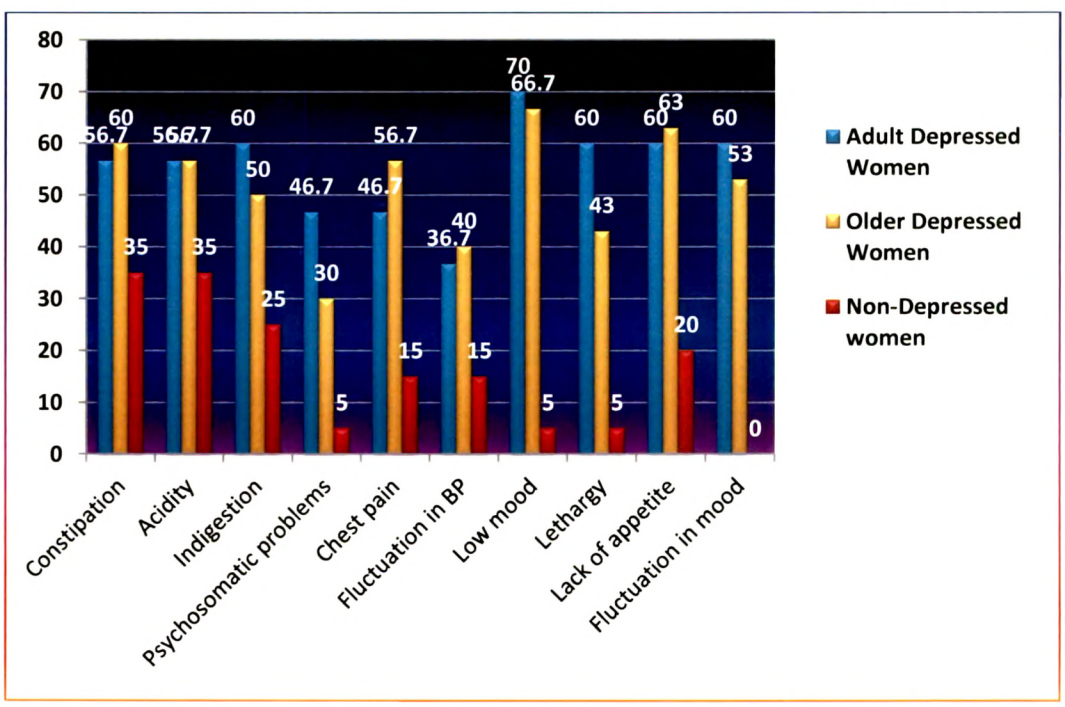
| Type of health complaint | Depressed | | | | | Non-depressed | |
|---|---|---|---|---|---|---|---|
| | 40-60yrs | | | >60yrs | | > 60 yrs | |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| Cold & cough | 56.7 | 36.7 | 43.3 | 50.0 | 60.0 | 56.7 | 50.0 |
| Viral fever | 26.7 | 20.0 | 13.3 | 16.7 | 20.0 | 20.0 | - |
| Malaria | 10.0 | 6.7 | 10.0 | 16.7 | 3.3 | 10.0 | - |
| Infections | 17.2 | 16.7 | 33.3 | 10.0 | 17.2 | 36.7 | - |
| a) Throat | 10.3 | 10.0 | 20.0 | 16.7 | 13.3 | 30.0 | - |
| b) Skin | 10.0 | 6.7 | 20.0 | - | 10.0 | 33.3 | - |
| c) Eyes | 10.0 | 16.7 | 13.3 | 10.0 | 26.7 | 16.7 | - |
| Vomiting | 16.7 | 3.3 | 6.7 | 20.0 | 3.3 | 10.0 | 5.0 |
| Diarrhea | 20.0 | 13.3 | 10.0 | 26.7 | 13.3 | 33.0 | 5.0 |
| Constipation | 56.7 | 56.7 | 43.3 | 66.7 | 60.0 | 56.7 | 35.0 |
| Acidity | 70.0 | 56.7 | 43.3 | 40.0 | 56.7 | 63.3 | 35.0 |
| Indigestion | 56.7 | 60.0 | 43.3 | 53.3 | 50.0 | 56.7 | 25.0 |
| Gas/ flatulence | 43.3 | 43.3 | 50.0 | 70.0 | 44.8 | 70.0 | 35.0 |
| Chest pain | 53.3 | 46.7 | 33.3 | 53.3 | 56.7 | 70.0 | 15.0 |
| No interest | 63.3 | 60.0 | 53.3 | 83.3 | 63.3 | 83.3 | 10.0 |
| Psychosomatic problems | 31.0 | 46.7 | 36.7 | 40.0 | 30.0 | 23.3 | 5.0 |
| Ulcers | 51.7 | 37.0 | 36.7 | 55.2 | 34.5 | 60.7 | 35.0 |
| Body aches | 65.5 | 60.0 | 46.7 | 65.5 | 55.2 | 51.7 | - |
| a) Back ache | 53.3 | 40.0 | 37.9 | 48.3 | 53.3 | 63.3 | 20.0 |
| b) Head ache | 60.0 | 40.0 | 50.0 | 51.7 | 50.0 | 53.3 | 20.0 |
| c) Muscle ache | 53.3 | 46.7 | 36.7 | 58.6 | 46.7 | 30.0 | - |
| Pain in joints | 63.3 | 53.3 | 43.3 | 53.6 | 56.7 | 43.3 | 20.0 |
| Dizziness | 69.0 | 50.0 | 40.0 | 65.5 | 43.3 | 50.0 | 25.0 |
| Dryness of skin | 26.7 | 13.3 | 23.3 | 44.8 | 56.7 | 30.0 | - |
| Trembling of limbs | 17.2 | 26.7 | 3.3 | 20.7 | 17.2 | 36.7 | - |
| Sleep disturbances | 70.0 | 69.0 | 63.3 | 86.2 | 70.0 | 73.3 | 15.0 |
| Fluctuation in BP | 56.7 | 36.7 | 50.0 | 57.1 | 40.0 | 73.3 | 15.0 |
| Low mood | 83.3 | 70.0 | 83.3 | 90.0 | 66.7 | 83.3 | 5.0 |
| Lethargy | 70.0 | 60.0 | 60.0 | 60.0 | 43.3 | 63.3 | 5.0 |
| Lack of appetite | 70.0 | 60.0 | 63.3 | 76.7 | 63.3 | 93.3 | 20.0 |
| Fluctuation in mood | 66.7 | 60.0 | 63.3 | 70.0 | 53.3 | 66.7 | - |
| Pneumonia | 16.7 | 3.3 | 6.9 | 6.7 | 10.0 | - | - |

A study done by Mehta and shah (2006) on 150 depressed women between three age groups (50-59, 60-69 and >70 yrs), the results showed that in the age group of 50-59 yrs most prevalent minor illnesses were low mood (76%), low appetite (74%), body ache (68%), sleep disturbance (66%) and joint pain (64%). In the age group of 60-69 yrs different trend was observed where

highest prevalence was observed in sleep disturbance (82%) followed by low mood (70%), low appetite (68%) and lethargy (66%). Slight difference between the elderly group and oldest group was also observed. The highest prevalence in the age group of 70 + yrs was lack of interest (74%), sleep disturbance (68%), low appetite (66%) and low mood (64%).

Disease profile of the elderly showed problems of the oral cavity (80%), gastrointestinal tract (66%), cardiovascular system (60%), central nervous system (52%) and loco motor function (42%) were the most prevalent major health problem. While joint pain (48%), sleep disturbance (30%), constipation (28%), lack of appetite and fluctuation in mood (26%) were among the commonly prevalent minor health problems among the elderly subjects. A considerable group of subjects (22%) were found to have mild depression (Kohle, 2008).

**Figure 4.13: Percentage of Minor health complaints amongst depressed and Non-depressed women**



In primary care, physicians require sophisticated consulting skills to enable them to differentiate a wide range of symptoms from a complex narrative in a short period of time. Symptoms of depression include classic psychological symptoms, such as low mood, loss of interest, poor concentration, and associated anxiety, and somatic symptoms, such as changes in appetite, lack of energy, sleep disturbance, and general aches and pains. The suspicion of depression is usually raised by the presence of psychological symptoms. However, in approximately two thirds of patients with depression, the clinical picture is dominated by somatic symptoms, such as lack of energy and general aches and pains, which patients frequently attribute to normalizing causes. As a result, many physicians become preoccupied with lengthy investigations into possible underlying organic disease rather than considering depression as a diagnosis. Indeed, depression is mostly difficult to recognize in patients who present with chiefly somatic complaints (APA, 2003).

Women, thus, in their entire life span face several stressful situations coupled with the physiological changes in the course of their physical development and reproductive age in the larger context of a patriarchal society. The complex web of these factors contributes to depression and its associated consequences in women's lives.

## C. MENOPAUSAL ASPECTS

Menopause is the most common cause of depression in women due to hormonal fluctuation taking place after the fourth decade of life. Major endocrine changes occur in women around the age of 45-50 years. There is a marked decline in estrogen production that leads to a series of changes commonly known as menopausal changes. Estrogen modulates neurotransmission at multiple points in the serotonin pathway, which is responsible for causing depression.

Menopause is a complex transition involving biological, psychological, social and cultural factors. Not only is it an inevitable part of aging, but it also evokes moral discourse on gender roles especially that of middle aged women. In the patriarchal Indian society, women's experiences during menopause may be influenced by other life changes like children leaving home, changes in domestic,
social, and personal relationships, anemic status and poor diet, divorce or widowhood, retirement, increased anxiety about illness, aging, and death, lack of financial security, and increased responsibility for aging parents. All these factors may contribute to their depressed state.

Therefore, in the present study an attempt was made to include women's experiences of menopause.

**1. Experience of Menopausal Symptoms**

Symptoms of menopause are varied in their types as well as their severity; many women notice no symptoms other than a gradual cessation of their periods, while others suffer from hot flashes, mood swings, sleep disturbances, sexual problems, etc. In the present study, information was elicited from the women on their types of menopausal symptoms experienced by them. The information was elicited using an exhaustive checklist as well as through free-listing. The menopausal symptoms reported by women have been listed in Table 4.1.24.

As can be observed from the table below, the vasomotor and physiological symptoms frequently reported by women aged 40-60 years as well as those over 60 years of age in the depressed category were: 'hot flushes', 'sleep disturbances', 'headache', 'high blood pressure', 'decrease in appetite'.

**Table 4.1.24: Menopausal symptoms reported by depressed and non-depressed women, by age and income level**

| Symptoms | Depressed | | | | | | Non-Depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | > 60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **Vasomotor** | | | | | | | |
| Hot flushes | 23.3 | 33.3 | 33.3 | 10.0 | 6.7 | 20.0 | 15.0 |
| Sleep disturbances | 46.7 | 46.7 | 56.7 | 30.0 | 20.0 | 63.3 | 35.0 |
| **Physiological** | | | | | | | |
| Headaches | 43.3 | 40.0 | 53.3 | 66.7 | 46.7 | 70.0 | 35.0 |
| Dizziness | 46.7 | 43.3 | 46.7 | 60.0 | 23.3 | 63.3 | 30.0 |
| Breast pain | 13.3 | 23.3 | 20.0 | 20.0 | 16.7 | 6.7 | 5.0 |
| Backache | 30.0 | 30.0 | 26.7 | 33.3 | 20.0 | 43.3 | 10.0 |
| Changes in weight | 23.3 | 40.0 | 43.3 | 30.0 | 30.0 | 30.0 | 30.0 |
| Vaginal pains/ vaginal infection | 16.7 | - | 16.7 | 3.3 | 16.7 | 20.0 | - |
| Cardiac palpitations | 23.3 | 20.0 | 23.3 | 20.0 | 16.7 | 26.7 | 20.0 |
| Changes in vision | 16.7 | 26.7 | 23.3 | 26.7 | 20.0 | 36.7 | 20.0 |
| Heart diseases | 3.3 | 6.7 | 13.3 | 3.3 | 10.0 | 20.0 | 10.0 |
| High blood pressure | 33.3 | 36.7 | 33.3 | 33.3 | 36.7 | 43.3 | 30.0 |
| Low blood pressure | 13.3 | 20.0 | 36.7 | 16.7 | 13.3 | 33.3 | 25.0 |
| Slight memory loss | 33.3 | 50.0 | 46.7 | 53.3 | 53.3 | 46.7 | 5.0 |
| Abdominal pains | 40.0 | 30.0 | 36.7 | 36.7 | 36.7 | 36.7 | 15.0 |
| Abdominal disorders | 16.7 | 16.7 | 33.3 | 33.3 | 33.3 | 23.3 | 5.0 |
| Pain in limbs / joints | 33.3 | 33.3 | 33.3 | 20.0 | 10.0 | 26.7 | 10.0 |
| Decrease in appetite | 36.7 | 43.3 | 33.3 | 33.3 | 36.7 | 53.3 | 10.0 |
| Uneasiness | 20.0 | 30.0 | 23.3 | 30. | 30.0 | 33.3 | - |
| Cold hands and feet | 23.33 | 20.0 | 13.3 | 16.7 | 3.3 | 10.0 | - |
| Pain in back of neck/ skull | 30.0 | 13.3 | 20.0 | 23.3 | 23.3 | 6.7 | 10.0 |
| Tightness in head or body | 33.3 | 20.0 | 13.3 | 13.3 | 10.0 | 26.7 | 10.0 |
| Feeling numb or tingling | 16.7 | 10.0 | 3.3 | 16.7 | 6.7 | 13.3 | 10.0 |
| Feeling of suffocation | 10.0 | 20.0 | 10.0 | 6.7 | 13.3 | 16.7 | - |
| **Psychological** | | | | | | | |
| Irritation | 66.7 | 63.3 | 76.7 | 73.3 | 60.0 | 80.0 | 60.0 |
| Depression/Mood swings | 56.7 | 53.3 | 70.0 | 50.0 | 50.0 | 56.7 | 60.0 |
| Feeling tired or lack of energy | 73.3 | 73.3 | 56.7 | 63.3 | 63.3 | 80.0 | 40.0 |
| Loss of interest in most things | 50.0 | 56.7 | 60.0 | 43.3 | 36.7 | 60.0 | 25.0 |
| Poor concentration | 50.0 | 43.3 | 60.0 | 56.7 | 36.7 | 60.0 | 15.0 |
| Attacks of panic/ feeling of fear | 23.3 | 23.3 | 43.3 | 13.3 | 16.7 | 50.0 | 15.0 |

| Symptoms | Depressed | | | | | | Non-Depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | > 60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| Excitable/ sudden feeling of joy | 23.3 | 20.0 | 40.0 | 20.0 | 13.3 | 23.3 | 10.0 |
| Crying spells | 63.3 | 60.0 | 63.3 | 53.3 | 53.3 | 73.3 | 25.0 |
| Impatient | 30.0 | 33.3 | 53.3 | 40.0 | 23.3 | 63.3 | 20.0 |
| Isolation | 66.7 | 56.7 | 70.0 | 66.7 | 53.3 | 80.0 | 10.0 |
| Nervousness | 30.0 | 36.7 | 36.7 | 16.7 | 10.0 | 26.7 | 5.0 |

Percentage of occurrence of complaints varied from lower income group to high income groups. Complaints like backache (33.3 vs 43.3 percent), change in vision (26.7 vs 30.7 percent), pain in the joints and limbs (20 vs 26.7), slight memory loss (53.3 vs 46.7) and dizziness (60 vs 63.3) were reported mainly by older depressed women which could be associated with aging as well as occurrence of depressive symptoms. In contrast the percent varied in case on non-depressed women.

Psychological symptoms were reported more frequently by both younger depressed women and elderly depressed women. The most commonly reported psychological symptoms, i.e., reported by 60-80 percent of the depressed women were: 'feeling tired', 'irritation', and 'depression', 'loss of interest in most things', 'isolation' and 'nervousness'. 'Crying spells', 'impatience', and 'poor concentration' were reported by 50 percent of the depressed women.

Non-depressed elderly women reported less number of such symptoms as compared to their counterparts who had depression. They mainly reported physiological symptoms (between 20-30 percent) they were experiencing due to increasing age. Moreover, most of these women lived in joint families, received help from their daughters-in-law, and had better social support.

Menopausal symptoms reported by other studies are: irregular bleeding, hot flushes, burning sensation, vaginal dryness which creates sexual difficulties,

pain in the limbs and joints (Mukherjee, Nayak and Mullick, 1996; Kuh et al., 1997; Indira, 1979), sleep problems, sore breasts, palpitations and dizziness (Porter et al., 1996). Along with physiological changes, other psychological changes are said to constitute the menopausal symptoms like anxiety, depression, poor concentration, fatigue (Mukherjee, Nayak and Mullick, 1996; Kuh et al., 1997), irritation, feeling of inability to cope, mood swings (Kaufman, 1967; Ballinger, 1976; Indira, 1979; Porter et al., 1996; Nagar, 1997). However these symptoms are strongly associated with current family and work stress (Gath et al., 1987; Kuh et al., 1997; Ramamurthy, 1997), the loss of a parent, ill health of husband, extra marital affair of partner and loss of income (Ramamurthy, 1997). Thus menopause is the time when women are experiencing changes in roles, responsibilities and relationships towards their children and spouse and are required to make many adjustments.

**2. Management of menopause**

Women were asked whether they had sought treatment for their menopausal health symptoms. None of the women had sought treatment for any of the health symptoms related to menopause that they experienced, though majority of the women strongly agreed that a woman should seek treatment for general as well as reproductive health problems.

About 100 women reported that either their spouses or they themselves took the decision to go for treatment. In all the families, mostly the husband bore the expenses for treatment. Yet, women did not seek treatment. This may be because those health symptoms did not hinder their daily routine, so the treatment was not considered important. In India, even if the actual need is great, it is affected by women's perception about their ill health and their conditioning to tolerate suffering (Bang and Bang, 1986). There might be a difference between actual need and perceived need.

Menopausal or post-menopausal women refuse to undergo gynecological examination as they do not feel the necessity of an internal examination once they have stopped menstruating. This was also observed in another study of

the situation of women's health in the slums of Bombay (Mulgaonkar et al., 1994). Thus, women have a tendency to either ignore or neglect their own health problems.

For treatment of menopausal symptoms and related diseases HRT has been used for some time now. There are several studies showing benefits of HRT or estrogen replacement therapy. A study conducted by Miller (2002) reported remission of depression in 68 percent women (age 40-55 years) receiving ERT compared to the control group. ERT has been reported providing cardiovascular benefits by protecting against atherogenic changes in LDL and HDL cholesterol in 211 postmenopausal women who were recruited in the study conducted at the University of Pittsburgh (Egeland et al., 1990).

Recently, uses of HRT have been questioned and many such studies show the harmful effects of using HRT. Hence this has made long-term use of HRT low despite of its several proven benefits.

Estrogen has been shown to increase the number of sites available for active transport of 5-HT into brain cells. Hence ERT or estrogen replacement therapy now known as Hormone replacement therapy is advised in peri-menopausal depression. In the present study, women were asked if they had undergone HRT or hysterectomy. Their responses have been presented in Table 4.1.25.

**Table 4.1.25: HRT and Hysterectomy sought by depressed and non-depressed women, by age and income level**

| Responses | Depressed | | | | | | Non-Depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60 yrs | | | > 60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **HRT** | | | | | | | |
| a. Yes | 3.3 | - | 3.3 | - | - | 6.7 | 5.0 |
| b. No | 96.7 | 93.3 | 96.7 | 96.7 | 86.7 | 93.3 | 95.0 |
| c. No response | - | 6.7 | - | 3.3 | 13.3 | - | - |
| **Hysterectomy** | | | | | | | |
| a. Yes | - | 6.7 | 3.3 | 3.3 | 10.0 | - | - |
| b. No | 16.7 | 13.3 | 23.3 | 20.0 | 23.3 | 26.7 | 10.0 |
| c. No response | 83.3 | 80.0 | 73.4 | 76.7 | 66.7 | 73.3 | 90.0 |

From the above table it can be observed that hardly 3 percent of low income and high income women in the 40-60 age groups and 6.7 percent of high income women aged 60 years and above had undergone HRT. Hysterectomy was reported by 6.7 percent middle income women in the younger age group and 10 percent of middle income women in older age group.

None of the middle income women above the age of 60 years in the depressed category had undergone HRT and 10 percent of them had undergone hysterectomy, whereas 5 percent of their counterparts in the non-depressed category had undergone HRT and none of them had undergone hysterectomy.

## 2. Perception about Menopause

As mentioned earlier, the symptoms of menopause vary in their types and severity and how women perceive these changes in their life also affects their ability to cope with these changes. Therefore, in the present study, women were asked – "Do you think menopause brings changes in the life of a woman?" The responses of both women in the depressed and non-depressed categories are presented in Table 4.1.26.

**Table 4.1.26: Perception of depressed and non-depressed women on the effect of menopause on the life of women**

| Question | Depressed | | | | | | Non-depressed |
|---|---|---|---|---|---|---|---|
| | 40-60 yrs | | | >60yrs | | | > 60 yrs |
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 | MIG n=20 |
| | % | % | % | % | % | % | % |
| **Does menopause bring changes in the life of a woman?** | | | | | | | |
| a. Yes | 40.0 | 53.3 | 66.7 | 40.0 | 33.3 | 70.0 | 45.0 |
| b. No | 43.3 | 20.0 | 6.7 | 40.0 | 43.3 | 16.7 | 50.0 |
| c. No response | 16.7 | 26.7 | 26.6 | 20.0 | 23.4 | 13.3 | 5.0 |

As can be observed from the table, among adult depressed women, over half of the women from middle income and high income groups replied in the affirmative that menopause does bring changes in one's life, while 40 percent of low income women felt the same. This could be attributed to the fact, that most of the low income group women had low awareness about menopause and they did not realize the changes brought about by menopause and therefore they took it as a part of their life.

Among older women in the depressed category, about (70 percent) of women from high income group agreed that menopause brings changes in a woman's life, whereas only (40 percent)of the low income women and (33 percent)of the middle income women in the same age group were of the same opinion.

The types of changes mentioned by women were mainly health problems, change in lifestyle and change in relationships within the family and society. A comparison between responses of older, middle income women in the depressed and the non-depressed group showed that a higher percentage of women in the non-depressed group (45 percent) than those in the depressed group (33 percent) were of the opinion that menopause brings changes in the life of a woman. Non-depressed group stated more of physiological problems and experiences, while their counterparts in the depressed category mentioned psychosocial changes that accompany hormonal changes during menopause.

The experience of menopause is subject to cultural influences. In developed countries, especially in the West, menopause causes different reactions, where women perceive the cessation of menstrual periods is a sign of the decline in womanhood and femininity. They fear the onset of aging, which results in a greater sense of loss (Ramamurthy, 1997) and they seek medical attention for problems, which Indian society accepts as normal.

Large multicentric studies have shown that women who had a more positive attitude towards menopause were less likely to be concerned about body changes or looking older, and they were also less likely to report depression.

Women are two to three times more likely than men to experience a major depressive episode during their lifetime. The underlying cause of the gender difference in depression and other mood disorders is not entirely clear, but the differences, which begin rather dramatically at puberty and become less marked after menopause, strongly suggest a link to fluctuating estrogen and progesterone levels.

Although hormones fluctuate in both men and women, the fluctuations are much more pronounced in women, particularly around their menstrual cycles, during the weeks immediately after pregnancy (postpartum), and in the period leading up to menopause (perimenopause).

Post-menopausal women also suffer from depression but their reasons are different like loss of spouse, loss of job, loss of responsibility, lack of vision, physical morbidity and many others. Therefore adult women who are already having depression may further worsen during their old age. Hence it is important to tackle this problem at early menopausal age.

Thus, we can conclude from this part of the study that further research is needed, to identify the specific genetic markers that might lead to a better understanding of how the balance between estrogen, progesterone, testosterone, and other reproductive hormones that affects brain function and increases women's susceptibility to depression.

## 7) PSYCHO-SOCIAL ASPECTS OF MODERATELY DEPRESSED WOMEN

The diagnosis pattern extensively used in psychiatry is often criticized due to its failure to consider women's psychological needs and the social realities that differ from men. According to Taylor (1988) etiology of women's distress is different and psychology of women needs to be understood in the context of the patriarchal social relations. The exposure to stressful events, the nature of mental health problem, the manifestation of the disorder and even the social and familial responses differ in case of women from men.

There are several factors in a person's background that constitute a risk for depression, and life events which are responsible. Precipitating factors can be stressful life events such as bereavement, acute physical illness of self or someone close, major financial crisis, negative interactions with family members or friends, etc. Other chronic stressors are declining health, dependence, socio-economic decline, marital difficulties, problems at work, retirement or loneliness and isolation.

Besides these risk factors and precipitating factors there are protective factors against depression, such as good nutrition, physical fitness, adaptive, integrated personality, capacity for confiding relationships, active coping styles to overcome adversity (as opposed to helplessness), besides a tangible social support and religious/spiritual beliefs.

Thus psycho-social aspects play an important role in determining progression of depression in women. Living conditions, marital status, cultural factors, contradictions in the image and expectations, burden of fulfilling multiple roles, conflict in relationships, experience of violence, neglect or abuse, women's status within the power structure of the family, stressful life events – all these aspects have a bearing on the mental health of women. Therefore an attempt was made in the present study to collect information in this regard through in-depth interviews with 180 moderately depressed women aged 40 years and above. The parameters studied were 1) Power structure 2) Loneliness & isolation, 3) Stress and 4) Self esteem.

Pre tested Questionnaire was used for collecting information on above parameters. The data obtained for following parameters were analyzed using appropriate statistical tests. The findings have been presented in this section under following heading:

1. **POWER STRUCTURE**
2. **LONELINESS & ISOLATION**
3. **STRESSFUL EVENTS**
4. **SELF ESTEEM.**

The details of each parameter have been discussed in detail as under.

## 1. POWER STRUCTURE

The low status accorded to women within their families is said to be associated with depression, particularly in elderly women. In the present study an attempt was made to understand women's position in the existing power structure in their families. To measure the existing power structure, the main parameters were: a) households headed by women; b) their involvement in household responsibilities and their perceptions regarding the same; c) their involvement in decision-making on various important aspects (e.g. health, education, marriage of children and finance besides purchasing groceries, preparing meals and fulfilling other social obligations); d) their access to and control over the family's finances. Each of these parameters is discussed below.

### a. Women-headed households

As per table 4.1.27 below, among the younger depressed women aged (40-60 years), the percentage of women who reported self as the head of their household was highest in the high income group (56.7 percent) followed by low income (46.7 percent). Among middle income women in the same age group, husband was the head of the household in the majority of the households (53.3 percent).

In case of older depressed women (above 60 years), the percentage of women who reported self as the head of their household was the highest in the low income group (53.3 percent). Among middle income women in this age group, the head of the household was either the woman herself (36.7 percent), or her husband (33.3 percent), while in the high income group the head of the household was the husband (33.3 percent), followed by the women themselves (26.7 percent). Many of the older depressed women belonging to middle and high income group also mentioned their son being the head of the household (20 percent each).

Overall, majority of the women belonging to low income group headed their households, although a substantial percentage of them were homemakers (with 46.7 percent in both age groups not working, i.e. earning) and were married (73.3 percent in 40-60 year age group and 50.0 percent in the 60 years and above age group respectively). Usually single women, widows and women having a source of income are expected to be the head of the household as per our societal norms.

Older depressed women belonging to middle income group also reported the highest percentage for 'self' as head of household, but there was not much difference with the second most representative category, i.e. 'husband' (3.4 percent only). This could be due to the fact that a greater percentage of women in this group were widowed or single (53.3 percent combined) as compared to married women (46.7 percent).

There was a difference in the power structure of middle income women amongst adult and older depressed women of the two age groups. 'Husband' was the head of the household in the maximum number of younger middle income homes, while there was an almost equal distribution among 'self' and husband in the older middle income homes. It was expected that 'Husband' has more power, being the head of the household, in the middle income group, as most of the younger middle income women (i.e., age 40–60 years) were married (90 percent) and are homemakers (70 percent).

It may be noted that in none of the categories is the daughter-in-law the head of the household, while son and daughter-in-law together as head of the household have been reported by a small percentage of middle and high income women in the older age group (though 39.3 percent women are living in joint families and 21.4 percent women are living with the daughter-in-law).

Son as head of households forms the third most representative category among older middle income and high income women (here widows constituted 43.3 percent and 23.3 percent respectively of middle and high income women age 60 years and above), thus reflecting the patriarchal character of Indian society where sons take charge of households after the father's death.

Majority of the women had expressed 'satisfaction' with the power structure within their families.

### B. Involvement in household responsibilities

At least 90 percent of the women across age and income group, with the exception of middle income women in the older age group (86.7 percent), responded in the affirmative when asked if they were taking part in household responsibilities.

While most middle and high income women in both age groups took part in household responsibilities by choice, more low income women (in both age groups) carried out household responsibilities due to compulsion or due to circumstances. Thus low income women seem to feel that they were overburdened by the workload and responsibilities of running the household.

**Table 4.1.27: Power structure and involvement in household responsibilities by women with depression, by age and income level**

| Particulars | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| **Household headed by** | | | | | | |
| 1. Self | 46.7 | 33.3 | 56.7 | 53.3 | 36.7 | 26.7 |
| 2. Husband | 20.0 | 53.3 | 30.0 | 30.0 | 33.3 | 33.3 |
| 3. Mother-in-law | 10.0 | 6.7 | 6.7 | - | - | 10.0 |
| 4. Father-in-law | 6.7 | - | - | 3.3 | - | - |
| 5. Father | - | 3.3 | 3.3 | 3.3 | 6.7 | - |
| 6. Mother | 6.7 | - | - | - | - | - |
| 7. Son | 6.7 | 3.3 | 3.3 | 3.3 | 20.0 | 20.0 |
| 8. Daughter-in-law | - | - | - | - | - | - |
| 9. Son + Daughter-in-law | - | - | - | - | 3.3 | 6.7 |
| 10. Husband +Mother-in-law | - | - | - | 3.3 | - | - |
| 11. Other | 3.3 | - | - | 3.3 | - | 3.3 |
| **Feelings about self/others heading household** | | | | | | |
| 1. Satisfied | 63.3 | 63.3 | 79.3 | 76.7 | 83.3 | 56.7 |
| 2. Unsatisfied | 20.0 | 13.3 | 13.8 | 13.3 | 6.7 | 16.7 |
| 3. Not Sure | 16.7 | 23.4 | 6.9 | 10.0 | 10.0 | 26.6 |
| **Whether taking part in household responsibilities** | | | | | | |
| 1. Yes | 90.0 | 93.3 | 96.7 | 90.0 | 86.7 | 93.3 |
| 2. No | 10.0 | 6.7 | 3.3 | 10.0 | 13.3 | 6.7 |
| **If yes, then** | | | | | | |
| 1. By choice | 33.3 | 57.1 | 75.9 | 18.5 | 65.4 | 57.1 |
| 2. By compulsion | 22.3 | 25.0 | 3.4 | 44.4 | 15.4 | 17.9 |
| 3. Due to circumstances | 40.7 | 17.9 | 20.7 | 33.3 | 19.2 | 25.0 |
| 4. No Response | 3.7 | - | - | 3.7 | - | - |

### C. Involvement in decision-making on family related matters

Table 4.1.28 showed that the areas in which women were involved in 'decision making'. In health related aspects most of the depressed women across all income categories and both the age groups were involved in taking decisions.

Regarding involvement in decision making on financial aspects, lesser percentage of women were found to be taking decisions in most groups except high income women from the younger depressed women and low income women from the older depressed women, where the percentages of women saying 'yes' and 'no' were equal.

In matters relating to education and marriage of children difference was observed. Younger depressed women were more involved in taking decisions related to education of the children compared to their counterparts. Whereas older depressed women were involved in taking decisions related to marriage part. The roles were distributed as per societal requirements.

**Table 4.1.28: Involvement of women with depression in decision-making on family related matters, by age and income level**

| Particulars | | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|---|
| | | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| **Whether women take decisions in matters related to** | | % | % | % | % | % | % |
| 1. Health | Yes | 80.0 | 96.7 | 90.0 | 73.3 | 83.3 | 80.0 |
| | No | 20.0 | 3.3 | 10.0 | 26.7 | 16.7 | 20.0 |
| 2. Financial | Yes | 40.0 | 30.0 | 50.0 | 50.0 | 36.7 | 36.7 |
| | No | 60.0 | 70.0 | 50.0 | 50.0 | 63.3 | 63.3 |
| 3. Charity / Donation | Yes | 46.7 | 56.7 | 86.7 | 53.3 | 43.3 | 53.3 |
| | No | 53.3 | 43.3 | 13.3 | 46.7 | 56.7 | 46.7 |
| 4. Education of children | Yes | 53.3 | 66.7 | 56.7 | 53.3 | 26.7 | 46.7 |
| | No | 46.7 | 33.3 | 43.3 | 46.7 | 73.3 | 53.3 |
| 5. Marriage of children | Yes | 53.3 | 36.7 | 36.7 | 60.0 | 50.0 | 53.3 |
| | No | 46.7 | 63.3 | 63.3 | 40.0 | 50.0 | 46.7 |
| 6. Other matters relating to children e.g. buying clothes | Yes | 36.7 | 53.3 | 50.0 | 43.3 | 23.3 | 43.3 |
| | No | 63.3 | 46.7 | 50.0 | 56.7 | 76.7 | 56.7 |
| 7. Purchasing | Yes | 73.3 | 66.7 | 76.7 | 63.3 | 33.3 | 66.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | No | 26.7 | 33.3 | 23.3 | 36.7 | 66.7 | 33.3 |
| 8. Preparing Meals | Yes | 76.7 | 83.3 | 80.0 | 66.7 | 50 | 66.7 |
| | No | 23.3 | 16.7 | 20.0 | 33.3 | 50 | 33.3 |
| 9. Social obligations | Yes | 66.7 | 60.0 | 83.3 | 60.0 | 56.7 | 83.3 |
| | No | 33.3 | 40.0 | 16.7 | 40.0 | 43.3 | 16.7 |
| 10 Any other e.g. like going | Yes | 20.0 | 3.3 | 26.7 | 30.0 | 10.0 | 16.7 |
| a movie or restaurant etc. | No | 80.0 | 96.7 | 73.3 | 70.0 | 90.0 | 83.3 |
| **Whether others are consulted while making decisions** | | **n=22** | **n=27** | **n=23** | **n=15** | **n=14** | **n=21** |
| Yes | | 46.7 | 90.0 | 63.3 | 13.3 | 66.7 | 70.0 |
| No | | 53.3 | 10.0 | 36.7 | 86.7 | 33.3 | 30.0 |

More women were involved in decision making related to purchasing, preparing meals and fulfilling social obligation across all groups with the exception of the middle income women in the older depressed women in matters related to purchase.

Middle income women in the older depressed group were found to be less involved compared to other groups in other areas also such as 'education of children', 'other matters, relating to children' and 'other decisions' like going to a movie or 'going out to eat', etc. This is could be due to the fact that there are less number of women educated above secondary level among older middle income women as compared to the younger middle income women and high income women of both age groups. Also, this group (i.e., middle income women age 60 years and above), has the highest percentage of widows, many of them living in a joint family indicating that their sons may have taken over the 'decision making'.

In spite of being involved in so many aspects of decision making a lesser percentage of women took decisions related to other aspects like 'going out to a movie' or going out to a restaurant, etc. This indicates that when it comes to social and entertainment activities, the preferences of women were not prioritized and were given less importance.

Over all, low income women in both the depressed adult and older women seem to be more independent in taking decisions than others. This was

evident in the high percentage of younger depressed low income women (53.3 percent) and older depressed low income women (86.7 percent) stating that they did not consult other while making decisions. A possible explanation for this could be that more women from this group were living in nuclear families as compared to joint families (56.6 low income women age 40-60 years and 53.3 percent low income women age 60 years and above). The percentage of women who took decisions independently were the highest among low income women over the age of 60 years, probably because, 20.0 percent women in this group were living alone. Yet this is relatively higher when compared with older low income women living in nuclear family (53.3 percent) indicating that low income women in joint families were also taking decisions independently.

Majority of the women in the middle and high income groups consult others when they make decisions, with as high as 90 percent middle income women age 40-60 years reporting the same, even though the percentage of high and middle income women living alone or in a nuclear family was higher than those living in a joint family (66.7 percent and 60 percent respectively for middle income women in the two age groups; 63.4 and 53.3 percent respectively for high income women in the two age groups).

Women, who consulted others for decision-making, across both age groups and all income categories, generally took their husband's advice in decision making in all aspects. Some take the advice of their son, even daughter-in-law. Decision-making within the family is a crucial aspect linked to the status and power enjoyed by the member within the family as well as in society. Women's participation in this sphere varies widely from one end of the continuum of very little participation to a total power for decisions at least in selected spheres of personal and family life. Data from Baroda households revealed that women have begun to play major roles in the decision-making process in terms of either taking more responsibility, joint decisions with husband and children, which is perceived as change from the past. However in the rural sample spouses or other family members made decisions in two thirds of cases and women participated in decision-

making only in a third of the families. Most families (80 percent) believed that gender and authority within family dictated the decision-making process (Sriram, 1999).

**D. Access to and control over financial resources**

Except low income women in the age group of 40-60 years, across all income groups and both age groups, most women report *not* being financially independent. This implies that even though women may belong to a higher income group, yet they may not be financially independent. Low income depressed women aged 40-60 years form the highest percentage of 'partially' independent women, when compared with other low income women in the older age group as well as middle and high income women of both age groups.

There was a marked difference between high income women in the two age groups who are financially independent, 42.9 percent of the older high income women are fully independent financially as compared to 21.4 percent of younger high income women, despite the fact that more high income women in the younger age group (26.7 percent) are retired and 13.3 percent working compared to 10.0 percent retired and 36.7 percent working (in younger low income group).

**Table 4.1.29: Control of women depression over their family's finances, by age and income level**

| Particulars | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| **Whether women are financially independent** | | | | | | |
| Fully | 10.0 | 19.0 | 21.4 | 18.8 | 27.3 | 42.9 |
| Partially | 50.0 | 14.3 | 7.1 | 31.3 | 9.1 | 14.3 |
| Not at all | 40.0 | 66.7 | 71.4 | 50.0 | 63.6 | 42.9 |
| **Whether women have control over family's finances** | | | | | | |
| Fully | 33.3 | 30.0 | 53.3 | 46.7 | 26.7 | 30.0 |
| Partially | 43.3 | 53.3 | 33.3 | 30.0 | 50.0 | 46.7 |
| Not at all | 23.4 | 16.7 | 13.4 | 23.3 | 23.3 | 23.3 |
| **If not fully, family's finances are controlled by** | | | | | | |
| 1. Husband | 35.0 | 57.1 | 64.3 | 31.3 | 31.8 | 19.0 |
| 2. Father-in-law | 10.0 | - | 7.1 | - | - | - |
| 3. Mother-in-law | 5.0 | 4.8 | - | - | - | 4.8 |
| 4. Father | 10.0 | - | - | - | - | - |
| 5. Mother | 5.0 | - | - | - | - | - |
| 6. Son | 10.0 | 14.3 | 7.1 | 25.0 | 36.4 | 14.3 |
| 7. Daughter-in-law | 5.0 | - | 7.1 | - | - | - |
| 8. Son + Daughter-in-law | 5.0 | 4.8 | - | - | 9.1 | 9.5 |
| 9. Others | - | 4.8 | - | - | 4.5 | 4.8 |
| 10. No Response | 15.0 | 14.2 | 14.3 | 43.8 | 18.2 | 47.6 |
| **Women's feeling about it** | | | | | | |
| Satisfied | 25.0 | 61.9 | 50.0 | 43.8 | 72.7 | 47.6 |
| Dissatisfied | 50.0 | 23.8 | 21.4 | 43.8 | 9.1 | 28.6 |
| Not Sure | 25.0 | 14.3 | 28.6 | 12.5 | 18.2 | 23.8 |
| **Whether financial needs of** | | | | | | |

| Particulars | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| **their family are met** | | | | | | |
| Fully | 5.0 | 47.6 | 85.7 | 12.5 | 63.6 | 76.2 |
| Partially | 40.0 | 47.6 | 14.3 | 68.8 | 36.4 | 23.8 |
| Not at all | 55.0 | 4.8 | - | 18.8 | - | - |
| **Whether women support others financially** | | | | | | |
| Yes | 20 | 28.6 | 78.6 | 18.8 | 36.4 | 38.1 |
| No | 80 | 71.4 | 21.4 | 81.3 | 63.6 | 61.9 |

It was evident from the above table that even though lesser percentage of women were financially independent, a higher percentage of them had 'full' or 'partial' control over their family's finances. The percentage of women having full control over the family's finances was the highest among high income women in the 40-60 age group (even though only 6.7 percent of women in this group are living alone and 36.7 are working) followed by the older low income women (20 percent of these women are living alone and 40 percent are still working).

Most middle income women in both age groups had 'partial' control only. For the younger middle income group women, this was expected as 90 percent were married and only 23.3 percent were working. However, among the older middle income women, 43.3 percent are widowed and 10.0 percent were still working, indicating that control over family's finances has passed on from father to son. (36.7 percent live in a joint family and 60 percent in nuclear family and alone).

Among younger women, regardless of the income group, the control over the family's finances lie with their husbands. There was a difference in the percentage of husbands who have control over the family's finance in the middle and high income groups in both age groups of depressed women.

If ones relates this to the power structure, one finds that women had not reported 'self" as head of households indicating that finances are more in the husband's hands or son's hands. In older middle income group women 'sons' as controllers of family's finances constitute the highest percentage. A substantial percent of older women in the low and high income groups have not responded to the question.

Regarding satisfaction with control of financial matters of the family, in both the age groups, a greater percentage of middle income women were satisfied with the control of financial matters in their family. More low income women in both age groups were 'dissatisfied' in both age groups, though more older low income women are satisfied than their younger counterparts.

In the high income group, women are divided about the feeling of being satisfied, dissatisfied and are unsure about their feeling regarding the structure of financial controls in their families.

When asked the question 'Are financial needs of your family met?' most middle and high income women stated that they were fully met. As expected most low income women stated that their financial needs were either not met at all or were met only partially. There is a significant difference in percentage of low income women of the two age groups who stated that their family needs were not at all met (55 percent in the 40–60 age group and 18.8 percent in the age of 60 years and above). This could be because the younger low income women may be having more needs and aspirations, while the older low income women may have accepted their condition and learnt to live with the existing means (though 68.8 percent of older low income women report their financial needs to be only 'partially met').

Most women in the low and middle income groups of both age groups do not support others financially. Most of the older high income women also do not support others. However, low income women of both age groups (20 percent in the 40-60 age group and 18.8 percent in the 60 years and above age group) support others financially even though they themselves might not be satisfied with the existing financial resources that they have.

There is a significant difference between high income women of the two age groups regarding financial support provided to others. Higher percentage of older high income group women did not support others, while more high income women in the younger age group supported others financially.

## 2. EXPERIENCE OF LONELINESS / ISOLATION

Social isolation has been a central concern in research on health, but indicators of isolation vary widely both across and within disciplines. Sociologists interested in family and living arrangements have focused on the negative health effects of living alone (Dean et al. 1992; Hughes and Gove 1981) and being unmarried (Lillard and Waite 1995; Ross 1995). Social network research has demonstrated health risks associated with having a small social network (Berkman and Syme 1979; Seeman et al. 1994), infrequent contact with network members (Brummett et al. 2001), and a lack of social network diversity (Barefoot et al. 2005).

*Social disconnectedness* can be characterized by a lack of contact with others. It is indicated by situational factors, like a small social network, infrequent social interaction, and lack of participation in social activities and groups. *Perceived isolation,* on the other hand, can be characterized by the subjective experience of a shortfall in one's social resources such as companionship and support. Feelings of loneliness and not belonging, for example, indicate a perceived inadequacy of the intimacy or companionship of one's interpersonal relationships compared to the relationships that one would like to have (van Baarsen et al. 2001). Loneliness is only weakly correlated with social network size and frequency of interaction with network

members (Fees, Martin, and Poon 1999; Hawkley et al. 2003; Hughes et al. 2004).

It can be gathered that over the years, most of the relationship of the women have either weakened or have remained the same and most of the women, especially women above 60 years of age, also had conflicts in their relationships. It is therefore not very surprising that majority of the women across age and income groups feel loneliness and isolation.

**Table 4.1.30: Loneliness and isolation experienced by women with depression, by age and income level**

| Whether experience | 40–60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| **Loneliness** | | | | | | |
| Yes | 86.7 | 76.7 | 86.6 | 83.3 | 93.4 | 96.7 |
| No | 13.3 | 23.3 | 13.3 | 16.7 | 6.7 | 3.3 |
| **Isolation** | | | | | | |
| Yes | 60.0 | 50.0 | 63.3 | 70.0 | 40.0 | 70.0 |
| No | 40.0 | 50.0 | 36.7 | 30.0 | 60.0 | 30.0 |

It can be seen from the above table that younger depressed women, an equal percentage of low income and high income women (87 percent) reported feeling of loneliness, whereas a comparatively lower percentage of middle income women in this age group reported the same. In older depressed women, loneliness was reported highest by high income women (96.7 percent), followed by middle income women (93.4 percent) and low income women (83.3 percent).

As women age their status within the household diminishes. They are no longer considered active participants in the house. Also, age brings along with it failing health and other psycho-social set-backs such as widowhood, or

separation from children due to break-down of joint families. Hence, lack of support within and outside the family, changing life style, break-down of joint family system, loneliness may be experienced more by elderly women.

Most researchers have found that elderly women are more likely than elderly men to feel lonely. A study by the authors of this article found gender to be a significant predictor of social isolation, but not loneliness. Women's increased longevity compared to men's means many live alone, and many also experience chronic health problems that can limit social interaction. However men appear to have a harder time coping with the loss of their spouse as they often have a smaller social support system than women and fewer intimate contacts including contacts with family.

Social isolation and loneliness have consistently been found to be associated with health. Declining physical health may lead to social isolation and associated feelings of loneliness. Perceived loneliness has been found to be one of the strongest predictors of health and the use of health care services among institutionalized seniors. Loneliness has also been found to be associated with diabetes, heart disease, ulcers, respiratory conditions, headache, low back pain and abdominal pain.

Sociologists have also identified low participation in social activities, particularly volunteering and religious attendance, as a health risk (Benjamins 2004; Thoits and Hewitt 2001). Perceived social support has been linked to physical and mental health by both sociologists and psychologists (Blazer 1982; Krause 1987; Lin, Ye, and Ensel 1999). Finally, a large body of psychological research has demonstrated a robust association between loneliness and worse health, including depression (Cacioppo et al. 2006; Hawkley et al. 2006; Steptoe et al. 2004). The risks associated with social isolation, in one form or another, are clear. However, the variety and complexity of individuals' social worlds can scarcely be captured with only one or two measures. It is therefore difficult to determine from previous research whether various aspects of social isolation combine or work separately to influence health outcomes.

With regard to feeling isolated, about two-thirds of low and high income women in the 40-60 age group and 70 percent low and high income women above the age of 60 reported feeling isolated. Isolation was comparatively less reported by middle income women in both age groups. Overall, the percentage of women reporting isolation was comparatively lesser than that of women reporting loneliness. This maybe so because, despite feeling lonely, they have a better support system, wherein they are able to confide in or share with others (friends, neighbors, etc.) their personal, health related or other general matters. One of the verbatim has been quoted as under during the interview session by adult depressed women belonging to middle income women:

"*I do feel lonely lately as my children have grown up and are able to take care of themselves. So, whenever I try to do or say something to them, they argue and don't listen to me. Hence, I feel that no one is bothered about me or listens to me. Even my husband does the same. But then I do know that when crisis come along, i.e. when I am sick, or have any other problems, these very people will be there to take care of me and they will not abandon me.*

It may also be noted that experience of isolation was reported by a relatively less percentage of middle income women above 60 years.

How women cope with loneliness and isolation has been depicted in Table 4.1.31.

As it can be observed from the table, the most frequently used coping strategy for loneliness by women age 40–60 years is to 'cry', as reported by 34.6 percent, 34.8 percent and 30.8 percent of low, middle and high income women respectively. Among women above the age of 60, crying is the most frequently used coping strategy by low income (36 percent) and high income women (37.9 percent). However, the most frequently used coping strategy of middle income women in this age group is 'diverting mind to other work" (39.3 percent).

Looking into the coping strategy for isolation, it may be said that a more or less similar pattern of response as that for loneliness emerged, with tolerance or crying as the main strategy used by low income (44.8 percent) and high income women (36.8 percent) age 40-60 years. Doing nothing (26.7 percent) is the coping strategy used more frequently by middle income women in the same age group. Similarly, among women age 60 years and above, the strategy used by low income and high income women to cope with isolation was to tolerate or cry (38.1 percent each).

**Table 4.1.31: Strategies of women with depression to cope with loneliness and isolation, by age and income level**

| Strategy | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=26 | MIG n=23 | HIG n=26 | LIG n=25 | MIG n=28 | HIG n=29 |
| | % | % | % | % | % | % |
| **To cope with loneliness** | | | | | | |
| Take God's name/*Mantra-Jaap*, prayer | 11.5 | 17.4 | 15.4 | 24.0 | 32.1 | 13.8 |
| Talking to others | 23.1 | 13.0 | 15.4 | 28.0 | 14.3 | 17.2 |
| Diverting mind to other work | 34.6 | 26.1 | 30.8 | 8.0 | 39.3 | 24.1 |

| Strategy | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=26 | MIG n=23 | HIG n=26 | LIG n=25 | MIG n=28 | HIG n=29 |
| | % | % | % | % | % | % |
| Sleeping | 3.8 | 8.7 | 3.8 | 32.0 | 3.6 | 17.2 |
| Cry | 34.6 | 34.8 | 30.8 | 36.0 | 25.0 | 37.9 |
| Do nothing | 11.5 | 8.7 | 0 | 8.0 | 17.9 | 20.7 |
| Meditation | 0 | 8.7 | 0 | 0 | 3.6 | 3.4 |
| Any other* | 26.9 | 43.5 | 34.6 | 20.0 | 25.0 | 41.3 |
| No Response | 0 | 4.3 | 3.8 | 0 | 0 | 0 |
| **To cope with isolation** | **n=18** | **n=15** | **n=19** | **n=21** | **n=12** | **n=21** |
| Tolerate / Cry | 44.4 | 6.7 | 36.8 | 38.1 | 16.7 | 38.1 |
| Meditation / Visit Temple | - | 20.0 | 21.1 | - | 16.7 | 4.8 |
| Music / T.V. | - | 13.3 | 5.3 | - | 8.3 | - |
| Go for walks | - | 6.7 | 5.3 | 4.8 | - | - |
| Visit relatives | - | 6.7 | - | 4.8 | - | - |
| Revolt | 27.8 | 13.3 | 10.5 | 14.3 | 16.7 | 14.3 |
| Divert mind to work | 5.6 | 13.3 | 26.3 | 14.3 | 16.7 | - |
| Find solutions | 11.1 | 13.3 | - | 4.8 | 25.0 | 19.0 |
| Do nothing | 11.1 | 26.7 | 10.7 | 28.6 | 8.3 | 14.3 |
| Any other** | 22.2 | 6.7 | 10.5 | 23.8 | 8.3 | 28.6 |
| No Response | 5.6 | 6.7 | - | - | - | 4.8 |

***Note:*** *'Any other' includes responses such as smoking, eating, reading, joining a social group, or a kitty party group. **'Any other' includes 'remember the past'/'husband', 'cursing self', 'daydreaming', 'going for walks', 'playing with grandchildren'.

It may be noted that 'find solutions' as the most frequently reported coping strategy by middle income women over the age of 60 (25 percent) which explains why women in this category feel least isolated as compared to women in the other groups. Also, tolerance or crying as coping strategy has been reported least by middle income women in both age groups, whereas this strategy is most frequently reported by women in other income groups.

'Find solutions' means that women in this group tried to talk about the issues which led to conflicts or the engaged themselves in other creative work. Thus, middle income women in both age groups have a more action-oriented or practical approach to coping with isolation, hence the feeling of isolation is least among them.

## 3. EXPERIENCE OF STRESSFUL EVENTS

Stressful experiences often take away a person's sense of control (promoting a sense of helplessness or hopelessness) and can cause great emotional upheaval and pain. The effects of stressful events are typically experienced quite differently by different individuals. Stressors that don't bother one person may cause intense distress for another. Also, stressful events need not be negative in nature to be disruptive. Even positive life changes such as getting married or having a baby can trigger a depressive episode.

Social, cultural or economic difficulties can cause stress to individuals. Events such as loss of job, social status, ending of a relationship, widowhood and for that matter even ill-health may trigger episode(s) of depression. In today's world where there are multiple roles to be played a person, the pressure to meet the expectations of others, and the environment and living patterns all add up to stress to an individual leading to depression.

Hence, it becomes essential to know of the life stressful events that may have occurred amongst the respondents of the present study. The Gurmeet Life Event Scale was used for the same purpose. As seen from Table 4.1.32, in the 40–60 age group, the stress level is high for low and high income women (63.3 percent and 63.3 percent respectively) and it is moderate for middle income women (46.7 percent).

In women age 60 years and above, women across both age groups and all three income groups had high stress level, i.e. 83.3 percent in low income women, 50.0 percent in middle income women and 80.0 percent in high income women.

Looking into the event that were more stressful it may be said that among 40-60 year-old women with depression, "change in sleep pattern" is the most stressful even, while "fear of illness is the highest stressful event in women over 60 years of age.

Again in the 40–60 age group the highest percentage for the most stressful event in the low income group is for the event "illness of close family member" (73.3 percent), which is also true for 43.3 percent middle income women in the same age group. For high income women in this age group, 'family conflicts' is the most stressful event (70 percent).

**Table 4.1.32: Level of stress in women with depression by age and income group, Chi square test**

| Level | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| Low | 8.3 | 10.0 | - | - | 6.7 | 6.7 |
| Moderate | 33.3 | 46.7 | 36.7 | 16.7 | 43.3 | 13.3 |
| High | 63.3 | 43.3 | 63.3 | 83.3 | 50.0 | 80.0 |

***Note:*** *d.f.*= 12; *p.* value = .0000

Among women with depression over 60 years of age, 'illness of a close family member (63.3 percent) was the most stressful event for low income women, while 'change in sleep patter (56.7 percent) was more stressful for middle income women and 'fear of illness' (73.3 percent) was more stressful for high income women.

It may be observed from the table that among women in the older age group, i.e. above 60 years of age, in all the income groups have experienced highly stressful events, whereas in the 40–60 age group, low income and high income women have experienced highly stressful life events, whereas middle

income women in this age group had experienced moderately stressful life events.

**Table 4.1.33: Experience of stressful life events in women with depression by age and income level**

| Life event | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| Death of close family member | | | | | | |
| Less stressful | 10.0 | 3.3 | 6.7 | 3.3 | - | - |
| More stressful | 30.0 | 26.7 | 33.3 | 50.0 | 30.0 | 50.0 |
| Neutral | 6.7 | 3.3 | - | - | - | 3.3 |
| N.A. | 53.3 | 66.7 | 60.0 | 46.7 | 70.0 | 46.7 |
| Illness of self | | | | | | |
| Less stressful | - | 3.3 | 3.3 | 6.7 | 3.3 | 6.7 |
| More stressful | 40.0 | 43.3 | 56.7 | 50.0 | 50.0 | 50.0 |
| Neutral | 3.3 | 3.3 | 10.0 | 10.0 | 10.0 | 6.7 |
| No Response | 56.7 | 50.0 | 30.0 | 33.3 | 36.7 | 36.7 |
| Illness of close family member | | | | | | |
| Less stressful | - | - | 6.7 | - | - | - |
| More stressful | 73.3 | 43.3 | 40.0 | 63.3 | 46.7 | 23.3 |
| Neutral | 10.0 | 13.3 | - | 3.3 | 3.3 | 6.7 |
| No Response | 16.7 | 43.3 | 53.3 | 33.3 | 50.0 | 70.0 |
| Not having male child | | | | | | |
| Less stressful | - | 3.3 | 3.3 | - | 6.7 | 3.3 |
| More stressful | 46.7 | 30.0 | 20.0 | 43.3 | 26.7 | 10.0 |
| Neutral | 6.7 | - | - | 3.3 | - | 3.3 |
| No Response | 46.7 | 66.7 | 76.7 | 53.3 | 66.7 | 83.3 |
| Family conflicts | | | | | | |
| Less stressful | - | 3.3 | 3.3 | 6.7 | - | 3.3 |
| More stressful | 56.7 | 26.7 | 70.0 | 50.0 | 46.7 | 63.3 |
| Neutral | 10.0 | 20.0 | - | 16.7 | 13.3 | 10.0 |
| No Response | 3.3 | 50.0 | 26.7 | 26.7 | 53.3 | 20.0 |
| Change in sleep patterns | | | | | | |
| Less stressful | - | - | 3.3 | 13.3 | - | 6.7 |
| More stressful | 46.7 | 50.0 | 63.3 | 43.3 | 56.7 | 46.7 |
| Neutral | 3.3 | 6.7 | - | 3.3 | 10.0 | 10.0 |
| Not Response | 50.0 | 43.3 | 3.3 | 40.0 | 33.3 | 36.7 |
| Change in eating habits | | | | | | |
| Less stressful | 13.3 | 10.0 | 13.3 | 20.0 | 23.3 | 26.7 |
| More stressful | 36.7 | 50.0 | 46.7 | 43.3 | 33.3 | 26.7 |
| Neutral | 10.0 | 10.0 | 10.0 | 6.7 | 16.7 | 3.3 |
| No Response | 40.0 | 30.0 | 30.0 | 30.0 | 26.7 | 43.3 |
| Fear of illness | | | | | | |
| Less stressful | 13.3 | 3.3 | - | 6.7 | 13.3 | 10.0 |

| Life event | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| More stressful | 43.3 | 53.3 | 50.0 | 50.0 | 50.0 | 73.3 |
| Neutral | 6.7 | 6.7 | 6.7 | 3.3 | 6.7 | - |
| Not Response | 36.7 | 36.7 | 43.3 | 40.0 | 30.0 | 16.7 |

***Note:*** These events are among multiple events. The Gurmeet Life Event scale may be referred to in Appendix III.

**4. Social support and self esteem**

Several studies suggest an association between social support available to individuals and their level of self-esteem. If social events can cause depression, they can also help to prevent it from occurring depression. One of the most well-studied sociological factors that helps prevent (or buffer against) depression is known as "social support."

As per study done by Ulrich (2010) a high self-esteem does not lessen the effect of stressful events on depression. This finding disputes the claim that a high self-esteem can act as a buffer against stressful events. According to the hypothesis ""individuals with low self-esteem are assumed to have fewer coping resources and thus are prone to depression, whereas those with high self-esteem are assumed to have better coping resource."

Another hypothesis concerning the relationship between self-esteem and stressful events claims that low self-esteem generates stressful events, because individuals with low self-esteem are more likely to engage in anti-social behavior.

The new findings obtained from three longitudinal studies of adolescent and young adults with a total of 3,011 participants revealed that both low self-esteem and stressful events were risk factors for depression, these two factors acted independently of each other. Further it was found that "low self-esteem and depression are not related simply because challenging life events lead to lower self-esteem and depression".

A person's support network is said to also affect their self esteem; the better the support network, the higher the person's self-esteem. Therefore, in the present study, an attempt was made to examine the association between women's satisfaction with their support network and their level of self-esteem. The same is presented in Table 4.1.34.

As evident from the table, most of the women were satisfied with the social support they got and also had high self-esteem.

**Table 4.1.34: Level of satisfaction with existing support and its effect on self esteem of women with depression, by age and income level**

| Particulars | 40 – 60 yrs | | | >60 yrs | | |
|---|---|---|---|---|---|---|
| | LIG n=30 | MIG n=30 | HIG n=30 | LIG n=30 | MIG n=30 | HIG n=30 |
| | % | % | % | % | % | % |
| **Support** | | | | | | |
| Satisfactory | 60.0 | 73.3 | 56.7 | 50.0 | 63.3 | 66.7 |
| Dissatisfactory | 26.0 | 10.0 | 13.3 | 30.0 | 23.3 | 20.0 |
| Undecided | 6.7 | 13.3 | 26.7 | 13.0 | 6.7 | 10.0 |
| No Response | 6.7 | 3.3 | 3.3 | 6.7 | 6.7 | 3.3 |
| **Self-Esteem** | | | | | | |
| High | 56.7 | 90.0 | 86.7 | 46.1 | 86.7 | 66.7 |
| Low | 43.3 | 10.0 | 13.3 | 56.3 | 13.3 | 30.0 |

Among younger depressed women (40-60 age group), satisfaction with existing social support was highest in middle income (73.3 percent), followed by low income women (60 percent) and high income women (56.7 percent). Among older depressed women (60 years and above), level of satisfaction was the highest among high income women (66.7 percent), followed by middle income women (63.3 percent) and the least among low income women (50 percent). Corresponding to that, the level of self-esteem of older women in the low income group was also less, with only 46.7 percent women in this group having high self-esteem. A possible explanation for this could be that

along with aging, this group also faces greater economic problems, low social status and failing health. Also, it may be noted that many of these women have no one to take care of them during illness or crisis. Therefore it is not surprising that older low income women are not satisfied with the social support that they have and this seems to have a negative effect on their self-esteem.

Thus it can be concluded from the above findings that psychosocial parameters do play an important role in causing depression. Mental health has to be considered within the context of social, economic and political framework. As the review suggests, depression in women and aging women is a result of adverse socio-cultural realities. The power equations in the society are required to be balanced in order to prevent distress and promote positive mental health. Empowering women, at all life stages, in the family would be a crucial step as power and control are found to be associated with depression.

## 8. INTERPLAY OF PSYCHOSOCIAL AND NUTRITIONAL FACTORS IN WOMEN WITH DEPRESSION

As mentioned earlier, statistical tests were applied on the data collected from 180 women with moderate depression to find out whether there is any association between psychosocial and nutritional factors with respect to depression and to explore the interplay of these factors on each other.

The psychosocial parameters selected for studying the association were: power structure, isolation, life events and self esteem. Caloric intake was calculated for selected subjects.

Correlations were studied between the caloric intake- power structure, feeling of isolation, experience of stressful life events and self-esteem individually. The figure 4.14 and table no 4.1.35 below shows the power structure and calorie intake of depressed women

**Figure 4.1.14: Power structure and calorie intake of the moderately depressed women (N=180)**

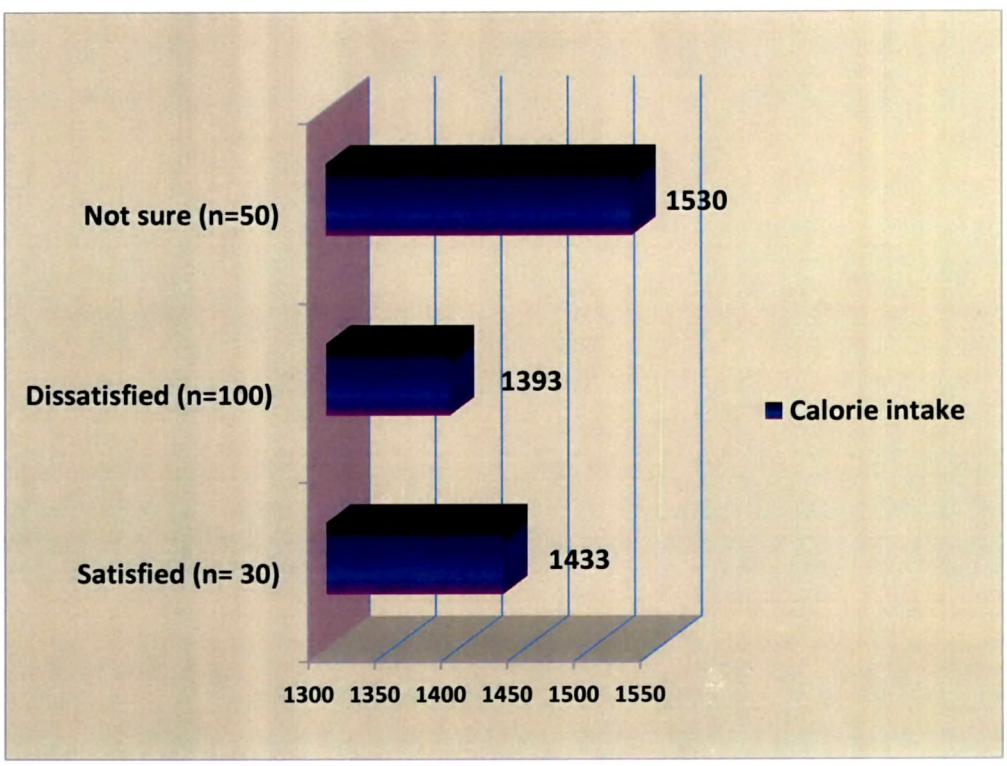


**Table 4.1.35: Power structure and calorie intake of depressed women (N=180)**

| Power structure | Calorie intake Mean value | f- ratio | f- value |
|---|---|---|---|
| Satisfied (n= 30) | 1433± 501 | 0.6028 | 0.5484 |
| Dissatisfied (n=100) | 1393 ± 491 | | |
| Not sure (n=50) | 1530 ± 470 | | |

It can be seen from the above table and figure that none of the categories of satisfaction with existing power structure showed significant difference with the calorie intake of depressed women though apparently women who were satisfied with the existing power structure within the family had better calorie intake.

Loss of appetite, fatigue and undernutrition together with other nutritional deficiencies has been found to be widely prevalent among depressed. Weight loss is known to be associated with depression. This altogether has an adverse effect on their nutritional status, making them vulnerable to malnutrition along with physiological variables with poor nutrition in the older adult also have direct impact on nutritional status. Eating problems may stem from loneliness, a lack of desire or ability to cook, financial worries or physical problems. Social isolation is common, resulting in the older adult losing interest in preparing or eating regular meals (Erin, 2009).

While screening for depression using the BDI, it was found that the prevalence of loss of appetite and feeling of isolation were high, therefore an attempt was made to see whether low calorie intake had any relationship with feeling of isolation. The table below shows the correlation of isolation and calorie intake of depressed women.

**Table 4.1.36: Isolation and calorie intake of women with depression (N=180)**

| Isolation | Calorie intake Mean value | t- value | p-value |
|---|---|---|---|
| Always + sometimes (n=130) | 1077 + 107.5 | 4.41* | 0.000 |
| Never (n=50) | 1112 + 101.1 | | |

*Significant at $p<0.05$

As can be seen from Table 4.1.36 the association of isolation and calorie intake were significant ($p\leq0.05$) in depressed women, which means that women who ranked higher for isolation on the BDI also had lower calorie intake. From our study it can be mentioned that when women were being interviewed on the psychosocial aspects they were asked what they were doing when they felt isolated. Their response was loss of appetite, no mood to eat. This explains the low calorie intake by women who experienced feelings of isolation.

Poor health and an increasing number of medical illnesses are also associated with impaired nutritional status. Mood and cognition are vital determinants of an older person's overall wellbeing. Social isolation not only leads to decreased nutrient intake but can also lead to depression (Brodaty H, Luscombe G, Parker G, et al 1997). In a study done by Michell (1993) on 130 widowed people, results revealed that newly widowed people, most of whom were women, were less likely to report that they enjoyed mealtimes, less likely to report good appetites, and less likely to report good eating behaviors than their married counterparts. Nearly 85 percent of widowed subjects reported a weight change during the two years following a spouse's death, as compared with 30 percent of married subjects. The widowed group was more likely to report an average weight loss of 7.6 pounds (3.4 kilograms).

During the in-depth interview from our study, most of the women expressed they had enjoyed cooking and eating when they were married, but as widows, they found those activities "a chore," especially since there was no one to appreciate their cooking efforts.

Stress is a major factor which affects the maintenance of overall health status as it leads to reduction in food intake, loss of appetite, reduction in weight, etc. Stresses that are chronic or severe can have far-reaching effects. Stress is epidemic and silent killer of the twentieth century. It is both, a physical and an emotional response to a triggering event; coping with it also involves lifestyle changes that many individuals resist in favor of their usual routines.

There are several stressful life events that are found to be associated with depression. Events such as loss of job or ending of a relationship may trigger an episode of depression (Derrick, 2003). Depression as a disorder (characterized by pervasive pessimism, low self-esteem and total lack of initiative) may develop if there are constant unachievable objects or goals and there are no positive relationships to help a person change direction. Growing competition, increased achievement orientation and pressure to excel are some of the most common factors related to experience of stress and resultant depression in today's age. The table 4.1.37 below shows the association between experiences of stressful events and its impact on nutrition in our depressed subjects.

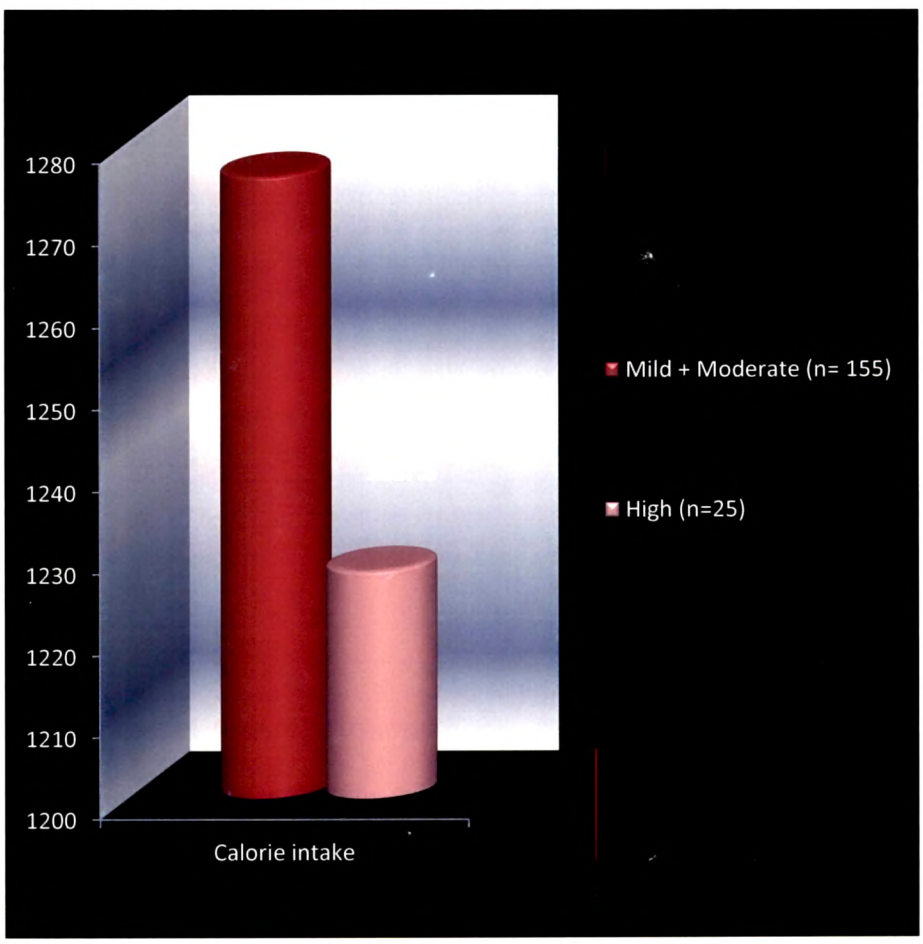
**Table 4.1.37: Data on experience of stressful life events and calorie intake of women with depression (N=180)**

| **Life events causing stress** | **Calorie intake Mean value** | **t- value** | **p- value** |
|---|---|---|---|
| Mild + Moderate (n= 155) | 1275.9 +263.8 | 2.31* | 0.000 |
| High (n=25) | 1227.8 + 277.8 | | |

*Significant at p<0.05

As can be seen from the above table and figure below, there is a significant difference ($p \leq 0.05$) between the levels of stress caused by life events on calorie intake in depressed women. In other words, women who ranked higher on the Gurmeet Singh stress scale had lower calorie intake.

**Figure 4.1.15 Level of Stress and Calorie intake of depressed women**




Stress can cause weight gain as well as weight loss. A study of 45 lean women aged between 65-75 years, found that women gained weight in response to stress and were unable to manage the stressful condition. The study concluded that release of cortisol, a major stress hormone, appears to promote abdominal fat and may be the primary connection between stress and weight gain in those subjects (Daniell, 2000).

Self-esteem can have a positive or negative impact on mental health and also possibly lead to reduced or increased food intake. Therefore an analysis was carried out to find the impact of self-esteem – both positive and negative - on calorie intake of depressed women (Table 4.1.38)

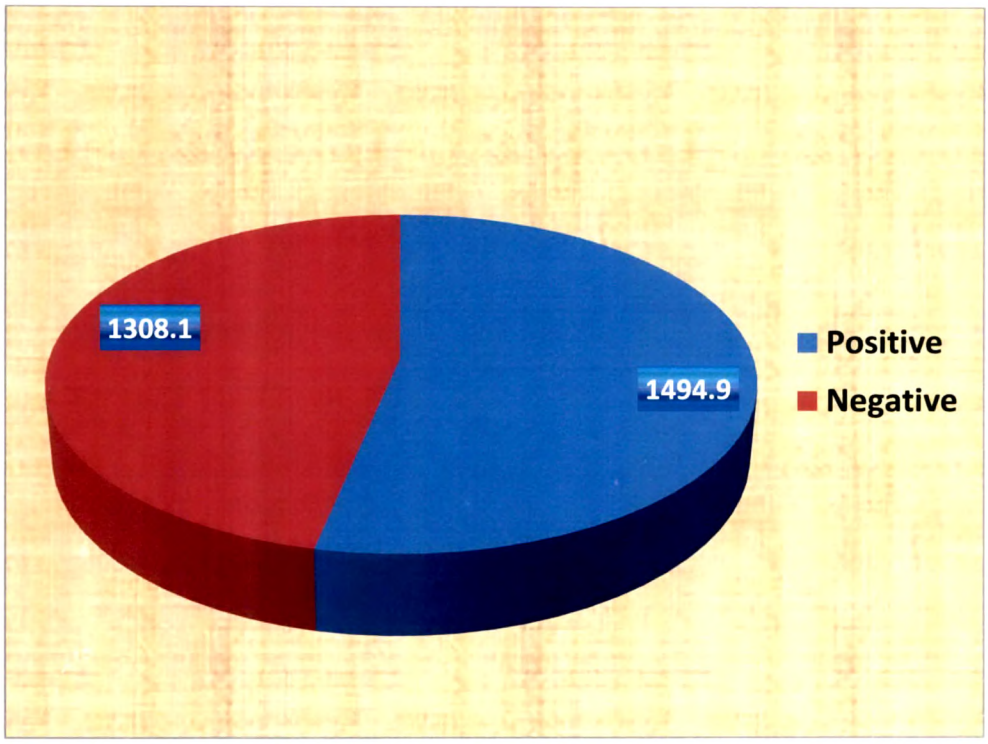
**Table 4.1.38: Self-esteem and calorie intake of women with depression (N=180)**

| **Self esteem** | **Calorie intake Mean value** | **t- value** | **p- value** |
|---|---|---|---|
| Positive (n=130) | 1494.9 + 507.36 | -0.02 | *0.0004 |
| Negative (n= 50) | 1308.1 + 431.7 | | |

* Significant at p ≥0.0005

As shown by Table 4.1.38, there is a significant difference (p ≥0.0005) between the positive self esteem level and negative self esteem level and calorie intake of the depressed subjects. Figure 4.16 below also depicts that women with positive self-esteem had better calorie intake compared to those who had negative self-esteem. Thus the analysis indicates that self-esteem of a person does affect the behavior and consumption of food. Self-esteem is based on individual's perception and abilities. People with low self-esteem are often shy, anxious, and depressed. They were negative about themselves and their abilities. Few personal communications with the subjects during interview share by them as- Because they did not feel worthwhile, they were more likely to do things that were not good for their health, such as going on starvation diets and smoking. People with high self-esteem were found to feel secure and confident. They were positive about their abilities. They expressed that it was important to take care of themselves, to eat well and to stay active.

**Figure 4.1.16: Self Esteem and Caloric intake of Depressed women (N=180)**




A study by Rao Gupta (1985) showed that when faced with conflict and stress, women continuously sacrifice their personal needs and welfare for the needs and well-being of their families. When they were asked why they resorted to this behavior, they responded that they were taught in childhood to adjust to their circumstances without complaining. Being oriented towards passivity, submission and a life of self-denial, women develop traits connected with low self-esteem like depressive moodiness, over touchiness and morbid sensitivity (Kakar, 1988).

Thus from the above correlation we can conclude that Psychosocial factors such as satisfaction with the existing power structure within the family, feeling of isolation, experience of stressful life events and self-esteem have an impact on nutrient intake of women with depression. Adequate nutritional intake plays a significant role in the maintenance of health and in increased longevity. Appropriate food choice is an essential factor in maintaining body functioning

and health which influences the rate of physiologic and functional decline associated with the aging process.

Food contributes to the quality of life, through psychological social and physical mechanisms. Malnutrition is an impairment of health resulting from a deficiency, excess or imbalance of nutrients. Depression leading to Malnutrition or vice a versa is a vicious cycle that cannot be broken unless proper nutrient care and intervention strategies are developed to reduce the frequency and aggravation. Recognizing this fact is key to making an early diagnosis and providing our population, and their families, with better quality of life ahead.

Thus, salient findings obtained from the phase I of the present study after in-depth interviews conducted amongst 180 moderately depressed women above the age of 40 years are mentioned below:

Women do not follow the regular three meal pattern. Reduction in food consumption in the past few years were due to the reasons such as lost appetite, no mood, development of aversion or dislike, isolation, loneliness, unpleasant situation/environment at home, lack of family support, loss of interest in cooking, lack of choice in what to eat, dominance of spouse/in-laws, etc. There was significant difference by income level in the nutrient intake of depressed women. Regardless of age or income level or depression status- non-frequent consumption of animal foods and sea foods, green leafy vegetables, fats, oils and nuts in depressed group might be responsible for the deficiency of key nutrients like selenium and choline, omega-3 fatty acid, Vitamin B6, vitamin B12 and folic acid. Therefore such dietary deficiencies may be considered as risk factor for depression.

A comparison of the health and nutritional status of depressed and non-depressed women showed that the latter have: more regular meal pattern, less craving for certain food items, and reduced food intake on account of health related reasons. Non-depressed women have better nutrient intake,

they consume most of the food items including animal foods, milk and milk products. They also have fewer health complaints, both major and minor.

Psychosocial factors such as satisfaction with the existing power structure within the family, feeling of isolation, experience of stressful life events and self-esteem have an impact on nutrient intake of women with depression. Women who were satisfied with the existing power structure within the family had better calorie intake. Those who ranked higher for isolation on the BDI had lower calorie intake. Women who ranked higher on the Gurmeet Singh stress scale had lower calorie intake. Women with positive self-esteem had better calorie intake compared to those who had negative self-esteem.

Thus majority of women across age and income groups, were not receiving any kind of treatment for their health problems. However, the results of the Phase I suggests that there is an urgent need to pay attention to depression as it will be a problem affecting a large proportion of the population. Women, being more at risk of depression due to health and nutritional, physiological and psychosocial reasons, are an important target group for research and intervention. Based on the findings obtained there is an urgent need to develop the intervention strategies with foods rich in folic acid or the herbal supplementation having an impact on depression.

## PHASE II: FOLIC ACID SUPPLEMENTATION FOR A PERIOD OF EIGHT WEEKS AND EVALUATION OF THE POST INTERVENTION EFFECT OF SUPPLEMENTATION ON OLDER WOMEN WITH DEPRESSION.

Ageing is associated with decline in physical and mental health. Though biological ageing varies among individuals, with advancing years there is a gradual slowing down of their intellectual functioning, their memory deteriorates and the speed in performance of many tasks also decreases. The physical and social environments have an impact on biosocial aspects of ageing for each individual. Because of the general decline in health, vitality and activity, there are changes in the mental state, which mark the onset of affective disorders such as depression. It has been found that a significant proportion of the aging population, are depressed.

Symptoms of depression however, are often mistaken for other illnesses or mere "signs of aging." For some reason, depression in most of the elderly people remains undiagnosed and untreated. In many cultures, mental illness carries a social stigma. In addition, many administrators with tight budgets reduce services for the elderly.

As age advances, the health problems tend to increase, and often the problems are aggravated due to neglect, poor economic status, social deprivation and inappropriate dietary intake which often result in multiple nutritional deficiencies (Kumar, 1997).

Folate is intimately linked to methylation processes and the synthesis of neurotransmitters in the central nervous system, such as serotonin (5-hydroxytryptamine; 5-HT). The 1-carbon cycle/folate metabolic pathway is complex; and it regulates nucleotide synthesis and also DNA methylation. 5-Methyltetrahydrofolate is the predominant circulating form of folate, which donates a methyl group to homocysteine during the generation of S-adenosylmethionine, a major source of methyl groups in the brain. Several of

the key enzymes in the 1-carbon cycle are folate-dependant in their activity, and this forms a biologically plausible link between folate and mood (Simon Gilbody, 2007)

Folate (in the form of folic acid) is a cheap and relatively safe food supplement with a number of proven health benefits (Lucock M, 2004). Food fortification is used in several countries (including the United States, Canada and Australia) and is being considered in others (including the UK)(Short R.2006). The demonstration of a population-level benefit of folate in terms of mental health and well-being might be informative to these debates.

Folic acid deficiency is the most common nutrient deficiency in the world. Depression is the most common symptom of a folic acid deficiency. In studies on depressed patients, thirty-one to thirty-five percent have been shown to be deficient in folic acid. In elderly patients, this percentage may be even higher. These Studies have reported that, among elderly patients admitted to a psychiatric ward, the number of patients with folic acid deficiency ranges from 35 percent to 92.6 percent (Carly, 2009).

A relationship between folate and neuropsychiatric disorders has been inferred from clinical observation and from the enhanced understanding of the role of folate in critical brain metabolic pathways. Depressive symptoms are the most common neuropsychiatric manifestation of folate deficiency. Conversely, borderline low or deficient serum or red blood cell folate levels had been detected in 15-38% of adults diagnosed with depressive disorders in an open study. However, low folate levels had been linked to poorer antidepressant response to selective serotonin reuptake inhibitors. Factors contributing to low serum folate levels among depressed patients as well as the circumstances under which folate and its derivatives may have a role in antidepressant pharmacotherapy is most important to be taken care (Alpert JE, Fava M, 2008)

Folic acid protects the brain. In a recent trial involving 20 elderly patients with depressive disorders, treatment with 50 mg/day of methylfolate was associated with an 81 per cent response rate within six weeks. Folate supplementation (15 mg/day of methylfolate) had showed markedly improvement in the effect of treatment with standard antidepressants. Study also concluded that chronic diseases (e.g. rheumatoid arthritis), certain cancer treatments, alcoholism, and a poor diet can all lead to a folate deficiency and the potential for depression(Ebly, Erika M., et al, 2001).

The nutrients we obtain from food enable us to function. But because it is difficult to quantify and measure people's behavior and feelings in response to specific nutrients, researchers are not sure what effects different nutrients might have on our brain.

Though the role of nutrition in preserving mental function in the elderly still remains unclear, recent research has pointed to the role of folic acid in depression. Probably the most clinically useful finding so far is that people who are deficient in folate may not respond to drug therapy as well as those with normal folate status.

The highest incidence of folate deficiency as measured by serum and red cell folate concentrations is in elderly populations, especially psychogeriatric patients (Reynolds EH, 1995). A close association with dementia and depression, apathy, withdrawal, and lack of motivation has been noted. One reason for the apparently high incidence of folate deficiency in elderly people is that folate concentrations in serum and cerebrospinal fluid fall and plasma homocysteine rises with age, perhaps contributing to the ageing process (Bottiglieri T, 2000)

Substantial evidence from population, case-control and cross-sectional studies suggest poor dietary folate intake and correspondingly low folate status is associated with depression after controlling for confounding factors (Gilbody et al

2007). This evidence comes mainly from Western countries but in a cross-sectional study of the Japanese population aged 21-67 years researchers looked at associations between folate, other B vitamin and essential fatty acid (EFA) intakes and found only low folate to be associated with increased prevalence of depressive symptoms, at least in men. In a recent cross-sectional study of older Chinese serum folate concentrations were lower in individuals with depression (mean = 21.5 nmol/L) compared to those without (24.0 nmol/L) (Ng et al 2009); a linear relationship between serum folate concentration and depressive symptoms independent of homocysteine levels suggests the role of folate as a cofactor in neurotransmitter synthesis is an important mediator in depression. However, a large population study found it was elevated homocysteine (≥15.0 µmol/L or 2.02 mg/dL) along with a single nucleotide polymorphism (SNP) associated with impaired methylation that were significantly related to depression rather than folate status alone (Bjelland et al 2003).

Among 115 admissions to a geriatric unit, 16% had low red cell folate. The 14 patients with dementia had lower folate concentrations than any other diagnostic group and the severity of the dementia on the mental assessment score was significantly correlated with folate concentrations, raising the possibility of an etiological role. In a case-control study of 164 patients with Alzheimer's disease, cognitive decline was significantly associated with raised plasma homocysteine and lowered serum folate (and vitamin B-12) concentrations (Clarke R, 1998)

Several studies in India have assessed the dietary intake and nutritional status of elderly individuals living in different circumstances, but there is no clear or consistent evidence on the impact of eating habits, diet, and nutritional status on mental health. Also to which extent the subtle nutritional deficiencies can lead to a poor mental state is not known. Hence, in view of the scarce information on the role of folic acid supplementation in depression, it was thought worthwhile to include folic acid supplementation as an intervention in the present study and to evaluate its role on depression.

In the present study, 180 women were identified with moderate depression, out of these, 90 women were above the age of 60 years. From these 90 elderly women who were moderately depressed, 30 women irrespective of the income group were selected for the intervention, i.e., folic acid supplementation. Elderly women were selected for the intervention as reviews have indicated that advancing age leads to reduction in folic acid levels, which in turn affects cognition. Low folic acid levels also lead to decline in the immune status and increase in the number of physical ailments or complaints. Elderly women from the middle income group were selected mainly for two reasons for the present study: blood serum estimations as well as the calculation of nutrient intake based on the 24 hour recall of 30 elderly women showed that they were deficient in folic acid. Women in this age and income group were also found to have more health and psychosocial problems than those in other age and income groups. Lastly, but most importantly, these women readily consented to participate in the intervention, unlike younger women.

Thus, the present study was carried out mainly to assess the post intervention impact of folic acid supplementation on depressed elderly women. The specific objectives of this phase included assessing their nutritional status, diet profile and disease profile. Biochemical parameters were also measured with respect to estimation of hemoglobin and folic acid and clinical parameters included measurement of blood pressure.

The thirty elderly women selected for the intervention were provided folic acid supplementation in divided doses i.e. 2 capsules per day for a period of eight weeks. In total the dosage given was 400mcg. Lastly the post data was collected after a period of eight weeks

The impact of folic acid supplementation was evaluated by comparing the pre and post intervention data. For all the parameters pre data obtained under phase

I was used. Data obtained from the subjects were analyzed by applying appropriate statistical tests. Results are presented and discussed under the following headings:

1. **Mental Health Status:** Severity of depression measured on the Beck Depression Inventory (BDI) Scale.
2. **Nutritional Status:** Anthropometric measurements and Biochemical parameter estimation of blood hemoglobin and folic acid.
3. **Diet Profile**: Assessment of nutrient intake using 24-hour dietary recall after intervention.
4. **Disease Profile:** Prevalence of Minor health complaints before and after intervention was analyzed. Blood pressure was also measured to assess the status of hypertension.

The details of each parameter mentioned above are discussed as under:

**1. MENTAL HEALTH STATUS:**

The mental health status of the subjects was gathered with the help of Beck's Depression Inventory (BDI) to assess the impact of the intervention, i.e. folic acid supplementation, on the severity of depression.

Table 4.2.1 shows the BDI scores of the 30 elderly (above 60 years) women, from the middle income group, who were provided folic acid supplementation for a period of eight weeks.

**Table 4.2.1: Severity of depression in elderly women before and after folic acid supplementation (N= 30)**

| Parameter | Mean | | t- Value | p- Value |
|---|---|---|---|---|
| | Pre- intervention | Post- intervention | | |
| **Beck Depression Inventory Score** | 45.96 ± 3.49 | 6.131 ± 2.59 | 81.04 | *0.000 |

*Significant at p≤0.05 Source: Amin, 1998.

As can be depicted from the table, there was a significant difference ($p \leq 0.05$) in the levels of depression in elderly women after the intervention period of eight weeks.

The mean score of the elderly subjects at 0 week was very high which got reduced after eight weeks of intervention. The level of depression decreased to a greater extent after supplementation from a moderate level (45 to 6) to mild level of depression. Similar finding has also been reported by a study (Mehta and Desai, 2004) on 20 depressed women with supplementation of soy isoflavone tablets for the period of 6 weeks. The results showed that before intervention of (10%) of the subjects were severely depressed, after 6 weeks of supplementation none of them remained in that group. Majority of the subjects (60%) were in the moderate depressive level, which was significantly reduced to only (10%) after 6 weeks of soya supplementation. In mild depression category 20% increase was found in the number of subjects after 6 weeks showing that the severity of the depression reduced to a greater extent in this group. Surprisingly there were (40%) of the subjects in normal category at the end of six weeks. Hence the level of depression had been shown to reduce at each severity stage.

**2. NUTRITIONAL STATUS:**

Nutritional status of 30 selected elderly moderately depressed women ($\geq$ 60 years) belonging to middle income group was assessed in terms of a)Anthropometric measurements, b)Biochemical estimation (Levels of Hemoglobin and Folic acid in serum) and c) clinical parameter - blood pressure measurement.

**A) Anthropometric measurements:**

Anthropometric measurements such as weight, height, mid-upper arm circumference (MUAC) and BMI were taken using bathroom scale and measuring tape (Appendix II). The data obtained is shown in table 4.2.2.

**Table 4.2.2: Anthropometric measurements of depressed elderly women before and after folic acid supplementation (n= 30)**

| Parameters | | | |
|---|---|---|---|
| | **Mean Values** | **f- Ratio** | **f- Value** |
| Height (cm) | 154.8± 8.0 | 0.83 | 0.54 |
| Weight (kg) | 61±10 | 1.98 | 0.07 |
| MUAC (cm) | 39±11 | 4.12 | 0.007 |
| BMI ($kg/m^2$) | 25.46± 3.72 | 2.18 | 0.046 |

*Significant at $p \leq 0.05$

The above table showed the result of mean anthropometric measurements of the depressed elderly women (≥ 60 years). There was no significant difference after the Intervention of Folic acid supplementation for a period of 8 weeks ($P<0.05$). The pre- and post-intervention estimates of the height, weight, mid and upper arm circumference (MUAC) was same and no change was observed (Table 4.2.2).

**B. BIOCHEMICAL AND CLINICAL PARAMETERS:**

Table 4.2.3 below shows the mean levels of all the biochemical estimations and clinical parameters using paired t-values.

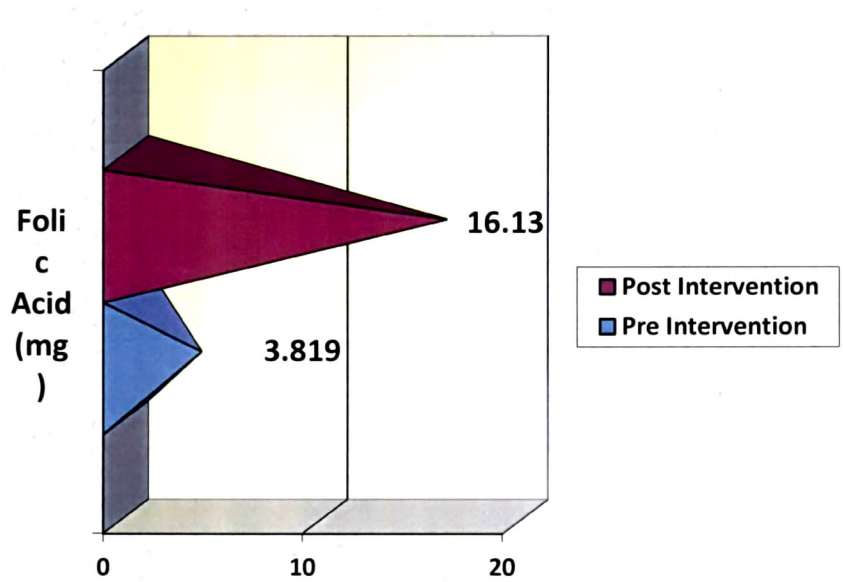
**Table 4.2.3: Levels of hemoglobin, serum, folic acid and blood pressure in depressed elderly women before and after folic acid supplementation (n= 30)**

| Parameters | Mean | | t-Value | p-Value |
|---|---|---|---|---|
| | Pre-intervention | Post-intervention | | |
| Hemoglobin (gm/dl) | 11.53±0.8 | 11.22±0.8 | 3.58 | 0.0097 |
| Folic Acid (mg) (3-20) range | 3.819 ± 1.54 | 16.13 ± 2.62 | - 31.06 | *0.0000 |
| Blood pressure (mmHg) | 121 ± 17 /86±15 | 118 ±18 /81± 14 | 1.57 1.18 | 0.7835 |

*Significant at p≤0.05

As can be seen from the table, there was a marginal change in the hemoglobin levels during post data collection. A slight reduction in blood pressure was observed but though not significant statistically. With respect to folic acid levels marked significant difference (p≤0.05) was seen after the intervention period of 8 weeks of folic acid supplementation. The serum values increased from 3mg to 16mg after intervention (fig 4.2.1).

**Figure 4.2.1: Pre and Post Mean score of serum folic acid levels after the intervention of 8 weeks in depressed elderly women (n=30)**



Mary (1995) reported from her study that, depressed patients were found to be deficient in folate, while others did not show statistically significant differences in folate levels between people with and without depression. It was still unclear which came first—the deficiency or the depression. Many depressed people tend to eat poor diets, which can lead to deficiencies of many vitamins and minerals, not just folate. In an open study of 38 folate deficient elderly subjects with depression, lethargy, and memory impairment, folinic acid was supplemented with dose of 50 mg per week for 120 days. The post data showed significant improved visuomotor performance, visuospatial memory, logical reasoning, associative memory, and activities for daily living in the elderly subjects (Rapin JR, 2001).

A systematic review of observational studies which examined the association between depression and folate was conducted. Eleven relevant studies (15 315 participants; three case–control studies, seven population surveys and one cohort study examining the risk of depression in the presence of low folate were reported. Pooling showed a significant relationship between folate status and depression (odds ratio (OR) = 1.55; 95% CI 1.26 to 1.91). This relationship remained after adjustment for potential confounding (OR) = 1.42; 95% CI 1.10 to 1.83). Folate levels were also lower in depression. There is accumulating evidence that low folate status is associated with depression. Much of this evidence comes from case–control and cross-sectional studies.(Tracy Lightfoot, 2007)

**3) DIET PROFILE**

To assess the effect of folic acid supplementation on the dietary intake of the elderly depressed women, pre- and post-intervention data on their nutrient intake (collected using the 24-hour dietary recall method) was compared and is presented in table 4.2.4.

**Table 4.2.4: Mean Nutrient intake of depressed elderly women before and after folic acid supplementation (n= 30)**

| Sr. No | Parameters | Mean | | p-Value |
|---|---|---|---|---|
| | | Pre-intervention | Post-intervention | |
| 1. | Energy (kcal) | 1269 | 1701 | *0.000 |
| 2. | Protein (gm) | 28.03 | 62.93 | *0.000 |
| 3. | Fat | 24.49 | 29.62 | *0.000 |
| 4. | Iron | 18.19 | 36.54 | *0.000 |
| 5. | Folic acid | 59.29 | 119.40 | *0.000 |
| 6. | Vitamin B6 | 0.93 | 2.35 | *0.000 |
| 7. | Vitamin B12 | 0.54 | 2.18 | *0.000 |
| 8. | Vitamin C | 20.32 | 45.31 | *0.000 |
| 9. | Calcium | 236.75 | 411.03 | *0.000 |
| 10. | Isoflavone | 35.22 | 35.28 | 0.604 |
| 11. | Tryptophan | 124.6 | 484.42 | *0.000 |
| 12. | Methionine | 416.45 | 630.08 | *0.000 |
| 13. | Phenylalanine | 120.8 | 293.5 | *0.000 |
| 14. | Potassium | 1941 | 3087 | *0.000 |
| 15. | Selenium | 7.6 | 9.4 | 0.177 |
| 16. | Choline | 21.81 | 21.89 | 0.650 |

*Significant at $p \leq 0.05$

As can be seen from the above table, there was a significant difference in the intake of the majority of nutrients after the period of intervention. With respect to the key nutrient i.e folic acid was found to be highly significant from zero weeks to eight weeks. The dietary folate was found to be improved with the inclusion of green leafy vegetables and citrus fruits in the diet of elderly women besides intake of folic acid tablet (fig 4.2.2).

Pre and Post Mean score of folic acid intake and iron intake after the intervention of 8 weeks in depressed elderly women (n=30) is presented in figure 4.4.2 & figure 4.2.3 respectively.

**Figure 4.2.2: Pre and Post Mean score of folic acid intake after the intervention of 8 weeks in depressed elderly women (n=30).**

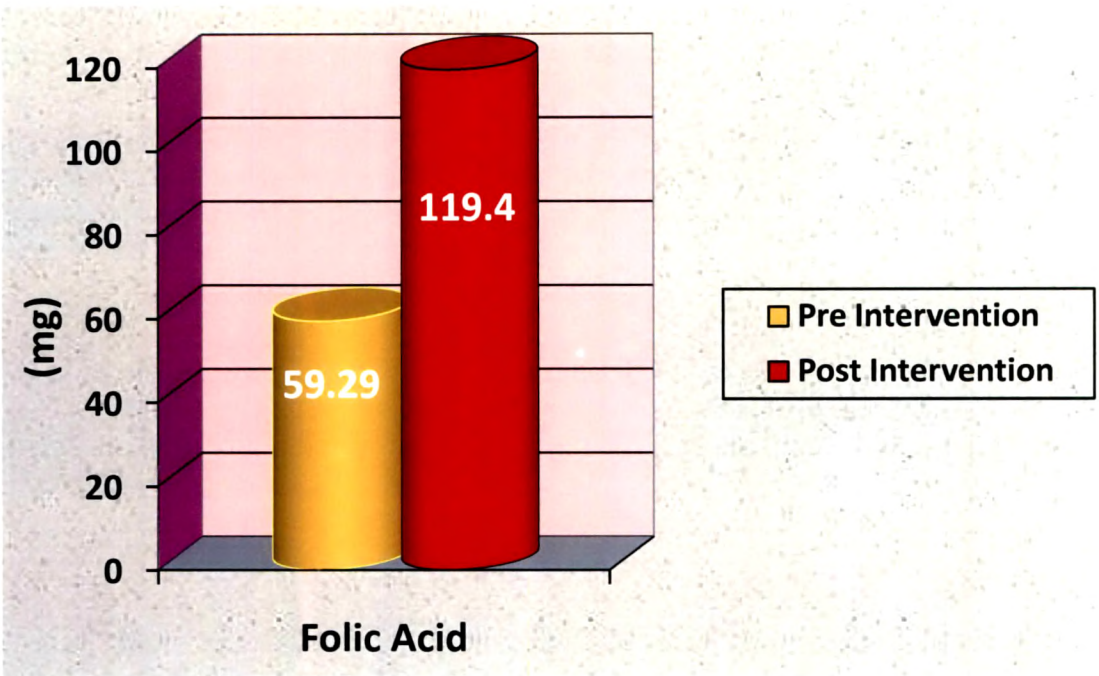
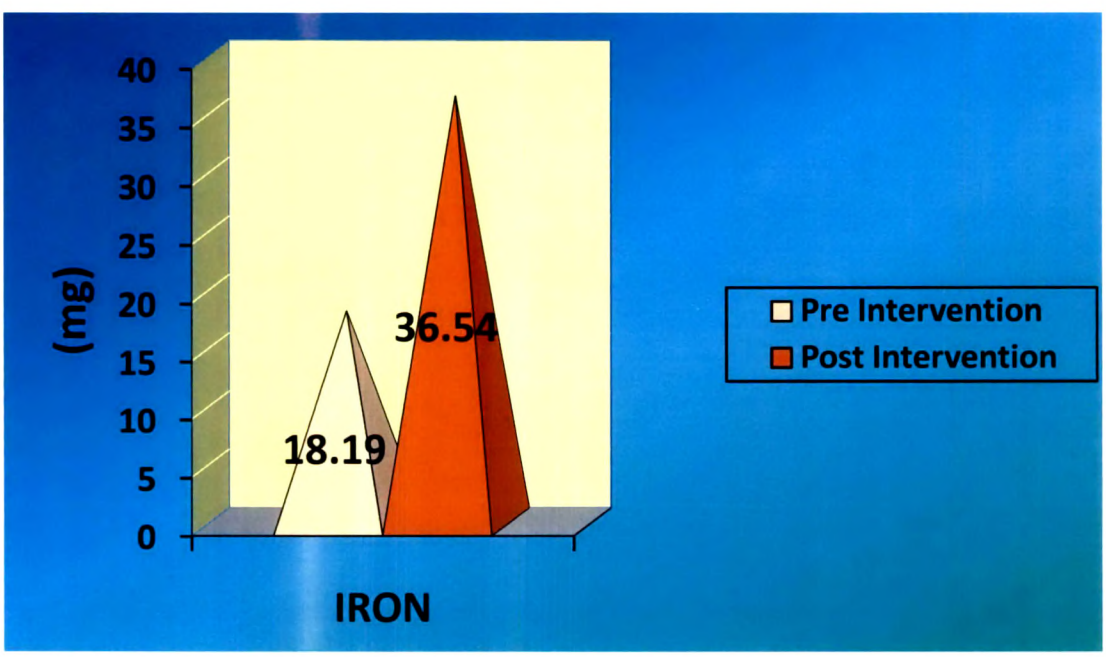



**Figure 4.2.3: Percentage of subjects showing mean intake of Iron before and after intervention**



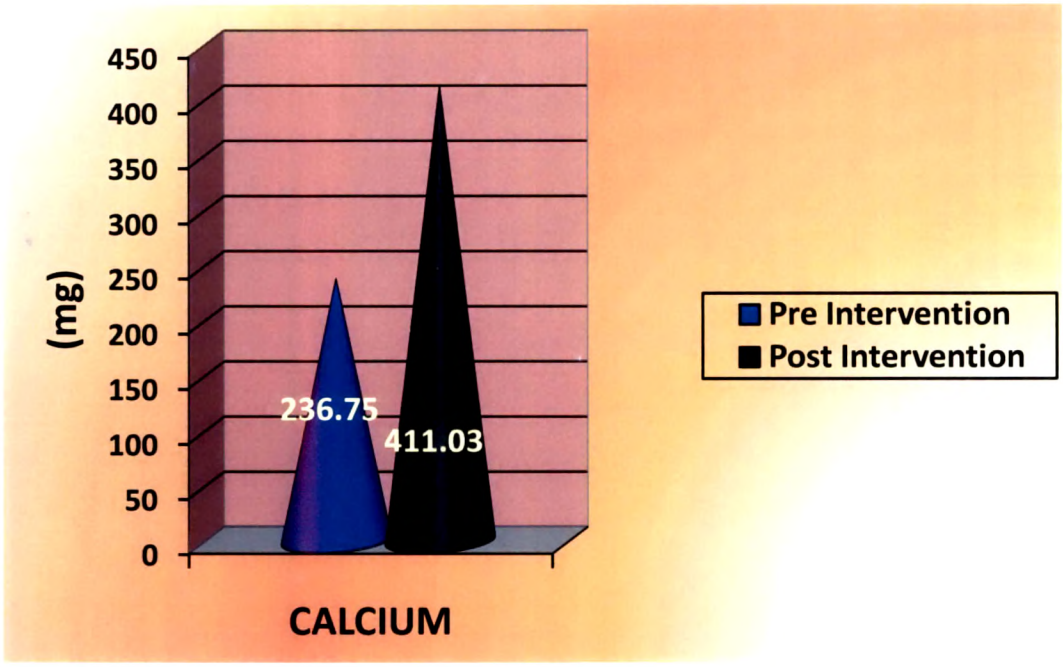
Further, significant difference was observed in the intake of iron, vitamin B12, and amino acids after intervention ($p<0.05$). This shows that supplementation improved the appetite, reduced complaints like 'no mood' or 'aversion', and thereby resulting in reduction in the level of depression (fig 4.2.3). Further, drastic improvement was observed in the calcium levels and showed significant difference ($p<0.05$). Overall the dietary intake of elderly women was found to be improved.

No significant difference was observed in the intake of selenium, choline and isoflavone, the "good mood" minerals.

A low or deficient blood level of folate (folic acid) has been detected in 15 to 38 per cent of adults suffering from depression. There is now increasing evidence that supplementation with therapeutic amounts of folate can significantly improve the condition of depressed patients. In a recent trial involving 20 elderly patients with depressive disorders, treatment with 50 mg/day of methylfolate was associated with an 81 per cent response rate within six weeks. Folate supplementation (15 mg/day of methylfolate) has also been found to markedly improve the effect of treatment with standard anti depressants (Wang, 2001).

Pre and Post Mean score of Calcium intake after the intervention of 8 weeks in depressed elderly women (n=30) is mentioned in figure 4.2.4

**Figure 4.2.4: Pre and Post Mean score of Calcium intake after the intervention of 8 weeks in depressed elderly women (n=30)**




Increased intake of folic acid, iron, vitamin B12, calcium and amino acids is seen after intervention. This shows that supplementation improved the appetite, reduced complaints like 'no mood' or 'aversion', and thereby resulting in reduction in the level of depression. No significant difference was observed in the intake of selenium, choline and isoflavone, the "good mood" minerals.

A study conducted by Ritche (2010) on finding the association between the dietary folate and cardiovascular problems on 1,980 men for ten years aged 40 years and above. The findings revealed that those who consumed the most dietary folate had a 55 percent lower risk of an acute coronary event as compared with those who consumed the least amount of dietary folate rich foods. It was interlinked as increased intake of folic acid lowers the level of homocysteine (an amino acid) in the bloodstream, a risk factor for cardiovascular disease which in turns reduces the severity of CVD problems. Folate-rich diets are thus associated with decreased risk of cardiovascular disease.

Supplemental folate is considered to have greater bioavailability than food sources Whitney et al (2002) Coppen and Bolander-Gouaille (2005) suggest 800µg/day may be efficacious. The majority of studies have investigated folate in the context of an augmentation to conventional antidepressant treatment and reviewers have come to positive conclusions but there are questions concerning whether the benefits apply equally to those with low and adequate folate status (Morris et al 2008, Mischoulon & Raab 2007, Taylor et al 2003). In one study folate (500 µg) plus fluoxetine (20mg) was compared to placebo plus fluoxetine (20mg) with the depression scores of the folate-augmented group decreasing to a much greater degree than the fluoxetine-only group Sufficient folate to significantly decrease plasma homocysteine concentrations was determined to be an important factor in treatment response (Coppen & Bailey 2000).

Folic acid is important for functioning of the nervous system at all ages. In the fetus the relation between maternal folate status and the risk of neural tube defects is well established: clinical trials have shown that periconceptual preventive treatment with the dose of 400 µg or higher of folic acid significantly reduces the risks of such defects (Reynolds EH, 2002).

**4) DISEASE PROFILE:**

In order to assess the impact of folic acid supplementation on health status data on disease profile were also analyzed with respect to minor health complaints reported by depressed elderly women after intervention for period of eight weeks. The same is presented in Table 4.2.5.

**Table 4.2.5: Minor health complaints reported by depressed elderly women after folic acid supplementation (n= 30)**

| Sr no | Parameters | Mean | | Chi-square Value | Degree of freedom | p- Value |
|---|---|---|---|---|---|---|
| | | Pre-intervention | Post-intervention | | | |
| 1. | Cold & cough | 55.7 | 16.4 | 20.47 | 1 | *0.00001 |
| 2. | Viral fever | 19.7 | 18.0 | 0.053 | 1 | 0.81695 |
| 3. | Malaria | 6.6 | 0.0 | 4.135 | 1 | 0.04199 |
| 4. | Infections | 27.9 | 11.5 | 5.187 | 1 | 0.02276 |
| 5. | Vomiting | 6.6 | 0.0 | 4.135 | 1 | 0.04199 |
| 6. | Diarrhea | 21.3 | 9.8 | 3.054 | 1 | 0.08051 |
| 7. | Constipation | 60.7 | 23.0 | 17.82 | 1 | *0.00002 |
| 8. | Acidity | 57.4 | 18.0 | 20.10 | 1 | *0.00001 |
| 9. | Indigestion | 52.5 | 16.4 | 17.57 | 1 | *0.00003 |
| 10. | Gas/ flatulence | 59.0 | 16.4 | 23.59 | 1 | *0.00000 |
| 11. | Chest pain | 62.3 | 19.7 | 22.90 | 1 | *0.00000 |
| 12 | No interest | 73.8 | 0.0 | 71.29 | 1 | *0.00000 |
| 13 | Psychosomatic problems | 27.9 | 4.9 | 11.72 | 1 | *0.00062 |
| 14 | Ulcers | 47.5 | 21.3 | 9.295 | 1 | *0.00230 |
| 15 | Body aches | 54.1 | 18.0 | 17.20 | 1 | *0.00003 |
| 16 | Pain in joints | 49.2 | 23.0 | 9.100 | 1 | *0.00256 |
| 17 | Dizziness | 49.2 | 8.2 | 25.04 | 1 | *0.00000 |
| 18 | Dryness of skin | 49.2 | 19.7 | 11.76 | 1 | *0.00060 |
| 19 | Trembling of limbs | 29.5 | 3.3 | 15.30 | 1 | *0.00009 |
| 20 | Sleep disturbances | 72.1 | 0.0 | 68.82 | 1 | *0.00000 |
| 21 | Fluctuation in BP | 59.0 | 23.0 | 16.40 | 1 | *0.00005 |
| 22 | Low mood | 77.0 | 11.5 | 53.15 | 1 | *0.00000 |
| 23 | Lethargy | 55.7 | 0.0 | 47.13 | 1 | *0.00000 |
| 24 | Lack of appetite | 77.0 | 0.0 | 76.45 | 1 | *0.00000 |
| 25 | Fluctuation in mood | 60.7 | 18.0 | 23.21 | 1 | *0.00000 |

*Significant at $p \leq 0.05$

As can be seen from the table, a highly significant difference ($p \leq 0.05$) was observed in majority of the minor health complaints reported by depressed

elderly women. A marked difference was observed in complaints related to digestion, like acidity, constipation, ulcers, flatulence and indigestion. Along with psychosomatic symptoms like low mood, loss of interest, lack of appetite and sleep disturbances, physical complaints related to advancing age, like body aches, fluctuation in blood pressure, and pain in joints, also reduced.

Thus from the findings of the present study in this phase it can be observed that that Folic acid supplement intervention showed beneficial effects. It has effected a marked change in the symptoms of depression by lowering the severity of depression, improving general health and nutritional status in elderly depressed women.

Folate deficiency is associated with depression and dementia, In elderly people it may be related to ageing, poor diet, malabsorption, drugs, or increased demand or be unexplained. Folic acid has particular effects on mood and cognitive and social function. Impaired folate metabolism may result in a pattern of cognitive dysfunction that resembles ageing. The duration of folate deficiency and its treatment is as important as the degree of deficiency and the dose of folic acid.

Thus folic acid supplementation proved to be beneficial in lowering the depression levels. If supplementation is extended for a longer period of time, it can take place of heavy antidepressants in case of depressed patients with folate deficiency.

Stuerenbrug HJ, et al (2005) In a study of 374 patients (272 Alzheimer's, 40 Mild Cognitive Impairment, and 42 Major depression) researchers found significantly lower HDL levels in smokers and previous smokers in comparison to non-smokers, $p<0,05$. The LDL: HDL ratio in smokers was significant higher (+20%) compared to previous smokers and non-smokers, $p < 0.05$. The mean levels of folic acid were statistically significant ($p<0.05$) lower (-24%) in smokers compared

to non-smokers. Patients with MCI and Alzheimer's disease and also major depression who are "smokers" show serum levels of HDL and folic acid that are known to be strong risk factors for vascular damage and increased risk for vascular brain damage and impaired cognitive function. Further cognitive decline can be slowed by cessation of smoking and substitution with folate or statin therapy of smoking patients.

The results obtained from phase III are discussed in the next page.

## PHASE III: BRAHMI SUPPLEMENTATION FOR A PERIOD TWELVE WEEKS AND STUDY THE POST INTERVENTION EFFECT OF THE SUPPLEMENTATION ON OLDER WOMEN WITH DEPRESSION

As age advances, the elderly form a vulnerable group for multiple morbidities: physical, mental and social among others. This arises from biochemical and morphological changes in the aging brain and other organs, compromised immunity and not too favorable psycho-socio-economic milieu. Because of the general decline in health, vitality and activity in old age, there are changes in the mental state, which mark the onset of affective disorders such as depression, dementia, memory loss and Alzheimer among the aging individuals. Out of these problems depression is very serious in elderly and affects up to 25% of women.

As a mode of treatment antidepressant drugs are mostly used by the psychiatrics. However these drugs have some side effects. It was therefore thought worthwhile to explore the possibilities of using herbal intervention treatment to reduce the signs of depression and improve the cognitive function. Herbal medicines address health concerns at the root and work in ways to improve overall health. They provide progressive & long-lasting results. These drugs are widely acceptable in Indian society without affecting any stage of the Individual taking psychiatric treatment. Brahmi seems to have good potential to be used in improving mental health as claimed by manufacturers of ayurvedic medicines. Brahmi is accepted as a brain tonic, which is clinically proved and documented in ayurvedic literature. Therefore it was thought worthwhile to impart intervention with brahmi capsules to the older women having depression with cognitive impairment. In light of the relevant literature, the general objective was to study physical and mental health of local depressed women and to evaluate the effect of Brahmi supplementation on mental health status of older women.

Out of 180 older women who were interviewed under phase I, 30 women (over 60 years of age) from the middle income group were selected for supplementation with Brahmi for intervention in this Phase. Further they were

categorized into experimental group (n =15 subjects) and control group (n =15 subjects) subjects were matched with respect to Age, Middle income group and Moderate BDI score.

The Specific objectives included assessing their mental health status, nutritional status, diet profile and disease profile. Clinical parameters were also measured with respect to blood pressure and estimation of hemoglobin.

Brahmi supplementation was planned for 12 weeks having 60% bacoside content (750 mgs of Brahmi extract) in the form of a soft gel capsules divided into doses i.e. 3 capsules per day. Lastly the post data was collected for the same after a period of 12 weeks

**BRAHMI CAPSULES**

Brahmi was given in the form of a soft gel capsules (supplied by Soft Health Creations Pvt. Ltd.) to a group of 15 elderly female subjects having depression along with impaired cognitive function. One capsule contained 250 mg of Brahmi extract (20% bacoside content) in them. Three such capsules per day were given to the subjects for 12 weeks. The effect of Brahmi was then studied on mental health and nutritional status. The capsules were supplied by Soft Health Creations Pvt. Ltd., Vadodara.

As mentioned earlier major aim of the study was to evaluate the impact of Brahmi on depressed elderly women with impaired mental function. Besides this an attempt was also made to assess the mental health of the selected subjects by Mini-Mental Status Examination (MMSE) (Folstein M.F et al, 1975) and Cognitive Impairment Test (CIT) (Katzman R et al, 1983).

The impact of Brahmi supplementation was evaluated by comparing the pre and post intervention data. Data obtained from the subjects was analyzed by applying

appropriate statistical tests. Results are described, discussed and interpreted under the following headings:

1. **Mental Health Status:** severity of depression measured on the Beck Depression Inventory (BDI) Scale, Mini Mental Status Examination (MMSE) Cognitive Impairment Test (CIT) and Self Esteem Rating Scale.
2. **Nutritional Status:** Anthropometric measurements and Biochemical parameter estimation.
3. **Diet Profile:** Assessment of nutrient intake using 24-hour dietary recall after intervention.
4. **Morbidity Profile:** Prevalence of Major and minor health complaints before and after intervention was analyzed.

## 1. MENTAL HEALTH STATUS:

The mental health status of the subjects was gathered with the help of four different scales such as Beck's Depression Inventory (BDI), Mini-Mental State Examination (MMSE), Cognitive Impairment Test (CIT) and Self Esteem Rating Scale.

Studies have shown that intake of Brahmi has beneficial effect on the mental status. Thus an attempt was made to see the impact of Brahmi on moderately depressed elderly subjects with respect to MMSE, CIT and Self Esteem.

The correlates of mental ability in old age are multifarious, ranging from biological to social (Anstey & Christensen, 2000; Anstey & Smith, 1999). Few of these correlates are understood in a mechanistic way, and the direction of causation is often obscure. To state that—to take one debated example (Hultsch, Hertzog, Small, & Dixon, 1999)—an engaged lifestyle causes more successful cognitive aging poses various problems: It begs the question about the direction of causation between mental function and engaged lifestyle, it does not identify the

ingredients in engaged lifestyles that are causal, and it does not provide a mechanism for the association between engaged lifestyle and successful cognitive aging. Thus, among the more difficult issues is separating those factors that are causes from those that are mere consequences of mental ability differences in old age. Those social, psychological, physiological, and medical factors that contribute variance to cognitive function in old age might do so wholly or partly because they correlate with mental ability differences at all ages; they might relate to life-long differences in cognitive ability rather than cognitive aging specifically (Crawford, Deary, Starr, & Whalley, 2001; Deary, 1995).

Table 4.3.1 below gives the mean scores of various tests for mental status with respect to MMSE, CIT and Self Esteem of depressed subjects before and after intervention.

**Table 4.3.1: Mean scores of various tests for mental status of depressed subjects before and after intervention.**

| Scales | Control group (n = 15) | | | Experimental group (n = 15) | | |
|---|---|---|---|---|---|---|
| | Pre data | Post data | t value | Pre data | Post data | t value |
| BDI | 22.30 ± 2.38 | 21.80 ± 2.93 | 0.68 | 23.00 ± 2.75 | 14.73 ±3.19 | 14.6* |
| MMSE | 17.67 ± 1.45 | 18.60 ± 2.69 | 2.02 | 17.93 ± 2.01 | 21.60 ± 2.52 | 6.12* |
| CIT | 10.67 ± 3.15 | 9.86 ± 3.73 | 1.03 | 11.20 ± 2.93 | 8.06 ± 1.62 | 4.29* |
| Self Esteem | 15.47 ±19.36 | 17 ± 17.49 | 0.482 | 17.06 ± 24.27 | 24.26 ±19.63 | 1.73 |

*significant at $p \leq 0.05$

The above table showed that there was a significant ($p \leq 0.05$) improvement among the experimental group where improvement in the scores of BDI and CIT (significantly decreased levels), MMSE and Self-esteem (significantly increased levels) were observed. Such type of improvement was also seen among the control group in some parameters but however it was not very evidently significant. Thus intervention with Brahmi showed a better impact on the elderly subjects.

A study conducted by Stough et al (2001) on 85 healthy volunteers using a dose of 300 mg Bacopa monniera standardized to 55% bacosides for a period of 12 weeks found a significant improvement in the speed of visual information processing, learning rate and memory consolidation.

The government owned Council of Scientific and Industrial Research (CSIR) and its Central Drug Institute (CDRI) laboratories in India began isolating the active ingredients to Bacopa in the 1960's and found it to contain two classes of plant saponins which they aptly christened Bacosides A and B - antioxidant chemicals responsible for its mind-sharpening, anxiety-reducing and neuroprotective effects. Their mechanism of action is not certain but it is known that these bacosides enhance depleted neural transmission, prevent its decay and encourage the protein synthesis that accompanies memory formation. They also bind to cell receptors providing antioxidant protection to the brains memory centres against highly reactive and damaging metabolic end-products known as free radicals (Sharma, 2003).

As per Double-blind placebo-controlled study in (Bennett,2000), tested bacopa herb extracts over 12 weeks in healthy human subjects and concluded that the herb significantly improves information processing, rate of learning and memory consolidation. Indeed bacosides overcome the "law of diminishing returns" which predicts that retention of new information in humans diminishes from 55% in the first hour to 27% in the second to even less in the third so that ordinarily 1 in 2 learned tasks are forgotten. However over a 3 month period students taking bacopa experience a leap to 95% retention which lasts well into 4 hours and means only 1 in 20 learned tasks are forgotten. The study has focused on Bacopa's effectiveness in treating depression and the results have proved promising. It has been used successfully to treat the symptoms associated with depression without the side effects that are often associated with the class of drugs known as SSRI's.

Decrease in degree of depression (BDI score) resulted in the improvement of other mental health parameters stating better health of the elderly after intervention with Brahmi. These improvements were found with respect to significant changes in scores of MMSE and CIT (see figure 1, 2 and 3).

**Figure 4.3.1: Percentage Of Depressed Subjects Showing Degree Of Depression According To BDI Scale Before And After Intervention**

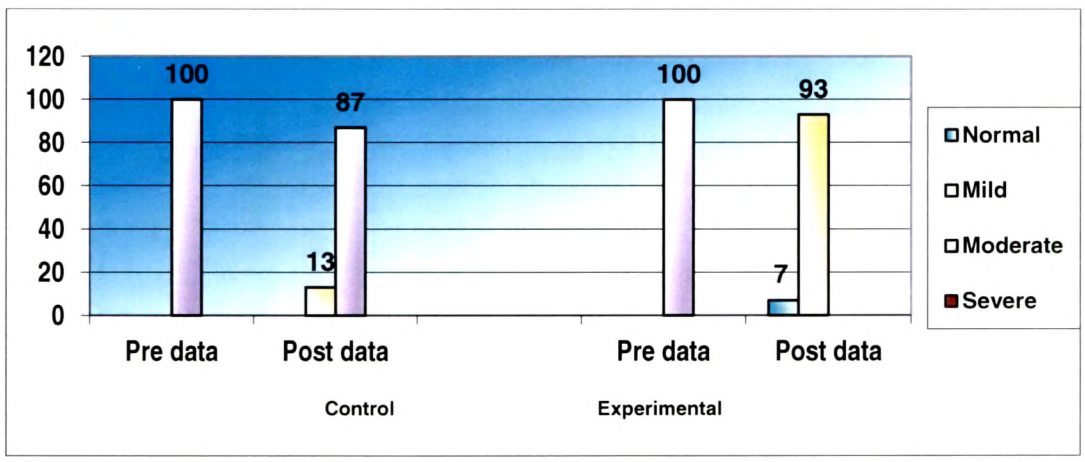



**Figure 4.3.2: Percentage Of Depressed Subjects Showing Degree Of Performance According To MMSE Scale Before And After Intervention**

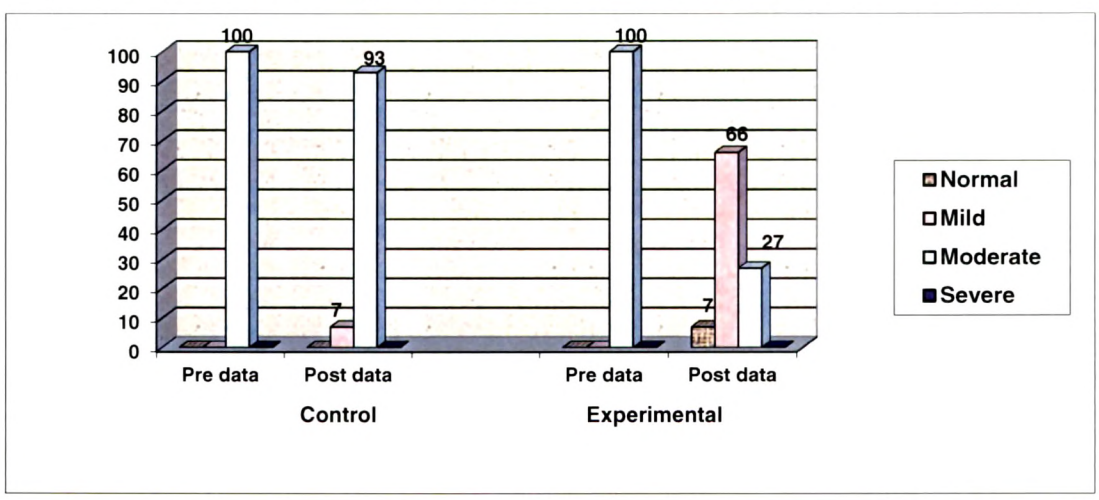
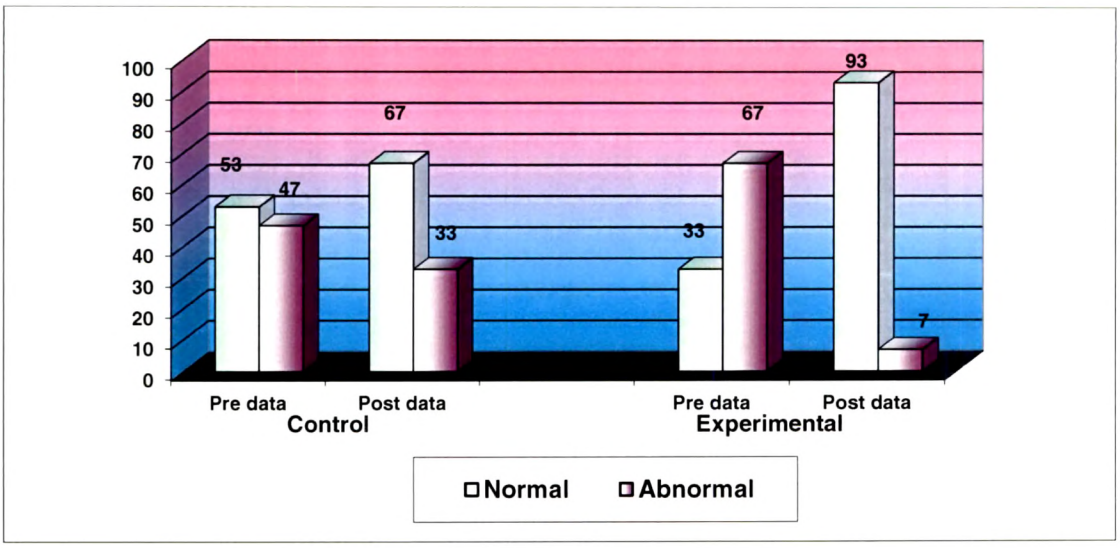


**Figure 4.3.3: Percentage of Depressed Subjects Showing Degree of Impairment According To CIT Scale Before And After Intervention**




Brahmi (Bacopa) carries properties that **improve mental functions** by a modulation of the cholinergic and GABAergic neurotransmission. Brahmi works scientifically as it restores the frontal cortical muscarinic and cholinergic receptor activities and hence it will improve the **mental quotient, memory span, concentration ability and stress threshold.** Further, Bacopa helps improve intellectual capacity, acuity, clarity of thought, and concentration. Bacopa is especially important for improving memory, especially in the elderly, and shortens learning time.

## 2. NUTRITIONAL STATUS:

Nutritional status of 30 selected elderly females (≥ 60 years) from free-living population belonging to MIG were assessed in terms of anthropometric measurements and biochemical estimation.

**A) Anthropometric measurements:**

Anthropometrics measurements such as weight, height, mid-upper arm circumference (MUAC), BMI were taken using bathroom scale and measuring tape. The data obtained is shown in table 4.3.2.

**Table 4.3.2: Mean anthropometric measurements of depressed subjects before and after intervention.**

| Indices | Control group (n = 15) | | | Experimental group (n = 15) | | |
|---|---|---|---|---|---|---|
| | Pre data | Post data | t value | Pre data | Post data | t value |
| Height (cm) | 155.43± 6.87 | 155.43±6.87 | _ | 153.67± 4.62 | 153.67± 4.62 | _ |
| Weight (kg) | 60.77 ± 11.6 | 60.63±11.56 | 0.81 | 62.00 ± 9.11 | 62.40 ± 8.35 | 1.10 |
| MUAC (cm) | 33.33 ± 8.41 | 33.33 ± 8.41 | _ | 32.55 ± 5.48 | 32.55 ± 5.48 | _ |
| BMI (kg/m2) | 25.10 ± 4.4 | 25.03 ± 4.39 | 0.28 | 26.24 ± 3.78 | 26.38 ± 3.38 | 0.86 |

*significant at $p \leq 0.05$

The above table showed the result of mean anthropometric measurements of the depressed elderly female subjects (≥ 60 years). Intervention with Brahmi for a period of 6 weeks did not show any significant impact on the physical health of the elderly subjects. In experimental group a minor weight gain was observed. Not much change was seen in the control group.

Bacopa is an Ayurvedic botanical with apparent anti-anxiety, anti-fatigue, and memory-strengthening effects. These five substances offer interesting contributions to a personalized approach for restoring cognitive function, perhaps eventually in conjunction with the judicious application of growth factors.

Brahmi is a great neurotonic, immuno-modulator, adaptogen, tranquilizing, memory and learning enhancing, cerebral activator, anti-ulcer, antispasmodic, anti-asthmatic ayurvedic herb. Other benefits are anti-allergic, free radicals scavenging effect and as herbal supplement in Epilepsy, anxiety and depression

which shows overall improvement in totality of the General health (Roodenrys S, 2002).

Thus intervention with Brahmi proved to have a significant impact on the mental health of the elderly compared to the physical health, suggesting the need for a long-term intervention.

**B) BIOCHEMICAL /CLINICAL PARAMETER:**

Data on mean systolic and diastolic blood pressure levels and hemoglobin values of depressed elderly female subjects (≥ 60 years) from MIG group before and after intervention is shown in table 4.3.3.

**Table 4.3.3: Mean biochemical parameters of depressed subjects before and after intervention.**

| Indices | Control group (n = 15) | | | Experimental group (n = 15) | | |
|---|---|---|---|---|---|---|
| | Pre data | Post data | t value | Pre data | Post data | t value |
| Systolic BP (mmHg) | 124.8± 17.33 | 124.5±13.30 | 0.092 | 128.1±11.50 | 121.8± 6.52 | 3.02* |
| Diastolic BP (mmHg) | 81.33± 14.57 | 82.66 ± 9.61 | 0.414 | 86.66± 11.75 | 82.26± 7.36 | 1.46 |
| Hemoglobin (gm/dl) | 10.93 ± 0.66 | 10.84 ± 0.69 | 0.98 | 11.18 ± 1.36 | 11.39± 1.17 | 1.84 |

*significant at $p \leq 0.05$

As seen from the table, there was a significant decrease in level of systolic ($p \leq 0.05$) and diastolic blood pressure of elderly subjects belonging to experimental group. No significant change was noted in the hemoglobin levels of experimental group on completion of the intervention. No changes were observed among the control group.

Pravina K (2007) conducted study on enhancement of Brahmi on healthy volunteers. The study was open label, randomized, dose escalation designed. Each of 23 participants were orally given one single capsule of Brahmi daily for 30 days, i.e., 300mg for first 15 days and 450mg for next 15 days. Detailed examination of clinical, hematological, biochemical and electrocardiographic

parameters done in pre and post-treatment periods did not indicate any untoward effects in any of the treated volunteers. Brahmi was found to meet the safety criteria at the dose administered for the given duration of trial period in healthy adult volunteers.

Brahmi herb is useful as hypotensive or anti-hypertensive, it might act through any one or more of physiological mechanisms that are involved in causing the fall or normalization of blood pressure in our body. The effect of Brahmi on systolic blood pressure has been reported to be insignificant. It causes a mild drop (3-7 mm of Hg drop) in blood pressure. It could not produce hypotension in therapeutic dose range (Lloyd J, 2001).

### 3. DIET PROFILE

The dietary intake was assessed in terms of nutrient intake using 24-hour dietary recall for depressed subjects before and after intervention. The nutrient intake has been assessed in terms of energy, protein, fat, choline, folic acid, tryptophan, methionine, vitamin B6, vitamin B12 and vitamin C.

Table 4.3.4 below depicts the mean nutrient intakes of depressed subjects before and after intervention.

**Table 4.3.4: Mean nutrient intake of depressed subjects before and after intervention. (n = 15, Mean ± SD)**

| Nutrient | RDA | Control group | | t-value | Experimental group | | t-value |
|---|---|---|---|---|---|---|---|
| | | Pre | Post | | Pre | Post | |
| Energy (kcal) | 1875 | 1252 ± 207.1 | 1119± 201.4 | 1.18 | 1265 ± 205.1 | 1357± 141.8 | 2.023 |
| Protein (gm) | 50 | 25.40± 10.68 | 21.67± 4.98 | 1.39 | 28.33± 11.07 | 30.66± 8.02 | 1.22 |
| Fat (gm) | 20 | 23.13± 5.64 | 22.80± 5.52 | 0.16 | 25.40± 9.43 | 25.50± 7.84 | 0.07 |
| Choline (ug) | 30 | 20.13± 5.48 | 18.13± 5.22 | 1.32 | 22.67± 7.2 | 27.06± 6.25 | 2.98* |
| Folic acid (ug) | 100 | 59.00± 25.15 | 47.67± 22.81 | 2.12 | 67.00± 33.66 | 85.00± 25.83 | 2.38* |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tryptophan (mg) | 200 | 131.10± 27.29 | 131.33 ± 21.75 | 0.028 | 128.20± 25.5 | 144.70± 17.46 | 3.22* |
| Methionine (mg) | 650 | 365.60± 121.3 | 319.30± 113.0 | 0.93 | 404.87± 81.68 | 435.47± 115.3 | 1.00 |
| Vitamin B6 (mg) | 2 | 1.15± 0.52 | 1.04± 0.25 | 0.73 | 0.77± 0.42 | 1.09± 0.38 | 2.44* |
| VitaminB12 (ug) | 1 | 0.34± 0.3 | 0.43± 0.45 | 0.95 | 0.35± 0.299 | 0.45± 0.36 | 1.77 |
| Vitamin C (mg) | 40 | 25.26± 7.06 | 20.73± 7.72 | 2.48* | 22.60± 5.28 | 29.46± 7.13 | 3.46* |

*significant at $p \leq 0.05$

The table showed that there was a significant ($p \leq 0.05$) increased in the mean nutrient intakes of depressed subjects in the experimental group in terms of choline, folic acid, tryptophan, vitamin B6 and vitamin C whereas marginal increase was found in the intake of other nutrients such as energy, protein, methionine and vitamin B12. While low intake of majority of nutrients was found in the control group after a period of six weeks. There was a significant ($p \leq 0.05$) decrease in the mean nutrient intake of vitamin C in the depressed elderly subjects of the control group, whereas there was a marginal decrease in the mean nutrient intake of other nutrients such as energy, protein, choline folic acid, methionine, vitamin B6 and vitamin B12 which are the important nutrients for mental health.

As seen before, intervention with Brahmi for a period of 12 weeks showed positive impact on mental health of the elderly. Perhaps decreased level of depression might have increased the appetite of the elderly belonging to experimental group. Likings towards foods like pulses, milk products, citrus fruits and green leafy vegetables showed significantly increased intake of choline, typtophan, vitamin C, vitamin B6 and folic acid($p<0.05$). These nutrients are found to have relation with mental health.

A cohort study was done in Britain on 921 elderly men and women to investigate the relation between cognitive function and cause specific mortality and found

that high vitamin C intake may protect against both cognitive impairment and cerebrovascular disease (Gale et al, 1996).

Studies in older individuals with no history of dementia or neurocognitive impairments have shown more positive results. It was found that cognitively intact participants taking 180 mg/d of Ginkgo biloba extract (Brahmi Strain) (n=131) had significantly greater improvement on cognitive tests compared to participants taking placebo (Mix et al, 2002).

Thus Brahmi intervention was found to have beneficial effect on the dietary intake of depressed elderly subjects in the experimental group.

**4. DISEASE PROFILE:**

The health and disease profile was collected by using an exhaustive check-list. The prevalence of major and minor health problems of depressed elderly subjects before and after intervention has been shown in the table 4.3.5.

**Table 4.3.5: Comparison of health profile in terms of number of health complaints of depressed subjects before and after intervention.**

| Disease profile | Control group (n = 15) | | | Experimental group (n = 15) | | |
|---|---|---|---|---|---|---|
| | Pre data | Post data | t value | Pre data | Post data | t value |
| Major health problems | 3.133 ± 1.64 | 3.133 ± 1.40 | – | 2.40 ± 1.50 | 2.00 ± 1.19 | 1.19 |
| Minor health problems | 11.87 ± 4.82 | 10.86 ± 4.53 | 0.92 | 12.20 ± 4.42 | 4.50 ± 2.10 | 7.33* |

*significant at $p \leq 0.05$

From the above table, it was observed that there was a slight reduction in the major health complaints of the depressed elderly subjects from the experimental group. With regard to minor health problems there was a significant ($p \leq 0.05$) reduction in the number of minor health complaints showing a positive impact of Brahmi whereas among the control group very slight reduction in the number of minor health complaints was observed.

Brahmi whereas among the control group very slight reduction in the number of minor health complaints was observed.

Thus taking overall view of intervention study using Brahmi on depressed elderly subjects, certain beneficial effects of Brahmi were observed after intervention with 12 weeks with respect to

- State of depression (as shown by BDI score)
- Cognitive function (as shown by MMSE and CIT score)
- Consumption of food intake and nutrient intake
- Health profile (as shown by reduction in number of health complaints and improvement in systolic blood pressure).

Finally, this study indicates beneficial effects of Brahmi (supplementation of 60% bacoside, 750 mg of Brahmi extract) with respect to mental health status in depressed subjects after 12 weeks of intervention.

Thus, the present study has successfully shown the relationship between nutrition and depression. Therapeutic use of folic acid as well as use of brahmi has resulted in benefiting depressed elderly women. The study has further shown great potential of brahmi extract as an effective and alternative therapeutic medicine for individuals not seeking medical treatment for depression. Thus, the findings of present study have significantly contributed to the existing knowledge leading to a ray of hope in dark world of depression.