DISCUSSION

The results of the present study have been discussed in this chapter in the light of literature cited and work done earlier under the following heads:

5.1 General and socioeconomic information
5.2 Information regarding Hypertension
   5.2.1 General information regarding Hypertension
   5.2.2 Blood Pressure levels and degree of HTN
   5.2.3 Risk factors of Hypertension
   5.2.4 Information regarding other complications / disorders beside Hypertension
5.3 Anthropometry
5.4 Physical activation
5.5 Dietary assessment
   5.5.1 Food consumption pattern
   5.5.2 Food preferences
   5.5.3 Nutrient intake
5.6 Nutrition education/ counseling

5.1 General and socioeconomic information

Out of the total hypertensive subjects 54.61 per cent were male and 45.39 per cent were female subjects (Table 4.1). Majority of the subjects (50.77%) were of age ≥50 years followed by 37.69 per cent in the age group 40-50 years (26.76% of male; 50.85% of female) and the remaining (11.54%) were in the age group 30-40 years (Table 4.2). Unl and Farrel (1983) also reported higher prevalence of Hypertension in myocardial patients of age above 40 years of age (45%) than in subjects below 40 years (29%) of age. According to Walia (1996) age of the hypertensive subjects ranged from 41 to 60 years with the mean age 51±5.0 years and reported positive correlation of age with the blood pressure. Moreover, a positive correlation was found between age and BP (SBP & DBP) of male subjects, however, a negative of SBP and positive of DBP with the age of the female subjects.

The results on personal and socio economic particulars of hypertensive subjects (Table 4.3) revealed that 86.15 per cent of the subjects were married (90.14% of male; 81.35% of female) and 13.85 per cent were found to be widowed (9.86% of male; 18.64% of female). Majority of the subjects (48.46%) were of upper caste followed by ST/SC (30.00%) and remaining (21.54%)
belonged to OBC category. Most (85.38%) of the subjects were found to be Hindu, followed by Sikh (13.08%) and Muslims (1.57%) religions, whereas, none of the subjects belonged to Christian community. The findings of family type revealed that majority (70.77%) of the subjects had nuclear families. Reason being the migration from home town for job purpose. Most of the subjects had medium size families (56.15%) i.e. 4-6 members, however, 14.61 per cent had small (< 3 members), and 29.23 per cent had large families having seven and more family members. The results of the present study are consistent with the study conducted by Walia (1996) in Punjab state and reported majority of the hypertensives subjects having nuclear families (60%) and 1-4 family members (60%). Majority of the subjects were living in rented houses (54.62%) and rest (45.38%) had their own houses. Moreover, 96.92 per cent of the subjects had pacca houses (94.37% of male; 100.00% of female) and only 3.08 per cent had still kaccha houses. 48.46 per cent of the subjects possessed land holding, out of which majority (35.38%) had no produce from land, whereas, 10.77 per cent were able to produce for subsistence only and 2.31 were able to produce for subsistence and sale also. Moreover, 23.08 per cent of the subjects were also rearing animals.

Literacy level of the subjects (Table 4.4) revealed that 4.62 per cent were under matric, 14.61 per cent were matric and 19.23 per cent had senior secondary qualification. Majority of the subjects had high literacy level i.e. 32.31 per cent were graduate (21.13% of male; 45.76% of female) and 29.23 per cent were post graduate (42.25% of male; 13.56% of female). Similar higher literacy level (73% Post Graduate; 27% Graduate) of the hypertensive subjects was reported by Walia (1996). Furthermore, a highly significant (P<0.01) difference was found between male and female literacy level and a highly significant (P<0.01) association between degree of Hypertension and the literacy level. Mendez, et al. (2003) also found positive association of education with BP in men in the study conducted in Jamaica.

A significant (P<0.01) difference was found between male and female occupation type (Table 4.5). Out of the total hypertensive subjects, 49.23 per cent belonged to service class, 7.69 per cent to business category and 16.15 per cent were retired employee, and only 3.85 per cent had agriculture as their main occupation. Walia (1996) also reported majority (64%) of the hypertensive subjects belonging to service class. Out of the total female hypertensive subjects, 50.85 per cent were housewife by their occupation. Moreover, degree of Hypertension was found
to be significantly (P<0.01) affected with the occupation of the subjects. Rose *et al.* (1997) in the study conducted in 1960 found employment to be associated with elevation in odds of high BP. On the other hand, Ribet *et al.* (2001) found spouse’s occupational category to be independently associated with men's hypertension, hypercholesterolemia and other CVD risk factors and indicated that socio economic status of the couple should be taken in account for a better understanding of cardiovascular risk.

The hypertensive subjects belonged to high economic status. Majority of subjects (26.92%) had total monthly family income higher than Rs. 25000/- followed by 20 per cent having Rs. 15000-20000/- family income. 19.23 per cent had income in the ranges of Rs. 20000-25000/- and Rs. 10000–15000/- per month. 10.77 per cent of the subjects had income in the range of Rs. 5000–10000 and 3.85 per cent having monthly family income less than Rs. 5000/- (Table 4.6). Moreover, a significantly (P<0.01) association was found between degree of Hypertension and the monthly income of the subjects. Walia (1996) reported majority (60%) of the hypertensives having family income per month Rs. 10000/- and above. The results of the present study are in confirmation with the findings of Mendez, *et al.* (2003), where income was found positively associated with the BP in men, and moreover, hypertension was found to be the highest among wealthiest women.

Monthly expenditure pattern (Table 4.7) of the subjects revealed that more than half of the total subjects (51.54%) had monthly expenditure of Rs.2000/- and above followed by 26.92 per cent between Rs.1000–2000/-on food. Expenditure on education was reported by 86.15 per cent of the total subjects, out of which majority (33.04%) were spending upto Rs. 2000– 5000/-on education followed by 24.11 per cent between Rs.1000–2000/-. All the subjects (100.00%) had share for health in their monthly expenditure. Personal expenses included gender specific expenses like personal habit of smoking drinking and others specific to male community and female specific expenses of cosmetics or others. 67.60 per cent of the total male and 74.58 per cent of the female subjects were having personal expenses. Majority of total subjects keeping share for personal expenses were spending Rs.1000 and above (31.52%). All the subjects had share for miscellaneous expenses majority of them had expenditure Rs. 3000 & above (53.85%).
5.2 Information regarding Hypertension

5.2.1 General information regarding Hypertension

Majority of the subjects had their condition diagnosed from 1–5 years (36.15%), followed by 34.61 per cent from 6–10 years, 18.46 per cent for ≤1 year, 8.46 per cent from 11–15 years and remaining 2.31 per cent of the subjects had their condition diagnosed from 16 and above years (Table 4.8).

Majority (42.31%) of the subjects had no initial symptoms/complaints and the Hypertension condition was diagnosed during regular health checkups (Table 4.9). Headache (30.00%) was found to be the most commonly prevalent diagnostic symptom followed by giddiness (18.46%), easy fatigue (17.69%), insomnia (Sleeping disorders, 14.61%), breathlessness (13.08%), chest pain (10.77%) and dizziness (6.92%). However, lack of concentration (0.77%), sounds in ear (1.54%) and blurred vision (1.54%) were very less prevalent and were reported by only the male subjects. Rao and Easwaran (1990) reported giddiness to be the most commonly symptom reported by the hypertensive subjects followed by reeling sensation in head, edema, breathlessness and chest pain.

Family history of the disease (Table 4.10) revealed that majority (44.61%) of the total subjects had family history of the disease, 25.38 per cent had no history and the rest (30.00%) did not know about any family history of the disease. Mostly either mother (39.65%) or father (44.83%) had the diseased condition in their families. Most of the subjects had family history of Hypertension (46.55%) and heart disease (27.59%). Rest of the subjects i.e. 25.86 per cent had family history of other diseases like kidney disease, diabetes or thyroid problems etc. The familial trends of Hypertension coincides with the findings of Rao and Easwaran (1990), where, 63 per cent of female and 46 per cent of male had family history of Hypertension and moreover, revealed father being afflicted in 30 per cent of the cases.

5.2.2 Blood Pressure levels and degree of HTN

The mean systolic blood pressure (Table 4.11) of the male subjects (141.31± 0.54 mm Hg) was found to be higher than that of female subjects (138.00±0.45 mm Hg) and moreover differ significantly (P<0.01). The mean SBP was found to be the highest (146.35 ±2.59 & 140.80±1.28 mm Hg) of the subjects of age group 40-50 years, however, lowest (136.37±3.21 & 134.00±1.83 mm Hg) of the subjects of age group 30-40 years. The mean diastolic blood pressure of female subjects was (88.33± 0.22 mm Hg) found to be slightly higher than that of male (88.19± 0.23 mm Hg).
Hg) subjects, however, non significant difference was observed between male and female diastolic blood pressures. The DBP male subjects was found to increase with the age i.e. the highest DBP (92.28±1.33 mm Hg) in the age group 50 & above years. In case of female subjects, the mean DBP was found to be the highest (90.00±1.53 mm Hg) in the age group 40-50 years. Walia (1996) reported the mean BP of hypertensives to be 163.8±3.2 / 95.4±0.29 mm Hg.

As per category of blood pressure (Table 4.1), majority (48.46%) of the total subjects had systolic blood pressure between 140-159 mm Hg followed by 35.38 per cent between 120-139 mm Hg. 8.46 per cent of the subjects had high SBP (≥160) that was of serious concern and only 7.69 per cent had their systolic blood pressure considered as normal (SBP ≤120 mm of Hg). The DBP of majority (46.15%) of the subjects was found between 80-89 mm Hg, of 27.69 per cent between 90-99, 16.15 per cent of total subjects had DBP considered as normal (DBP ≤ 80 mm of Hg) and 10.00 per cent of subjects had DBP ≥100 mm of Hg. Moreover, significant (P<0.05) difference was found between male and female with respect to category of blood pressure (SBP and DBP). Gupta et al. (1995) found mean blood pressure to be 125±19 / 81± mm Hg in men and 126±20/ 81±20 mm Hg in women subjects and moreover reported isolated diastolic Hypertension (65% of men; 57% of women) as commonest subtype. As per degree of Hypertension (Table 4.13), a significant (P<0.01) association was found between degree of Hypertension and the age of the subjects. Majority of the male subjects (50.70%) were at I stage degree of Hypertension, followed by 38.03 per cent had pre Hypertension and 11.27 per cent were at II stage Hypertension. However, majority (54.24%) of the female subjects, had pre Hypertension, followed by 35.59 per cent at stage I and the 10.17 per cent at stage II degree of Hypertension.

84.61 per cent of the subjects were using antihypertensive medicines, out of which, 72.73 per cent were taking medicines regularly (Table 4.14). All the subjects were taking medicines either once (59.09%) or twice (40.91%) a day. Moreover, the attitude of subjects about the use of medicines, when blood pressure remains under control for longer time revealed that 18.46 per cent of the subjects follows doctor’s advice, whereas, 16.92 per cent of the subjects reduces drugs amount and 27.69 per cent prefer to stop medication when blood pressure was under control for a longer time. Majority (43.08 %) of the subjects were not regular about blood pressure check ups.
5.2.3 Risk factors of Hypertension

Only male subjects reported habits of smoking, alcoholism and other addictions (Table 4.15). Personal habit of smoking (Table 4.16) revealed that out of the total male subjects, 56.34 per cent were smokers. Cigarette (85.00%) and bidee (65.00%) were the most preferred mode of smoking. Moreover, the frequency of taking 10–20 per day was reported by majority of the subjects (37.50%). 37.50 per cent of smokers became moderate smokers and 32.26 per cent of the non smokers left smoking after diagnosis of Hypertension. Moreover, a non significant association was found between smoking habit and degree of Hypertension. Walia (1996) reported 30 per cent of the hypertensive subjects to be smokers and moreover, 30 per cent of the subjects quitted smoking showed a decrease in diastolic BP and weight. McNagny et al. (1997) studied the association of cigarette smoking and severe uncontrolled HTN (BP 192 / 106 mm Hg) in African Americans and found severe uncontrolled hypertensives to be current smokers and less compliant with medicines.

Personal habit of drinking (Table 4.17a & b) revealed that only 38.03 per cent of the subjects were non drunker and rest of 61.97 per cent were found to be in the habit of drinking. 54.54 per cent of the drunkers had moderated their alcohol consumptions and 40.74 per cent of the non-drunkers had stopped drinking after diagnosis of Hypertension. All the subjects were using more than one type of alcoholic beverages; however, none reported taking wine. More preferred were whiskey (72.73%), brandy (50.00%) and rum (31.82%). Mostly the subjects reported either weekly (36.36%) or occasionally (31.82%) consumption. Majority of the drunkers (50.00%) were taking 200ml and more per consumption and none were having less than 50 ml per consumption. Moreover, a non significant association was found between drinking habit and degree of Hypertension. Walia (1996) reported 60 per cent of hypertensives taking alcohol, 30 per cent of which consumed alcohol daily and moreover, priority was given to whisky, followed by beer and rum. Contradictory statements were given by various researchers about the association of alcohol to CVD risks. Marques–Vidal, et al. (2001) reported that binge drinking pattern leads to psychologically disadvantageous consequences regarding blood pressure levels and Stranges, et al. (2004) reported that drinking outside meals had significant effect on HTN risk independent of the amount of alcohol consumed. On the other hand, others (Zilkens, et al., 2005; Sacco, et al.,
reported the beneficial effects of moderate alcohol consumption as reducing risk of total and CVD mortality in hypertensive subjects.

67.60 per cent of the male and 45.76 per cent of female subjects were found to live a stressful life (Table 4.18). In male subjects, family (54.17%) and occupational (50.00%) stresses were most common; however, 8.33 per cent also reported some psychological disturbances as the cause of stresses. Females had more of family stresses (77.78%) than occupational (29.63%) stresses and no one reported any psychological disturbances. Stress had an effect on food consumption of both male (45.83%) and female (48.15%) subjects. Majority of the subjects (72.27% of male; 61.54% of female) were eating less under stressful conditions. The subjects at Stage II degree of Hypertension were found to eat less. Moreover, a non significant association was found between living status and degree of Hypertension. Light, et al. (1999) reported frequent stress exposures to be important modulating factors in stress related hypertension and moreover demonstrated higher (P<0.05) systolic and diastolic BP levels. Cesana, et al. (2003) found association between job strain and office blood pressure and moreover, SBP increased upto 3 mm Hg when moving from low to high strain job categories.

Sleeping pattern (Table 4.19) revealed that 53.52 per cent of the male and 62.71 per cent of female subjects experienced some sleeping disorders mostly insomnia. Majority of the subjects (84.21% of male; 81.08% of female) were not using sleeping pills. A non significant association was found between degree of Hypertension and sleeping pattern of the hypertensive subjects.

5.2.4 Information regarding other complications / disorders beside Hypertension

The condition of Hypertension was further complicated with other complications / disorders (Table 4.23) in 73.08 per cent of the total subjects. Obesity was the most prevalent (63.13%) among hypertensives followed by diabetes (18.95%), dyslipidemia (14.74%), kidney disease (11.58%), hormonal imbalances (10.53%), heart disease (9.47) and eyesight complications (3.16%). Among those had no complications, 25.71 per cent had past history of any other diseases. Moreover, 15.38 per cent of the total subjects had undergone bypass surgery too. Shanthirani et al. (2003) studied the prevalence and risk factors of HTN in selected South Indian population and reported higher prevalence of diabetes (P<0.001), obesity (P<0.001) and CVD (P=0.001) among hypertensives compared to normotensive group. Hypertension substantially increased the risk of coronary heart disease (CHD), stroke, retinopathy and nephropathy.
Viewing wide prevalence of obesity, more precise information of body weight was collected (Table 4.24) and revealed that only 60.00 per cent of the total subjects check body weight regularly, however, rest (40.00%) of the subjects had never checked their body weight. Out of the subjects checking body weight regularly, majority (34.60%) were checking body weight whenever got chance, 52.56 per cent monthly and 12.82 per cent were checking weekly their body weight. Majority of the subjects considered them overweight (49.23%), out of which, 70.31 per cent of them were doing efforts to control body weight. Dietary modifications (66.67%), exercise (64.44%) and fasting (15.55%) were the ways adopted to control body weight. 77.78 per cent of them lost some weight and all reported improvement in Hypertension condition by weight reduction.

5.3 Anthropometry

The height of hypertensive subjects (male & female) was found to decrease with the age and mean height of male subjects (165.13±0.29cms) was found to be higher than that of female (156.28±0.25cms) subjects. Furthermore, majority of the subjects had height in the range 155–160cms (36.92). Florencio, et al. (2004) found higher prevalence of Hypertension in obese and short (50%) stature women and thereby concluded stature to be negatively correlated with Hypertension and overweight. Walia (1996) also reported similar findings in which height of normotensives was found to be higher than that of hypertensive subjects (Table 4.25a & 4.26).

The mean body weight of the hypertensive subjects was found to be 75.17±0.26 Kg of male and 68.39±0.52 Kg of female subjects. However, body weight was found to be the maximum of the subjects in the age group 40-50 years. Majority of the subjects had weight in the range of 65–75 Kg (40.00%) followed by 75–85 Kg (21.54%) and 55–65 Kg (16.15%) and 15.38 per cent had body weight 85 Kg and above. Malhotra, et al. (1999) reported mean weight of hypertensives to be higher than that of normotensive (53.80 Kg vs 48.4 Kg, P<0.001), and Walia (1996) also reported weight of hypertensive (74.6±1.01 Kg) subjects to be higher than that of normotensive (69.05±1.02 Kg) subjects.

The waist circumferences was found to be the highest of the hypertensive subjects of age 50 years and above with the mean values 93.28±0.39 and 86.00± 0.37cms for male and female subjects, respectively. Moreover, majority of the total subjects (43.85%) had waist circumference in the range 80 -90cms, followed by 90-100cms (37.69%), ≥ 100cms (10.77%) and 70 – 80cms
Guagnano, et al. (2001) found increasing odd ratio for the risk of Hypertension with the increase of waist circumference and reported waist circumference to be a strong risk of HTN and moreover central obesity to be a common link between blood pressure and insulin resistance.

Hip circumference was found to be the highest in the age group 30-40 years for male (96.37±2.26 cm) and in the age group 40-50 years for female (103.95±1.11 cm) subjects. Moreover, the mean hip circumference of female (102.10±0.21 cm) subjects was found to be higher than that of male (95.00±0.24 cm) subjects. Majority (50.00%) of the total subjects had hip within range 90–100cms, 40.77 per cent had above 100cms and 9.23 per cent of the subjects had hip circumference in the range 80– 90cms.

Mid upper arm circumference (MUAC) was found to be the highest in the age group 30-40 years for male (27.62±0.35 cm) and in the age group 50 years & above for female (27.29±0.27 cm) subjects with the mean values 26.33±0.14 cms and 26.85±0.05 cms, respectively for male and female subjects. Moreover, majority (70.00%) of the subjects had MUAC measurement in the range 24–28 cms.

The data on indices derived from anthropometric measurements (Table 4.25b & 4.26) revealed that only 17.69 per cent of the total hypertensive subjects had BMI within normal range (BMI 18.50 to 24.99), however, majority (55.38%) of the subjects had BMI between 25.00 – 29.99 and 24.61 per cent had Grade I obesity i.e. BMI 30–34.99. Moreover, a significant (P<0.05) difference was found between male and female with respect to BMI. The mean BMI was found to be 27.13±0.19 and 28.11±0.22 for male and female subjects, respectively.

Waist to hip ratio (WHR) is an index of the central obesity. WHR was found to be the highest (1.00±0.05 of male; 0.88±0.03 of female) of the subjects in the age group 50 years & above with the mean WHR 0.97±0.003 for male and 0.84±0.005 for female subjects. Only 14.08 per cent of male and 18.64 per cent of female subjects had WHR considered normal (<0.95 for male; <0.8 for female) and rest of the subjects had WHR above the normal indicative of abdominal obesity. Gupta and Mehrishi (1997) during comprehensive cardiovascular survey in an urban population of Rajasthan reported a positive relationship of WHR with weight (r=0.11), BMI (r = 0.13) and systolic (r = 0.11) and diastolic BP (r = 0.11) and postulated that truncal obesity judged by increased WHR increases coronary risk by mechanism of high blood pressure (BP).
Waist to height ratio (WHtR) has been reported to have an impact on Hypertension condition. Majority of the subjects had WHtR between 0.55–0.60 (50.00%) and 10.77 per cent of the subjects had WHtR within 0.45-0.50 considered normal (<0.50). WHtR was found to be the highest (0.60±0.03 of male; 0.58±0.02 of female) of the subjects in the age group 50 years & above. Moreover, a highly significant (P<0.01) difference was found between mean WHtR for male (0.58± 0.003) and female (0.55± 0.006) subjects. Cox et al. (1997) studied the association of six anthropometric indices with elevated blood pressure in a random sample of British adults (2712 men; 3279 women) between 18 and 64 years of age. The prevalence of elevated blood pressure (>140 and / or 90 mm Hg) was reported to be significantly (P<0.001) associated with quintiles of BMI, waist and WHtR. Moreover, waist and height were reported to be independently related to the prevalence of elevated blood pressure.

Correlation studies (Table 4.39) revealed that a positive correlation of systolic as well as diastolic BP was found with the, weight, waist, hip, BMR, whereas, negative correlation of systolic as well as diastolic BP with the height of all the hypertensive subjects. The correlation of WHtR was found to be negative with the DBP, whereas, a positive correlation with the DBP of male and female subjects. The correlation of WHR was found to be positive with both SBP and DBP of male, however, negative that of female subjects. Rurik, et al. (2004) studied the correlation of anthropometric and blood pressure in elderly people and reported that 75 per cent of the people considered overweight / obese according to BMI (73% of men; 83% of women) and 73 per cent of the people considered at high risk according to waist circumference showed Hypertension (≥140/ ≥90 mm Hg). Vikram, et al. (2003) reported significantly high odd ratios for Hypertension, diabetes mellitus and hypertriglyceridemia in women considered non obese according to BMI (BMI <25 Kg/m²) and also suggested that Asian Indians have excess CVD risk at BMI and WC values considered normal and therefore, definitions of normal ranges of BMI and WC should be revised for Asian Indians.

5.4 Physical activity

The data on personal consideration of the subjects about their daily routine revealed that majority of the male (52.11%) subjects considered their sedentary pattern; however, female (50.85%) stated their daily routine of moderately active pattern (Table 4.27). Exercise pattern (Table 4.28a & b) revealed that 57.75 per cent of male and 61.06 per cent of the female subjects
were found to do exercise; out of which, only 26.83 per cent of male and 47.83 per cent of female subjects were doing exercise regularly. Walk (63.41% of male; 78.26% of female) and yoga (34.15% of male; 47.83% of female) were the preferred types and moreover, exercise at evening time (39.02% of male; 69.56% of female) was mostly preferred. Majority (56.10% of male; 47.83% of female) of the subjects were found to do exercise for less than 3 days a week. Majority of the male subjects were found to spend half to 1 hour (34.15%) and females (39.13%) less than half hour per exercise time. Despres (1994) reported a negative caloric balance of normal men and women during exercise period and indicated high intensity exercise training to be necessary of reducing risk of Hypertension and other cardiovascular diseases in patients characterized by abdominal obesity. Moreover, daily brisk walk for about 40-60 minutes was reported to be the simplest form of exercise necessary for the treatment of metabolic complications related to abdominal obesity.

Because of the epidemic of sedentary lifestyle worldwide, there has been a secular decline in the amount of daily energy expenditure. Therefore, the energy expenditure on daily activities by the subjects was recorded. The mean energy expenditure on different activities by the hypertensive subjects (Table 4.29) revealed that the highest energy expenditure on personal and household activities (386.93±3.67 Kcal by male; 390.75±6.64 Kcal by female) was recorded by the subjects of age group 30-40 years and for leisure activities (320.74±0.88 Kcal by male; 300.63±1.26 Kcal by female) by the subjects of age group 50 years & above. Whereas, the energy expenditure for professional activities was found to be the highest by the male (337.58±2.01 Kcal) subjects of age group 30-40 years and by female subjects (247.19±2.80 Kcal) of age group 50 years & above. The mean total energy expenditure was found to be the highest by the male (2552.95±94.87 Kcal) subjects of age group 30-40 years, however, by female subjects (2540.94±40.07 Kcal) of age group 40–50 years. Moreover, a negative correlation of both SBP and DBP was found with the energy expenditure of male subjects, however, the correlation was found to be negative for female subjects. Noriyunki, et al. (2005) studied the daily activity pattern in terms of energy expenditure in Japanese office workers to detect risk of development of CVD. An inverse association was found between daily energy expenditure and the development of Hypertension and type 2 diabetes in both obese and non obese men.
5.5 Dietary assessment

Frequency of taking meals per day revealed that majority (60.00%) of total subjects were taking standard thrice meals per day, however, 32.31 per cent were taking twice meals and 3.85 per cent were taking more than thrice meals a day. 60.77 per cent of the subjects were regular and 39.23 per cent were not regular about taking meals. Majority (43.85%) of the subjects were taking meals while watching T.V. (Table 4.30a).

5.5.1 Food Consumption Pattern

5.5.1.1 Prevalent dietary pattern

A wide range of variation was observed with respect to common meal pattern (Table 4.30b) of the hypertensive subjects. The observed meal timings were found to be early morning, before breakfast, breakfast, mid morning, lunch, mid noon, evening, dinner and after dinner. Walia (1996) reported three meal pattern by the selected hypertensive subjects in Punjab state and Sharma (2005) also found three meal pattern in selected areas of Chamba and Kangra Districts of H. P.

The data of meal timings i.e. early morning, before breakfast and breakfast as presented in Figure 4.11a and Table 4.30b revealed that majority (63.85%) of the subjects were taking tea at early morning as bed tea, whereas, 23.84 per cent of the subjects were not taking anything just after they wake up. Before breakfast, 38.46 per cent were not having anything; however, others were taking beverages i.e. tea (38.46%) or milk (26.15%) either alone or with biscuits (12.31%) or rusks (18.46%). In the breakfast, majority of the subjects were taking Chap+Veg combination (36.92%) or paranthas (33.08%), however, among breakfast cereals mostly bread (9.23%), dalia (10.00%) were used. 7.69 per cent were taking Rice+ Dhal combination in their breakfast. 8.46 per cent were taking tea and 20.46 per cent were found to take milk in the breakfast. Subjects were also found to have butter (12.31%) and pickles (16.15%) in their breakfast that may aggravate Hypertension condition. The reason expressed by the subjects under reference of using these was that they are fond of pickles and butter and can’t restrict using these. Moreover, 6.92 per cent of the subjects were not having their breakfast. Sharma (2005) also reported majority of the subjects taking tea early in the morning and chapatti and vegetable were mostly consumed as breakfast food.

The data of meal timings i.e. mid morning, lunch and mid noon (Figure 4.11b& Table4.30b) revealed that majority of the subjects were not taking anything during mid morning (44.61%) and
mid noon (45.38%) timings, however, mostly the subjects were taking tea (31.54% & 33.85%, respectively) during these timings. These variations were due to difference in occupation type of the subjects. In lunch, most of the subjects were taking Chap+Veg (26.92%) or Rice+Dhal (21.54%). 20.77 per cent were also found to have pickles with the lunch (mostly female; 32.20%). 37.69 per cent were having tea (either alone or with lunch) and 16.92 per cent were having Tea+Snacks as their lunch and 12.31 per cent were found to skip lunch. It may be due to their two meal pattern. Sharma (2005) reported higher consumption of rice over chapatti and moreover, Rice+Dhal combination was reported to be more popular among gaddi communities than non gaddi communities. Curd and curry preparations were also reported to be consumed in lunch.

The data of meal timings i.e. evening, dinner and after dinner timings (Figure 4.11c & Table 4.30b) revealed that the subjects in the evening were found to have Tea+Snacks (21.54%), Chap+Veg (33.38%) or bread butter (6.92%) either alone or with tea (33.85%) or milk (8.46%). 7.69 per cent of the subjects were not having anything during evening time. All the subjects were having their dinner. Dinner included different combinations i.e. Chap+Veg (29.23%), Chap+Veg+Dhal (23.08%), Chap+Veg+Rice+Dhal (10.00%), Rice+Veg+Dhal (13.08%) and Rice+Dhal (24.61%). Majority (66.92 %) of the subjects were taking salads, however, Curd / Raita /Curry (20.77%) and pickles (21.54 %) were also part of the dinner. Majority of the subjects were not taking anything after the dinner (53.08%), however, 13.85 per cent were taking fruits and 6.92 per cent taking sweet dish after having dinner. Most of the subjects were taking milk (30.00%) at bed time; however, others were taking coffee (7.69%) or tea (3.85%) after their dinner. In contrary to the findings Sharma (2005) reported higher preference for chapatti and vegetable combination at dinner by the subjects of selected communities in H.P., however, also reported consumption of rice and dhal in the dinner.

5.5.1.2 Eating Habits

Liking of foods in reference to method of cooking (Table 4.31) revealed that most of the subjects liked mixed foods (47.69%) and pressure cooked (34.61%) foods, however, nobody showed liking for boiled foods.

Eating habits of animal foods by the hypertensive subjects (Table 4.32) revealed that majority of the male subjects were non vegetarian (52.12%), 18.31 per cent were ovo-vegetarian (eating only milk and egg) and 29.58 per cent were vegetarian. Whereas, among female subjects,
majority (49.15%) of the subjects were found to be vegetarian, 27.12 per cent ovo-vegetarian and 23.73 per cent were found to be non vegetarian. Majority of the male subjects stated weekly (36.00%) consumption, whereas, female reported rarely (40.00%) consumption of non vegetarian foods. Moreover, a significat (P<0.05) association was found between frequency of consumption of non vegetarian foods and degree of Hypertension in male subjects, however, non significant in case of female subjects. Walia (1996) also reported higher consumption of non vegetarian items by the hypertensive subjects than the normotensives, however, a decrease in consumption of animal food was observed during the intervention period as they were advised to reduce consumption of such foods high in fat, cholesterol, sodium content, and moreover, restriction of these helped in bringing down blood pressure too.

Eating out habits may affect any disease condition. Therefore, information was collected (Table4.33) and the data revealed that 50.77 per cent of the total subjects were dining out regularly, out of which 25.76 per cent were dinning out fortnightly, monthly and occasionally, whereas, 22.73 per cent were dinning out rarely. Information on the type of foods preferred revealed that majority (39.39%) of the subjects were dinning outside for social ceremonies (marriage etc.), however, 10.61 per cent prefer Punjabi foods, others preferred South Indian (15.15%), Chinese (15.15%), or non vegetarian (19.70%) foods when dine outside home.

Information about any food allergy (Table 4.34) revealed that 4.62 per cent of the total subjects (all male) had food allergies, out of which majority of the subjects were allergic to brinjal (66.67%) and other were allergic to colocasia (33.34%) and soybean soil (16.67%).

Salt has been reported to be one of the important contributory factors of Hypertension (Haddy and Pamnani, 1995; Tobian, 1997; Dickey and Janick, 2001) and decreased intake of dietary sodium has been demonstrated to have a hypotonic effect, both alone and as an adjunctive measure to pharmacologic therapy. The information collected about salt consumption by the subjects (Table 4.35) revealed that majority of the subjects (56.34% of male; 42.37% of female) had liking for moderate salt in the food products, however, no standards were specified and results are fully statement based. All the subjects (male & female) were prescribed for salt reduction in foods. 64.79 per cent of the male and 59.32 per cent of the female subjects had modified their salt consumption and all of them stated an improvement in the Hypertension condition by reduced salt consumption. The ways adopted for reducing salt consumption included using low or no salt in
salad, avoiding pickles, adding no extra salt over cooked foods and low salt in cooking foods. Svetkey et al. (2004) reported the maximum BP control rate (84%) achieved with the DASH/low sodium diet in stage I Hypertension (120-150/80-95 mm Hg).

5.5.2 Food preferences in terms of frequency of consumption of foodstuffs

Table 4.36 shows the consumption of various foodstuffs from different food groups in terms of their frequency of consumption. Frequency of consumption of selected cereal-based foodstuffs revealed that only bread was consumed daily by 7.04 per cent of the male and 3.39 per cent of the female subjects. On alternate days, besides bread, noodles (5.63% of male; 6.78% of female) and semolina (only female) were consumed, whereas, rest of the selected foodstuffs i.e. corn flakes, rice flakes and macaroni the frequency varied from weekly to rarely consumed. Walia (1996) reported higher consumption of wheat, followed by maize and rice by the hypertensive subjects. On the other hand, Parmar (2006) reported daily consumption of wheat and rice by the army personnel of selected cantonment area (M.P.)

Frequency of consumption of pulses and legumes varied from alternate days to rarely consumed by the male subjects, however, variations were observed in case of female subjects. The frequency of consumption of green gram, black gram and lentil varied from alternately to regular use, whereas; alternate to rarely for red gram and weekly to rarely consumption of bengal gram by the female subjects. Walia (1996) reported more liking for bengal gram and green gram (whole/split/washed), lentil (washed), channa and rajmash by the hypertensive subjects.

Among vegetables, the frequency of consumption of green leafy vegetables i.e. amaranth, spinach and fenugreek varied from alternate to rare consumption by all the subjects except for lettuce that was consumed less frequently by the female subjects i.e. weekly to rarely consumed. Consumption of other vegetables revealed that only radish was used daily by 46.48 per cent of the male subjects, however, alternate day to rare use by the female subjects. The frequency ranged from alternate to rarely consumption for cauliflower, round gourd, colocasia) and carrot. Lotus stem and knol-khol were less frequently used by the subjects i.e. weekly to rarely. Walia (1996) reported more consumption of seasonal vegetables by the subjects and found more consumption of green leafy and other winter vegetables by the subjects as the study was conducted in the winter season.
Among fruits only mango and banana (only male) were consumed frequently and the frequency ranged from daily to rarely, whereas, the frequency of consumption of watermelon, muskmelon and apple (only female) ranged from alternately to rarely consumption. Chikku were used less frequently and it varied from weekly to rarely consumption.

Among milk and milk products, whole milk and curd were used more frequently and the frequency of consumption varied from daily to weekly for whole milk, daily to rarely for curd (none of female reported weekly consumption). The frequency of consumption of cheese varied from alternate day to rarely by male, however, weekly to rarely by the female subjects. Sweets were reported to be consumed weekly, regularly or rarely by different proportion of the subjects.

Among fats and oils, refined oils were most frequently used i.e. daily to weekly consumption. Butter and pure ghee were used daily to rarely by the male subjects, however, female reported alternately to rarely consumption of butter and daily to rare use of pure ghee. Vanaspati ghee was also used by the subjects and the frequency of consumption varied from alternate day to rarely. Walia (1996) also reported more consumption of refined oils by the hypertensive subjects, however, subjects were also found to consume pure ghee and butter as a cooking medium.

Among animal foods, egg was reported to be consumed more frequently by the subjects and the frequency varied from alternate day to rarely consumption. For chicken consumption, the frequency varied from weekly to rarely and fish was less frequently consumed i.e. regularly to rarely by the subjects. Frequency of consumption of mutton varied from weekly to rarely by male subjects, whereas, regularly to rarely by the female subjects.

Cumin seeds were consumed daily by all the female subjects; however, male subjects reported either daily or weekly use of cumin seeds. Among nuts, the frequency of consumption of ground nuts, and almonds and walnuts (only female) varied from alternate day to rarely, however, weekly to rarely for the consumption of cashew nuts and coconuts by the subjects.

Among beverages, tea was consumed more frequently i.e. daily (90.14% of male; 83.05% of female) by the subjects, whereas, consumption of coffee and cold drinks varied from alternately to rarely by the subjects.

Among confectioneries, biscuits were more frequently consumed and the frequency ranged from daily to rarely. Chocolates and pastries were consumed more frequently (weekly to rarely) by
the male subjects, however, frequency varied from regularly to rarely for chocolates consumption by the female subjects. Among selected processed foods, pickles and *namkeens* (only male) were consumed more frequently and daily to rarely frequency of consumption was observed for the same. Besides these, potato chips (only female), sauces/ketchups and soups were consumed on alternate days to rarely by different proportions of the subjects. Canned juices were also consumed by the subjects, i.e. either regularly or rarely by the subjects. Miscellaneous ingredients i.e. vinegar, aginomotto, and baking powder were used less frequently and the overall frequency ranged from regularly to rarely consumption of these. Weekly consumption was observed of vinegar and aginomotto by the male subjects for, whereas that of aginomotto and baking powder by the female subjects.

5.5.3 Nutrient Intake

Data on the nutrient intake i.e. proximate principles, minerals and the vitamins by the hypertensive subjects at all the age groups in comparison with the RDA is presented in Table 4.37a, b & c.

Nutrient intake by hypertensive subjects revealed that among proximate constituents, the intake of energy, protein, total fat, visible fat and fibre constituents was found to be the highest by male subjects of age group 30-40 years, whereas, by the male subjects of age group 40-50 years for carbohydrate intake. On the other hand, the intake by female subjects of age group 40-50 years was found to be the highest for energy, protein, total fat and fibre, however, by female subjects of age 30-40 years for visible fat and carbohydrate constituents. The mean intake of most of the proximate constituents by the subjects i.e. energy, protein, visible fat and fibre was found to be higher than the RDA. Walia (1996) also reported significantly (P<0.05) higher calories intake by hypertensive subjects than normotensives and moreover, reported that a reduction of total energy intake from 2652.8±83.4 Kcal to 2463.9±45.5 Kcal during the intervention period lowered blood pressure from 163.8±3.2/ 95.4±0.29 to 128.0±1.3/ 81.5±1.30 mm Hg. Moreover, the intake of protein, total fat, visible fat and carbohydrates was also reported to be higher than the RDA.

Among mineral constituents, the intake of Na, K, Mg, P and Fe was found to be the highest by the male subjects of age group 40-50 years, whereas, by the subjects of age group 30-40 years for Ca and Na : K ratio. On the other hand, the intake of K, Mg, P and Fe was found to be the highest by female subjects of age group 30-40 years, however, by female subjects of age group
40-50 years for Na, Ca and Na: K ratio. Moreover, the mean intake of minerals i.e. Na, P and Na: K ratio was found to be higher, whereas, lower for Mg and Fe by the hypertensive subjects when compared with the RDA. Walia (1996) reported higher intake of Ca and Na above RDA by the hypertensive subjects, however, the average intake of K, Mg and Fe was found to be lower than the RDA and were advised to increase the intake of foods rich in these nutrients because such deficiencies have been reported to aggravate the Hypertension condition.

A wide range of variation was observed with respect to vitamin intake by the hypertensive subjects. The intake of vitamin A, C and riboflavin was found to be highest by the male subjects of age group 30-40 years; whereas, by the male subjects of age group ≥50 years for thiamin and niacin. On the other hand, by female subjects, the highest intake of vitamin A and riboflavin was observed by the subjects of age group 40-50 years, of vitamin C and thiamin by the subjects of age group 30-40 years and of niacin by the female subjects of age group ≥50 years. Moreover, the intake of vitamin C and thiamin was found to be higher, however, lower of vitamin A and niacin by male and female subjects when compared with the respective RDA. Seasonal changes has been reported (Walia, 1996) to bring dietary alterations and ultimately on vitamin status and moreover, hypertensive subjects has been advised to increase intake of vitamins A, C and niacin being protective against heart diseases.

Correlation studies (Table 4.39) showed a positive correlation of systolic as well as diastolic BP with the energy intake, total fat intake, sodium intake, whereas, a negative correlation was found of systolic BP as well as diastolic BP with potassium intake by all the hypertensive subjects. A wide range of variation was observed with respect to systolic and diastolic blood pressure and among male and female subjects for rest of the factors studied. A negative correlation was found of SBP and DBP with the intake of protein, Ca and Na: K ratio of the male subjects, however, the correlation was found to be positive with all the parameters of female subjects. Moreover, a positive correlation was found between SBP and Mg intake of male and female subjects, whereas, the correlation was found to be negative with DBP of all the subjects.

**Comparison of energy intake and energy expenditure by the subjects**

Comparison of energy intake and energy expenditure by the subjects given in Table 4.38 revealed that the mean energy intake of all the subjects i.e. 3156.03±28.60 Kcal (of male) and 2695.33±10.90 Kcal (of female) subjects was found to be significantly (P<0.01) higher than the
energy expenditure i.e. 2515.51±5.82 Kcal of male and 2452.38±11.63 Kcal of female subjects. Moreover, both the energy intake and energy expenditure by the male subjects were found to be the highest by the subjects in the age group 30-40 years, i.e. 3406.70±126.75 Kcal and 2552.95±101.43 Kcal. However, the highest (2800.70±73.43 Kcal) energy intake by female subjects was found by the subjects in the age group 40-50 years and the maximum energy expenditure (2362.34±71.58 Kcal) by the subjects of age group 30-40 years. Walia (1996) also found energy intake (2652.8±83.4 Kcal) to be higher than energy expenditure (2305.0±106 Kcal) by the hypertensive subjects and also reported decrease in BP as a result of decreased energy intake and body weight during intervention period. This might be the main cause of body weight above standards and require increased physical activity.

5.6 Nutrition education / counselling

5.6.1 General nutrition awareness (Part I)

Changes in the general nutrition awareness concepts of the subjects as shown in Table 4.40a revealed that all the subjects were aware of the facts that soy bean is richest source of proteins and amla is rich source of Vitamin –C and all the female subjects were aware of the fact that washing vegetables before cutting is good practice than washing after cutting the vegetables. All the subjects gave correct responses after nutrition counselling for the fact that calcium and phosphorus are the major components of bones and teeth, whereas, all the female subjects gave correct responses for the statement that green leafy vegetables lack iron. An increase in the number of correct responses (less or more) was observed for most of the statements after providing nutrition counselling to the hypertensive subjects with the mean gain in knowledge i.e. 4.65 for male and 6.03 for female subjects with respect to general nutrition awareness of the subjects (Table 4.41). Walia (1996) studied the effect of nutrition counselling in the control of Hypertension in selected area of Punjab (India) state. Dietary counselling was impressed on the subjects to reduce the intake of fats/ oils, sugars, cereals, sodium and to include physical exercise in the daily regime by taking long brisk walks and doing yoga and meditation. The individuals were found to change their dietary pattern as recommended and the findings revealed a reduction in the intake of mentioned nutrients, weight, and blood pressure of the hypertensive subjects.
5.6.2 Knowledge regarding Hypertension (Part II)

Changes in the knowledge of subjects regarding concepts/statements about Hypertension as presented in Table 4.40b revealed that all the subjects gave correct responses after counselling for the statements i.e. Hypertension and high blood pressure are synonym terms and higher the blood pressure, lower the chances of heart problems. Moreover, all the female subjects gave correct responses for the statements like your waist measurement is a good yardstick of your weight and identified major risk factors other than high blood pressure for heart disease and stroke. All the subjects were aware about what Hypertension is and all the male subjects were aware about the fact that generally blood pressure increases with the age. An increase in the number of correct responses was observed for most of the concepts/statements included in part II after providing nutrition education/counselling to the subjects with the mean gain in knowledge i.e. 5.40 for male and 5.70 for the female subjects (Table 4.41). Seth and Chug (1990) studied the effect of diet counselling as an integral component of Hypertension management in mild to moderate essential hypertensives and found improvement in the knowledge/awareness about the disorder and better dietary compliance. Moreover, an improved awareness has been expected to result in better control of the disease.

5.6.3 Nutrition and Hypertension (Part III)

Changes in the knowledge of subjects regarding nutrition and Hypertension concepts as presented in Table 4.40c revealed that before nutrition counselling, 16 & 20 per cent of the male and 28 & 24 per cent of the female subjects were aware of the concepts i.e. dietary/lifestyle modifications alone are sufficient to control pre Hypertension and fish oil causes thinning of blood and improves blood circulation too, however, after nutrition counselling, the percentages increased to 72 & 40 of male and 64 & 50 per cent of female subjects, respectively for the statements. All the subjects were aware of the relationship of salt to the Hypertension and moreover, an improvement in the knowledge of subjects after nutrition counselling was observed for the statements regarding identification of minerals associated with the condition of Hypertension.

An improvement in the knowledge of hypertensive subjects was also observed regarding identification of the foodstuffs rich in component associated with increasing blood pressure (sodium) i.e. amaranth, knol-khol, *lichi*, muskmelon, bread, canned juices, aginomotto and baking powder. All the subjects identified that pickles can cause Hypertension. Moreover, the mean gain
in knowledge was found to be 5.85 (male) and 6.69 (female) about knowledge regarding nutrition and Hypertension of the subjects (Table 4.41). Iso et al. (1996) conducted a community based intervention programme for Hypertension. The outcomes included increased milk consumption, reduced salt intake and moreover, significant (P<0.05) reduction of SBP in the intervention group, thereby, suggested such community based Hypertension control program as an effective non pharmacological means of lowering BP.

5.6.4 Effect of nutrition education on knowledge by the subjects

Overall comparison of gain in knowledge of the subjects (Table 4.42) revealed that majority (42%) of the total subjects had medium gain in knowledge (10-20) and 30 per cent had high gain in knowledge (20-30) i.e. 24 per cent of male and 36 per cent of the female subjects. Results of the present study are in confirmation with the findings of Parmar (2006) who reported a significant impact of nutrition education with the medium gain in knowledge of majority (54%) of the female subjects selected from army cantonment area (M.P.).