CHAPTER-6

RESULTS AND
DISCUSSION
The present study was carried out on 53 control subjects and 500 study subjects aged between 18 to 75 years. The observation of blood biochemical parameters analysis, study revealed that:

The mean values of total cholesterol in different control group showed in Table-3 and figure-1. The mean value of total cholesterol in 18 to 29 years control group was $151.86 \pm 16.2$ 30 to 45 years control group $168.0 \pm 14.5$ and in 46 to 75 years control group was $178.1 \pm 35.9$. The gradual increase in total cholesterol level with increasing age was found might be due to free radical formation with the aging (Comfort)\textsuperscript{166}. The values obtained are resembled with the finding of Leonardo et al (1965)\textsuperscript{167}.

The serum total cholesterol values represented in table-6 and figure-2 reveal that the mean value of total cholesterol in study group I over weight subjects was $171.6 \pm 27.8$, study group I obese subjects was $188.7 \pm 32$ and in study group I morbid obese subjects was $215.9 \pm 46.2$.

The comparative study of total cholesterol in between control and study group(I) was represented in table-16 and figure-6, revealed that the significant rise was found with the p value of (p<0.01), in over weight subjects, the more significant rise was found with the p value of (p<0.001) in obese subject and highly significant rise was found with the p value of (p<0.001) in morbid obese subjects.

The serum total cholesterol values represented in table-9 and figure-3 reveal that the mean values of total cholesterol in study group II over weight
subjects was 199.9 ± 31.9, study group II obese subjects was 218.1 ± 42 and in study group II morbid obese subjects was 239.4 ± 30.3.

The comparative study of total cholesterol in between control and study group (II) was represented in table-16 and figure-6 revealed that the significant rise was found with the p value of (p<0.001) in over weight subjects, the highly significant rise was found with the p value of (p < 0.001) in obese subjects and also highly significant rise was found with p value of (p<0.001) in morbid obese subjects.

The serum total cholesterol values represented in table-12 and figure-4 reveal that mean values of total cholesterol in study group III over weight subjects was 213.3 ± 44, study group III obese subjects was 238 ± 47.4 and in study group III morbid obese subjects was 273.5 ± 39.3.

The comparative study of total cholesterol in between respective control and study group (III) was represented in table-16 and figure-6, reveal that the highly significant rise with the p value of (p<0.001) was found in over weight subjects, and the highly significant rise with the p value of (p < 0.001) in obese and morbid obese subjects.

These findings are very close to the observations made by (Coggiula et al 1981)\textsuperscript{38}. The increase in total cholesterol with the increased weight was found due to over production of cholesterol as reported by (Zimmerman et al 1984)\textsuperscript{37}.

However, the serum total cholesterol values represented in table-15 and figure-5 reveal that mean values of total cholesterol in study group (IV) diabetic subjects was 278 ± 33.9, study group (IV) CHD subjects was 271.6 ± 36 and in study group IV other obesity associated disease subjects was 262.1 ± 54.2.

The comparative study of total cholesterol in between common control and study group IV was represented in table-26 and figure-16 reveal that the highly
significant rise was found with the p value of (p < 0.001) in diabetic, CHD and other obesity associated disease of study group (IV) the findings of study group (IV) was very close to the findings of morbid obese subjects. According to (A.S. Hakim) the increase was found due to increased level of free fatty acid in obese subject.

The comparative study of total cholesterol in common control with common over weight, common obese, common morbid obese and study group IV was showed in table-26 and figure-16, reveal that the rise with the mean value of 194.8 ± 34.8 and p value of (p<0.001) was found in common over weight subjects, the rise with the mean value of 215 ± 40.8 and p value of (p<0.001) was found in common obese subjects and the rise with the mean value of 243.2±38.3 and p value of (p<0.001) was found in common morbid obese subjects. The finding was closed to the finding of (Denke et al 1993). The rise in total cholesterol with the rise in weight due to over nutrition raised LDL-cholesterol levels resulting increased total cholesterol (Kesaniemi et al).

It was revealed from table-36 and figure-26 that mean total serum cholesterol was 190.2 ± 35.3 mg% in the vegetarian obese subjects and 246.3±39.4 mg% in non vegetarian obese subjects.

The comparative study of total cholesterol in between control and vegetarian and Non-vegetarian obese subjects was represented in table-36 and figure-26, revealed that the significant rise was found with the t value of 7.9 and p value of (p<0.001) in vegetarian obese subjects and highly significant rise was found with the t value of 10.2 and p value of (p < 0.001) in non vegetarian obese subjects. The rise was much more in non vegetarian than vegetarian. It might be due to high fat contains in non vegetarian diet which lead to increased deposition of fat in adipose tissue which results increased synthesis of cholesterol (Ston et al).
It was revealed from table-37 and figure-27 that mean total serum cholesterol was 188.2±34.3 mg% in the physically active obese subjects and 248.2 ± 39.9 mg% in sedentary obese subjects.

The comparative study of total cholesterol in between control and physically active obese subjects and sedentary obese subjects was represented in table-37 and figure-27 revealed that the significant rise was found with the t value of 6.4 and p value of (p < 0.001) in physically active obese subjects. and highly significant rise was found with the t value of 11.1 and p value of (p< 0.001) in sedentary life styled obese subjects. The rise was much more higher in sedentary life styled obese subjects than physically active obese subjects. It might be due to energy storage in the form of fat in sedentary subjects which leads to increased synthesis of cholesterol (James O Hill)\textsuperscript{164}.

[The increase in total cholesterol in obese subjects when compared to their respective age group control subjects might be due to the fact that in elderly obese subjects the activity of LDL – receptors may be stimulated within the serum LDL level leading to increase in cholesterol]

The mean serum HDL cholesterol values represented in table-3 and figure-1 reveal that the mean value of HDL–cholesterol in 18 to 29 years control group was 56.1 ± 5.7, 30 to 45 year control group was 53.4 ± 7.4 and in 46 to 75 year control group was 48.2 ± 7.9. the observations showed the gradual decrease with age. It might be due to decreased level of oesterogen with age.

The mean serum HDL–cholesterol values represented in table-6 and figure-2 revealed that the mean value of HDL–cholesterol in study group I over weight subjects was 56.2±5.7; study group obese subjects was 53.2 and in study group I morbid obese subjects was 45.2 ± 5.2.
The comparative study of HDL-cholesterol in control and study group (I) was represented in table-17 and figure-7 reveal that the decrease in serum HDL level in over weight of study group (I) was insignificant and decrease in serum HDL level in obese subjects of study group (I) was also insignificant and the HDL level mg% in morbid obese subjects of study group (I) was significant with the value of (P < 0.001) these values are closely related to the findings of [Rhoades et al 1976 and Carlson and Erickson]^{140}.

The significant decrease in morbid obese subjects of study group (I) might be due to increase level of triglyceride which stimulate breaking of triglyceride from HDL particle which leads to decrease in HDL-c level [Dr. Anjali Manocha]^{23}.

The mean serum HDL-cholesterol values represented in table-9 and figure-3, revealed that the mean value of HDL-cholesterol in study group (II) over weight was 49.9 ± 5.1, study group (II) obese was 45.6 ± 5.1 and in study group (II) morbid obese subjects was 40.8 ± 9.8 mg%.

The comparative study of HDL cholesterol in control vs study group (II) was represented in table-17 and figure-7, revealed that the slightly significant decrease with the p value of p < 0.05 was found in study group II over weight subject, the significant decrease was found with the p value of p <0.05 was found in study group II over weight subject the significant decrease was found with the p value of p < 0.001 in study group (II) obese subjects and highly significant decrease was found with the p value of (p < 0.001) in study group (II) morbid obese subjects.

The elevated VLDL may be caused by increased hepatic FFA delivery in obese. Which causes increase in triglyceride level and this increased triglyceride
level stimulate the transfer of cholesterol esters from HDL-particles to triglyceride which results in the lowering of HDL-cholesterol [Dr. Anjali Manocha]^{23}.

The mean serum HDL-cholesterol values represented in table-12 and figure-4, revealed that the mean value of HDL-cholesterol in study group (III) over weight was 40.15 ± 9.5, in study group III obese was 37.6 ± 6.7, and in study group III morbid obese was 31.0 ± 4.5 mg%.

The comparative study of serum HDL-cholesterol in control Vs study group III was showed statistically significant decreased with increased weight.

Observations showed in table-17 and figure-7 revealed that the decrease in serum HDL level in over weight subjects of study group III was significant with the t value of 3.92 and p value of < 0.001, whereas in obese subjects of study group III was highly significant with the t value of 5.9 and p value of (p < 0.001) and in morbid obese subjects of study group III was also highly significant with the t value of 8.0 and p value of (p < 0.001). These values are close to the findings of (Rhodes et al 1976)^{140}.

The mean HDL-cholesterol in study group IV (Diabetic subject was found to be 39.9 ± 8.4 mg%. Table-15 and figure-5 where as in study group (IV) CHD subject was found to be 34.4 ± 5.6 and in study group (IV) other obesity associated diseases it was 44.2 ± 11.

The comparative study of HDL-cholesterol in common control vs study group IV was represented in table-27 and figure-17 reveal that the highly significant decrease was found with the p value of (p<0.001) in Diabetic and CHD and more significant rise was found with the t value of 5.8 and p value of (p<0.001) in other associated disease subject of study group (IV).
The comparative study of HDL-cholesterol in common control vs common over weight common obese, common morbid obese and study group (IV) was represented in table-27 and figure-17 reveal that the more significant decreased with the mean value of 48.7 ± 6.7 and p value of (p < 0.001) was found in common over weight subjects, the more significant decreased with the mean value of 45.5 ± 5.2 and value of (p<0.001) was found in common obese subjects and the highly significant decrease with the mean value of 38.9 ± 8.7 and p value of (p < 0.001) was found in common morbid obese subjects. The findings are very close to the observation made by (Kamel et al 1979)52.

Increase level of triglyceride causes increase transfer of cholesterol from HDL which result decrease in HDL level.

It was revealed from table-36 and figure-26 that mean serum HDL-cholesterol was 46.1 ± 5.8 in vegetarian obese subjects and 38.2±7.8 mg/dl in non-vegetarian obese subjects.

The comparative study of HDL-cholesterol in between control and vegetarian, Non-vegetarian obese subjects was represented in table-36 and figure-26 revealed that the highly significant decrease was found with the t value of 6.8 and p value of (p < 0.001) in vegetarian obese subjects where as highly significant decrease was found with the t value of 7.2 and p value of (p < 0.001) in non-vegetarian obese subjects. Though the decrease was statistically very significant in both the subjects in comparison to control but the decrease was very high in non-vegetarian subjects.

The mean HDL-cholesterol was found to be 48.1 ± 6.8 mg% in physically active obese subjects and 36.2 ± 7.8 mg% in sedentary obese subjects.

The comparative study of HDL-cholesterol in control vs physically active obese subjects and sedentary obese subjects was represented in table-37 and
figure-27 revealed that the significant decrease was found in physically active obese subjects with the t value of 3.88 and p value of (P<0.001) and highly significant decrease was found in sedentary obese subjects with the t value of 5.2 and p value of (p<0.001). Though the decrease in both the subjects are statistically very significant but the decrease was very high in sedentary obese subjects.

The table 3 and figure 1 revealed that mean serum triglyceride was found to 98.6 ± 17.9mg% in 18 to 29 year control group and 118.3 ± 27 mg% in 30 to 45 years control group and 126.2 ± 16.5 mg% in 46 to 75 year control group. The gradual increase in triglyceride level might be due to aging. These values are in close agreement with the findings of (Crison 1960)\textsuperscript{127}.

The table 6 and figure 2 revealed that the mean value of triglyceride was found to be 152.2 ± 25.9 mg% in over weight subjects of study group of study group (I) and 238.3 ± 35.1 mg% in morbid obese subjects of study group (I).

The comparative study of mean triglyceride in control vs study group (I) was represented in table-18 and figure-8, revealed that a significant rise in triglyceride was recorded in the study group (I) over weight subjects with the p value of (p<0.001), and highly significant rise was found in obese and morbid obese subjects of study group (I) with the p-value of (p < 0.001).

The mean serum triglyceride values represented in table-9 and figure-3 revealed that the mean values of triglyceride in study group (II) over weight was found to be 193 ± 42.9mg%, in study group II obese was found to be 208.3 ± 33.8 mg% and in study group (II) morbid obese subjects was found to be 300±64.9 mg%.

The comparative study of triglyceride in control vs study group II was represented in table-18 and figure-8, revealed that the highly significant rise was found with p value of (p<0.001) in over weight obese and morbid obese subjects.
of study group II. These results are in collaboration with the findings of (Albrink et al 1962). The mean serum triglyceride values represented in table-1 and figure-4 revealed that the mean values of triglyceride in study group (III) over weight was found to be 222.16 ± 74.4, in study group (III) obese was found to be 254.2 ± 39.7 and in study group (III) morbid obese subjects was found to be 310.1 ± 66.2 mg%.

The comparative study of triglyceride in control vs study group (III) was represented in table-18 and figure-8, revealed that the statistically highly significant rise were found with the p value of (p < 0.001) in overweight obese, and morbid obese subjects of study group III.

The mean serum triglyceride level represented in table-28 and figure-18 revealed that the mean value of serum triglycerides was found to be 189.2 ± 47.2 mg % in common overweight subjects, 220.3 ± 35.9 in common obese subjects and 284.1 ± 55 in common morbid subjects.

The comparative studies of serum triglycerides in common control vs common over weight subjects, common obese subjects and common morbid obese subjects were represented in table-28 and figure-18 revealed that the statistically highly significant rise found in over weight obese and morbid obese subjects with the p value of (p < 0.001) in comparison to common control. It might be due to defective lipolysis of triglyceride rich lipoprotein or due to resistance to the peripheral action of insulin which might stimulate hepatic over production of VLDL – triglyceride by delivering excess substrate to the liver.

According to (Sheehan MD) the increase level of free fatty acid found in overweight and obese subjects which stimulate increased synthesis of triglycerides.
Table-15 and figure-5 revealed that mean serum triglycerides values was found to be 275.3 ± 57 in obese diabetic subjects of study group (IV), 328.4 ± 88 in obese CHD subjects of study group (IV) and 220.1 ± 56.9 in other obesity associated diseases subjects of study group (IV).

The comparative study was shown in table-28 and figure-18 reveal that statistically very significant rise was found with the p value of (p < 0.001) in all the subjects of study group (IV).

In obese subjects increased FFAs level increases VLDL level which results in increasing triglyceride level.

It was revealed from table-36 and figure-26 that mean serum triglyceride was found to be 201 ± 42.4 in vegetarian obese subject and 261.2 ± 48.8 mg% non vegetarian obese subjects.

The comparative study of mean triglyceride in common control vs vegetarian obese and non vegetarian obese subjects was represented in table-36 and figure-26, revealed that statistically highly significant rise was found with the p value of (p < 0.001) in both the subject but very – very high rise was found with the t value of 16.1 in non vegetarian obese subjects.

It was revealed that table-37 and figure-27 that mean serum triglyceride was found to be 198.2 ± 40.4 mg% in physically active obese subjects and 264.2 ± 50.8 mg% in sedentary obese subject.

The comparative study of mean triglyceride in common control vs physically active obese subjects and sedentary obese subjects was represented in table-37 and figure-27, revealed that statistically highly significant rise was found with the p value of (p < 0.001) in both the subjects but very very high rise was found in sedentary obese subjects with the t value of 20.2.
It was observed from present series of study that serum triglyceride was found to be more elevated in sedentary obese subjects than physically active obese subjects when compare to control. It might be due to over storage of fat leads to increased level of FFA which leads to in crane synthesis of triglyceride.

It was observed that serum triglyceride level was found to be increased more in older group than younger, when compared with their respective controls. The results of present study are resembled with the findings of (Albrink and man 1989)49.

The increase in serum triglyceride in over weight, obese and morbid obese subjects might be due to over production of VLDL-triglyceride by diverting excess substrates to the liver.

The serum LDL-cholesterol was found to be 97.8±6.8 in 18 to 29 year control group, 102.6±22.7 in 30 to 45 year control group and 116.8±16.2 in 46 to 75 year control group represented in table-3 and figure-1.

The gradual increase was found with the age might be due to the formation of free radical with aging (Comfort et al)166.

The serum LDL-cholesterol was found to be 98.9 ± 22 mg% in over weight subjects of study group (I), 110.3±17.9 mg% in obese subjects of study group (I) and 115.7 ± 9.4 mg% in morbid obese subjects of study group (I) and 115.7 ± 9.4 mg % in morbid obese subjects of study group (I) represented in Table 6 figure 2.

The comparative study of LDL-cholesterol in control vs study group (I) was represented in table-19 and figure-9 revealed that the rise found in LDL level of study group (I) over weight was statistically insignificant with the p value of (P > 0.10) and rise found in LDL level of study group (I) obese was least significant with the p value (p < 0.05) and rise found in LDL level of study group (I) morbid
obese was highly significant with the p value of (P < 0.001). (Caggiula et al 1981)\textsuperscript{38} also reported that LDL-cholesterol has shown to rise in direct proportion to weight gain.

A non significant increase in LDL-cholesterol was recorded in over weight subject of study group I as compared to control while a significant increase was observed in obese and morbid obese when compared to control. The present results resembled with the findings of (Grundy and Bernett 1990)\textsuperscript{34}.

The mean LDL-cholesterol values represented in table-9 and figure-3 revealed that mean LDL-cholesterol found to be 114.3 ± 18.2 mg% in over weight subjects of study group (II), 136.2±19 in obese subjects of study group (II) and 153.8 ± 19.2 in morbid obese subjects of study group (II).

The comparative study in control group vs study group II was showed in table 19 and figure 9 revealed that the rise found in the mean value of LDL-cholesterol in over weight subjects of study group (II) was least significant with the p value of (p<0.05) where as statistically highly significant rise was found with the p value of (p < 0.001) in obese and morbid obese subjects of study group (II).

The table-12 figure-4 revealed that the mean value of serum LDL-cholesterol was found to be 129.1±31.3 in over weight subjects of study group (III), 141.1±24 in obese subjects of study group (III) and 160±16 was found in morbid obese subjects of study group (III).

The serum LDL–cholesterol was found to be least significant increase with the p value of (p<0.05) in over weight subjects of study group III where as highly significant increase was found with the p value of (p < 0.001) in obese and morbid obese subjects of study group III.
The comparative study of mean LDL cholesterol in common control vs common over weight, common obese and common morbid obese subjects were represented in table-29 and figure-19, revealed that the statistically least significant rise was found with the p value (p<0.05) in over weight subject where as highly significant rise found with the p value of (p<0.001) in obese and morbid obese subjects of common obese and common morbid obese. It might be due to increased secretion of VLDL or high fraction at conversion of VLDL to LDL in obese subjects. (Grundy et al 1987)\textsuperscript{34}.

Table-15 and figure-5 revealed that the LDL–cholesterol level found to be 142±43.7 in diabetic subjects of study group (IV), 158.8 ± 25.8 in CHD subjects of study group IV and 122.3 ± 8.7 in other obesity associated diseased subjects of study group (IV).

The comparative study of common control vs study group (IV) was shown in table-29 and figure-19 revealed that the highly significant rise with the p value of (p<0.001) was found in Diabetic and CHD subjects study group IV but least significant rise with p value of (p < 0.05) was found in other associated diseased subjects of study group (IV).

The serum LDL cholesterol was found to be 108.9±16 in vegetarian obese subjects and 148.8 ± 20 was found to be in non vegetarian obese subjects.

The insignificant rise was found with the p value of (p<0.10) in vegetarian obese subjects when compared to respective control and significant rise was found with the p value of (p < 0.01) in non vegetarian obese subjects.

The serum LDL–cholesterol was found to be 118.0 ± 16.2 mg% in physically active obese subjects and 154.8 ± 22 mg% in sedentary obese subjects.
The statistically significant elevation was found with the p value of 
(p<0.01) in physically active obese subjects and statistically more significant 
elevation was found with the p value (p < 0.001) in sedentary obese subjects.

It was observed that serum LDL-cholesterol was found to be increased 
more in sedentary subjects than physically active obese subject the results are 
resembled with the findings of (Grundy and Bernette 1990)\textsuperscript{34}.

It was noted that LDL-cholesterol was increased with the age in obese 
subjects might be due to decreased formation of LDL-receptor with aging 
resulting decreased clearance of LDL–receptor causing increased serum level as 
reported by (Miller 1984)\textsuperscript{137}.

Table 3 Figure-1 the mean serum VLDL–cholesterol was found to be 16.40 
± 4.5 in 18 to 29 year control group, 21.7 ± 4.6 in 30 to 45 year control group and 
26.34 ± 7.1 in 46 to 75 year control group. The increase found with age due to 
aging (Comfort et al)\textsuperscript{166}.

The table-6 and figure-2 revealed that the level of VLDL–cholesterol was 
found to be 31.3 ± 7.3 in over weight subject of study group I, 34.8 ± 7.3 in obese 
subject of study group I, 41 ± 13 mg\% in morbid obese subject of study group I. 
Whereas table-9 and figure-3 revealed that the level of VLDL-cholesterol was 
found to be 41.8 ± 13.2 mg\% overweight subject of study group II, 49.7 ± 12.9 
mg\% in obese subjects of study group II and 57.1 ± 10.3 mg\% in morbid obese 
subjects of study group II while table 12 and figure 4 revealed that the LDL level 
was found to be 52.22 ± 8.1 in over weight subject of study group III, 58.2 ± 11.5 
mg \% in obese subjects of study group III and 64.0 ± 9.39 mg\% in morbid obese 
subjects of study group III.
And table-30 and figure-20 revealed that the level of LDL-Cholesterol in common over weight and common obese and common morbid obese was found to be 41.8 ± 10.8, 47.5 ± 10.5, 54 ± 11.1 respectively.

The comparative study of LDL-cholesterol in control vs study group I, II and III was represented in table-20 and figure-10 reveal that the statistically highly significant increase were found with the p value of (p < 0.001) in all study group but increase was very high in morbid obese subjects.

The increase in VLDL-cholesterol might be due to high production of VLDL-cholesterol in over weight obese and morbid obese subjects as well as due to over nutrition in these subjects resulting raised in VLDL-concentration.

According to (Sheehan)27 the increased level of free fatty acid found in over weight & obese subjects stimulate the production of VLDL from triglyceride and other fat content.

Table-15 and figure-5 revealed that the serum VLDL-cholesterol was found to be 51.9 ± 7.3 in Diabetic subjects of study group IV, 58±8.7 mg% in CHD subjects of study group IV and 48±5.3 mg% in the other obesity associated disease subjects of study group IV.

The comparative studies showed in table-30 and figure-20 revealed that the statistically high significant rise with the p value of (p<0.001) was found in all the subjects of study group IV. But it was observed that the more and more significant increase was found in CHD subjects.

The mean value of VLDL-cholesterol was found to be 40.7 ± 10 and 54.6 ± 10.8 respectively in vegetarian and non-vegetarian obese subjects represented in table 37 and figure 27.
The statistically highly significant rise in the VLDL level with the p value of \( p < 0.001 \) was found in vegetarian and non-vegetarian obese subjects but it was observed that increase was more in non-vegetarian than vegetarian obese subjects.

The table 38 and figure 28 reveal that the mean value of serum VLDL-cholesterol was found to be 38.7±7 and active sedentary obese subject comparative study revealed that statistical highly significant increase was found with the p value of \( p < 0.001 \) in physically active and sedentary obese subjects. But the rise was very high in sedentary obese subjects than physically active subjects.

The raised in VLDL-cholesterol in over weight obese and morbid obese subject might be due to over production of VLDL-cholesterol due to over nutrition resulting in raised serum VLDL-cholesterol.

According to (Dr. A.S. Hakim)\(^{21}\) the increased weight causes increased hepatic FFA delivery which causes elevated VLDL-cholesterol level.

The table–3 and figure–1 revealed that the mean serum total lipid level was found to be 500.7±57.2 in 18 to 29 year control group, 538.1 ± 48.7 in 30 to 45 year control group and 576.9±56.8 in 46 to 75 year control group. The gradual increase in the level of total lipid with increasing age might be due to aging.

The table-6 and figure-2 revealed that the serum total lipid values were found to be 589 ± 58.6 mg%, 615 ± 99.1 mg%, 638.1 ± 82.2 mg% respectively in over weight obese and morbid obese subjects of study group (I).

The table-9 and figure-3 revealed that the serum total lipid values were found to be 603.7 ± 79.6, 685.8 ± 95.3, 701.9 ± 55.6 respectively in over weight, obese and morbid obese subjects of study group II.
Table-12 and figure 4 revealed that the serum total lipid values were found to be 752.6 ± 75.6, 765.3 ± 10.7, 798.4 ± 91.4 respectively in over weight, obese, morbid obese subjects of study group (III).

Table-15 and figure-5 revealed that the serum total lipid values were found to be 874.1 ± 198.1, 896 ± 114, 763.8 ± 79.4 respectively in diabetic, CHD, and other associated diseased subjects of study group (IV).

The comparative study from the table-21 and figure-11 and table-31 and figure-21 revealed that the total lipid level in all study group were found to be statistically highly significant in all the study group with the p-value of (p<0.001). But the more and more significant rise found in morbid obese subjects, CHD subjects and diabetic subjects.

The table-36 and figure-26 revealed that the mean serum total lipid was found to be 610.2 ± 80, 756.4 ± 74.9 respectively in vegetarian and non-vegetarian obese subjects.

The comparative study of total lipid in control vs vegetarian and non-vegetarian obese subjects represented in table-36 and figure-26 revealed that the highly significant elevation with the p value of (p<0.001) were found to be in vegetarian and non-vegetarian obese subjects respectively. But the more increase was found in non-vegetarian than vegetarian.

The table-37 and figure-27 revealed that the mean serum total lipid values were found to be 606.2 ± 78.2 ; 760.4 ± 75.9 mg % respectively in physically active and sedentary obese subjects.

The comparative study of total lipid in control vs physically active and sedentary represented in table-37 and figure-27, reveal that the statistically highly significant rise were found with the p value of (p<0.001) in physically active obese
and sedentary obese subjects. But the elevation found in sedentary obese subjects was more than the physically active obese subjects.

The table-3 and figure-1 revealed that the blood sugar level was found to be 90 ± 10.3 in 18-29 year control group, 98.9 ± 14.7 mg% in 30 to 45 year control group and 108.4 ± 9.6 in 46 to 75 years control group. The gradual increase in blood sugar level might be due to effect of ageing (Comfort et al) \(^{166}\).

The blood sugar level represented in table-6 and figure-2 revealed that the mean value of Blood sugar were found to be 99.8 ± 13.9, 112.1 ± 14.2, 118.1 ± 10.9 respectively in over weight, obese and morbid obese subjects of study group(I).

The blood sugar level represented in table-9 and figure-3 revealed that the mean value of blood sugar were found to be 108.4±9.9, 118.5±11.2, 120.9±9.8 mg% respectively in over weight, obese and morbid obese subjects of study group (II).

The Blood sugar level represented in table-12 and figure-4 revealed that the mean value of Blood sugar were found to be 112.5 ± 14.9, 120± 10.4 and 127.7 ± 6.9 respectively in over weight obese and morbid obese subjects of study group (III).

The blood sugar level represented in table-15 and figure-5 revealed that the mean value of blood sugar were found to be 154.7 ± 44.9, 132.8 ± 11.9 and 122.9 ± 8.5 respectively in diabetic, CHD and other obesity associated disease subjects of study group (IV).

Where as comparative study of Blood sugar level in respective control vs study group (I), (II), (III) were represented in table-22 and figure-12, revealed that the statistically significant rise was found with the p value of (p < 0.05) in over
weight subjects of study group (I) and (II) and more significant rise was found with the p value of (p < 0.01) in overweight subjects of study group (III). Where as statistically highly significant rise was found with the p value of (p < 0.001) in obese and morbid obese subjects of study group (I, II, III).

The comparative study of sugar in common control and common over weight, common obese and common morbid obese subjects was represented in table-32 and figure-22 revealed that statistically at least significant rise with p value of (p<0.05) was found in common over weight subjects and highly significant elevation was found with the p value of (p < 0.001) in common, obese and morbid obese subjects.

The increased level of free fatty acids occurs in obesity this increased FFA causes reduction of pancreatic insulin secretion which leads to increased sugar level with increasing weight.

The highly significant elevation with the p value of (p < 0.001) was found in all the subjects of study group (IV).

The table-36 and figure-26 revealed that the blood sugar level was found to be 114.2 ± 10.6 in vegetarian obese subjects and 116.4 ± 12.6 mg% in non vegetarian obese subjects. The comparative study showed significant elevation with the p value of (p<0.001) in both the subjects when compared to control But the rise was more in non vegetarian subjects than vegetarian obese subjects.

The prevalence of obesity is higher in non–vegetarian subjects so that the increase in sugar level was also higher in sugar level (MCNA- obesity).

The table 37 and figure 27 revealed that the blood sugar level was found to be 110.2 ± 11.6 mg% in physically active obese subjects and 120.4 ± 13.2 mg% in sedentary obese subjects the comparative study showed significant elevation with
the p value of (p < 0.001) in both the subjects when compared to control. But the rise was more in sedentary subjects than physically active subjects.

The prevalence of obesity is higher in sedentary subjects so that the increase was also higher in sedentary subjects. (MCNA–obesity).

The mean value of serum urea was represented in table-3 and figure-1 revealed that the serum urea was found to be 22.5 ± 3.3, 25.11 ± 6.5mg% respectively in 18, 29 year control group, 30 to 45 year and 46 to 75 year control group. The gradual increase in urea with age might be due to ageing.

The table-6 and figure-2 revealed that the mean value of urea were found to be 25.2 ± 2.8, 29.2 ± 5.4, 32 ± 5.4 mg% respectively in over weight, obese and morbid obese subject of study group I.

The table-9 and figure-3 revealed that the mean value of urea were found to be 26 ± 4.7, 32 ± 6.1, 34.4 ± 6.1 respectively in over weight, obese and morbid obese subjects of study group II.

The table-12 and figure-4 revealed that the mean value of urea were found to be 29.5 ± 8.9, 35.2 ± 9.1 and 41.8 ± 4.9 respectively in over weight, obese and morbid obese subjects of study group III.

The table-15 and figure-5 revealed that the mean value of urea were found to be 38.1 ± 9.6, 38 ± 5.5, 29.9 ± 6.9 respectively in diabetic, CHD and other associated disease subjects of study group IV.

Where as comparative study of urea level in control vs study group (I), study group (I), (II), (III) were represented in table 23 and figure 13 revealed that the statistically in significant rise with the p value of (p > 0.05) were found in over weight subjects of study group I, II, III. However statistically significant rise with the p value of (p<0.01) were found in obese subjects of study group I, II, III.
Whereas statistically highly significant rise were found with the p value of (p<0.001) in morbid obese subjects of study group I, II, III.

The table-33 and figure-23 revealed that the highly significant elevation in the urea level with the p value of (p < 0.001) was found in diabetic and CHD obese subjects of study group IV but least significant elevation with the p value of (p<0.05) was found in other obesity associated disease subjects of study group (IV).

The increase in weight leads to the increased synthesis of lipids which leads to increased excretion of biliary cholesterol and other which increase the kidney tension as a result the level of urea increase with weight (MCNA—obesity).

The table-36 and figure-26 revealed that the significant rise in the urea with the p value of (P<0.05) was found in vegetarian and highly significant non vegetarian obese subjects when compared to control. But rise was more in non vegetarian obese subject than vegetarian obese subjects.

The table–37 and figure–27 revealed that the significant rise in urea level with the p value of (P<0.05) was found in physically active subjects where as highly significant rise in urea level with the p value of (P<0.001) was found in sedentary obese subject when compared to control.

The mean value of serum creatinine in table-3 and figure-1 revealed that the mean serum creatinine level were found to be 0.9 ± 0.5; 1.1 ± 0.3, 1.4 ± 0.3 mg% respectively in 18 to 29 year control, 30 to 45 year and 46 to 75 year control group. Gradual increase with age might be due to aging.

The table-6 and figure-2 revealed that the serum creatinine level were found to be 1.0 ± 0.2 , 1.3 ± 0.3, 1.5 ± 0.3 mg% respectively in over weight; obese, morbid obese subject of study group I.
The table-9 and figure-3 revealed that the mean serum creatinine level were found to be $1.2 \pm 0.2$, $1.5 \pm 2.1$, $1.9 \pm 0.5$ mg\% respectively in over weight, obese and morbid obese subjects of study group (II).

The table-12 and figure-4 revealed that the mean serum creatinine level were found to be $1.6 \pm 0.5$, $1.8 \pm 0.5$ and $2.2 \pm 0.4$ mg\% respectively in over weight, obese and morbid obese subjects of study group (III).

The table-15 and figure-5 revealed that the mean serum creatinine level were found to be $2.2 \pm 0.8$, $1.9 \pm 0.5$ and $1.8 \pm 0.5$ mg\% respectively in diabetic, CHD and other obesity associated subjects of study group IV.

The table-24 and figure-14 revealed that the statistically insignificant rise was found with the p value of (p>0.05) in the level of creatinine in over weight subjects of study group I, II, III. Whereas least significant rise with the p value of (p<0.05) was found in the level of creatinine in obese subjects of study group I and II and morbid obese subjects of study group I. The statistically high significant rise was found with the p value of (p < 0.001) in morbid obese subjects of study group II and III.

The table-34 and figure-24 revealed that the least significant rise in serum creatinine level with the p value of (p < 0.05) was found in common over weight subjects and significant rise was found with the p value of (p < 0.01) in common obese subjects and highly significant rise was noted in creatinine level with the p value of (p< 0.001) in common morbid obese subjects when compared to common control.

Though the changes in serum creatinine was not very significant but the rise was found to be only because of obesity. (Dr. Hakim)\textsuperscript{21}. 

\begin{center}
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The table-34 (a) and fig -24(a) revealed that the least significant rise in MDA level with the p value of (>0.05) was found in over weight subjects and significant rise was found with p value of (p < 0.01) in common obese subjects and highly significant rise was noted in MDA level with the p value of (p < 0.001) in common morbid obese subjects when compared to common control.

The table – 34 (b) & fig -24 (b) revealed that the least significant rise in SOD level with the p value ( >0.05) was found in over weight subject and significant rise found with p value of (p < 0.01) in common obese subjects and highly significant rise was noted in SOD level with the p value of (p < 0.001) in common morbid obese subjects when compared to common control.

The table -34 (c) & fig -24- (c) revealed that the least significant rise in catalase level was found in over weight subjects and significant rise was found in obese subjects and highly significant rise was found in morbid obese subject in comparison with control subjects.

These changes in free radical and antioxidant enzymes are because of increased free radical production in diabetic persons and which leads to increase level of anti oxidant enzymes because these antioxidant enzymes are scavenger of free radical.
The highly significant rise was found in serum creatinine level with the p value of (p<0.001) in Diabetic and CHD subjects and only significant rise was found in serum creatinine level with the p value of (p<0.05) in other obesity associated disease subjects.

The table-36 and figure-26 revealed that the serum creatinine was found to be $1.4 \pm 0.4$ and $1.8 \pm 0.6$ mg% respectively in vegetarian and non-vegetarian obese subjects.

The comparative study showed insignificant changes in creatinine level in vegetarian subject and least significant rise in non vegetarian subjects when compared to the common control.

The table-37 and figure-27 revealed that the serum creatinine level was found to be $1.6 \pm 0.4$ and $1.7 \pm 0.5$ mg% respectively in physically active and sedentary obese subjects.

The comparative study showed significant rise with the p value of (p<0.05) in physically active subjects and significant rise with the p value of (p<0.01) in sedentary obese subjects when compared to common control.

The table-3 and figure-1 revealed that the blood haemoglobin level were found to be $11.8 \pm 1.2$, $12.1 \pm 0.7$ and $11.9 \pm 1.2$ mg% respectively in 18 to 29 years, 30 to 45 years and 46 to 75 years control group.

The table-6,9 and 12 and figure 2, 3 and 4 revealed that the haemoglobin level were found to be $11.7 \pm 1.7$, $11 \pm 1.5$, $11 \pm 1.7$ mg% respectively in over weight obese and morbid obese subjects of study group (I) and $11.1 \pm 1.7$, $10.9 \pm 2.6$, $10.3 \pm 1.6$ mg% respectively in over weight, obese and morbid obese subjects of study group (II) and $11.2 \pm 4.2$, $10.7 \pm 1.7$, $9.1 \pm 4.9$ mg% respectively in over weight, obese and morbid obese subjects of study group (III).
The table-15 and figure-5 revealed that the haemoglobin present were found to be $9.7 \pm 6.2$ and $11.1 \pm 6.2$ mg% respectively in diabetic, CHD and other obesity associated disease subjects of study groups IV.

The comparative study of haemoglobin level in control vs study group I, II and III represented in table-25 and figure-15, revealed that the changes observed in haemoglobin percentage was found to be in significant with the p value of ($p>0.1$) in all subjects of study group I and other diseased subjects of study group (IV). Where as statistically least significant study group II and morbid obese subjects of study group III and CHD subject of study group (IV) with the p value of ($p < 0.005$). Where as statistically significant decreased was found with the p value of ($p < 0.001$) in Diabetic subjects of study group IV and obese and morbid obese subjects of study group III.

The table-36 and figure-26 revealed that the insignificant changes in the Hb level was found with the p value of ($p>0.05$) in vegetarian and non vegetarian obese subjects when compared to common control.

Where as table-37 and figure-27 revealed that the decreased in the Hb level was found to be statistically insignificant in physically active and sedentary obese subjects.

The changes in haemoglobin level with the increase weight is not very significant. the gradual decrease was found with age not with weight it might be due to ageing. (Comfort et al)$^{166}$. 
