Chapter - VII

General discussion
The present study is entitled as “STUDIES ON RISK FACTORS ASSESSMENT OF CORONARY ARTERY DISEASE WITH SPECIAL EMPHASIS TO LIPID PROFILE PEROXIDATION AND ANTIOXIDANT STATUS”. As positive control of coronary artery disease (CAD), this study is devoted to myocardial infarcted (MI) subjects. These MI subjects (Table IV.7) are compared with the normal control. Significant (p<0.01) increased levels of cholesterol, Tg, LDL-C, cholesterol/HDL-C and LDL-C/HDL-C, and significant (p<0.001) decreased levels of HDL-C are observed in the MI group. Serum lipid peroxidation level (Table V.7), i.e., MDA (Malondialdehyde) and auto antibody against oxidized LDL-C are found significantly higher (p<0.01) than the control group. Ratio of NO and MDA, and NO levels are significantly lower (p<0.001) in MI group than in the control group. Antioxidant levels of myocardial infarction group are compared with the normal group (Table VI.7, i.e., Fig.VII – 3a,3b and 3c), the mean SOD level in the MI group is significantly lower (p<0.001) than the control group and also shows a negative association between SOD and myocardial infarction, suggesting that myocardial infarction is associated with a decreased activity of the cytoprotective antioxidant enzyme SOD. Along with these inverse (significantly higher, p<0.01 and p<0.001) relationship between the cytoprotective antioxidant enzymes, GPx, catalase and myocardial infarction are observed. All these reveal that during myocardial infarction cholesterol, Tg, cholesterol/HDL-C and LDL-C/HDL-C, MDA and auto antibody against oxidized LDL-C level are significantly increased; whereas, HDL-C, ratio of NO: MDA, and antioxidant enzymes SOD, GPx and catalase are significantly decreased in comparison with the normal control group.

From Tables IV.1-IV.6 it may be noticed that lipid profile level has not significantly changed with increase of age. The study is conducted over a total of 662 people. As per guideline of the NCEP (National Cholesterol Education Programme), the risk factor range of cholesterol is > 190 mg/dl; only 38% of the total participants crossed the risk factor level of cholesterol, and 62% are under the risk factor criteria. Risk of triglyceride ranged >180 mg/dl; only 22% people crossed the bar, and 78% are under the risk factor criteria. Range of HDL-C is described as < 40 mg/dl, 44.7% people belong to this group, and 55.3% have their HDL-C >40 mg/dl.
Fig.VII – 1: showing the levels of MDA and NO in myocardial infarcted and control group.

Fig.VII – 2: showing the ratio of NO and MDA in myocardial infarcted and control group.

Fig.VII – 3a, 3b, and 3c showing the antioxidant levels in myocardial infarcted and control groups.
Fig. VII – 4: showing the percentage of participant in safe and risk zone of CAD as per guide line of NCEP (lipid profile level)
In the case of LDL-C, 70% people are found to be under the risk factor (LDL-C <130 mg/dl) criteria; and only 30% people belong to the risk group. So, it may be concluded that lipid profile independently does not fulfill the risk factor criteria, and that the average Indian people are below the lipid profile risk factor criteria. Thus, the risk factor criteria on the basis of lipid profile, in the case of Indian, need further evaluation to arrive at a definitive conclusion only when a higher number of people participation in the study group is considered. MDA levels increased with age and ratio of nitric oxide and MDA (NO: MDA) are decreased (but not significantly) with age in the case of both male and female participants (Table V.1-V.6). In either case nitric oxide level is found to have decreased but not significantly. No significant change is observed in the level of auto antibody against ox-LDL which could trigger an autoimmune response leading to the formation of antibodies. Negative correlation between age and SOD activity, and positive correlation with GPx (Table.VI.1-VI.6) activities are observed but no significant changes in the case of catalase activity is found associated with ageing. So, it can be suggested that, the increased level of MDA and decreased ratio of NO: MDA and antioxidant level with age could be interpreted as due to higher production of free radicals during the aging.
Lipid profile signature of different groups in percent deviation from control

Different groups
-40
-20
20
40
60
80

TDM = All diabetics  THTN = All hypertensive  TO = All overweight  THTNDM = All hypertensive with diabetics  HTNDMSMOK = Hypertensive diabetic smoker

Fig.VII-5a: Showing lipid profile signature of different groups in percent deviation from control
Lipid peroxidation signature of different percent deviation from control

Fig. VII - 5b: showing the lipid peroxidation signature of different percent deviation from control

TDM = All diabetic
THTN = All hypertensive
TO = All overweight
THTNDM = All hypertensive diabetic
HTNDMSMOK = Hypertensive diabetic smoker
MI = Myocardial infarction
Antioxidant signature of different groups percent deviation from control

Different groups

TDM = All diabetic  THTN = All hypertensive  TO = All overweight  THTNDM = All hypertensive diabetic  HTNDMSMOK = Hypertensive diabetic smoker  MI = Myocardial infarction

Fig. VII – 5c: showing the antioxidant signature of different groups percent deviation from control
The lipid profile, lipid peroxidation and antioxidant signature of different groups in percent deviation from control are denoted here by the graphical presentation in Fig.VII - 5a,5b and 5c.

The level of Tg is higher (Fig.VII-5a) in hypertensive diabetic smoker, hypertensive diabetic and over weight groups. The level of HDL-C is lower and LDL-C/HDL-C ratio is very high in these groups. Shift for deviation of HDL-C level is lower than the control group. The extent of deviation or fluctuation is also high in these groups. The fluctuation varies about 60% and 30%. This fluctuation is almost absent in total diabetic groups. In myocardial infarction group trend of fluctuation from normal control is almost similar to hypertensive diabetic smoker group. But this magnitude is slightly less than myocardial infarction group. In case of hypertensive group, much appreciable deviation from normal population is not observed.

In a comparison, made between diabetic, hypertensive and diabetic hypertensive smoker groups, the later group magnify the fluctuation by decreased level of HDL-C, increased level of Tg and cholesterol/HDL-C level.

The level of lipid peroxidation (Fig.VII-5b) i.e. MDA and ox-LDL are increased maximum in myocardial infarcted (MI) group. But MDA is increased highest in hypertensive diabetic smoker group and hypertensive diabetic group is followed by it. Antibody of ox-LDL is increased second highest in hypertensive diabetic group and hypertensive diabetic smoker group is followed by it. Ratio of NO and MDA decreased maximum in MI group and followed by hypertensive diabetic smoker group. But the percent deviation signature of overweight and DM groups decreased to minimum and found nearly the same.

From the Fig.VII-5c, it is observed that the level of antioxidant severely disrupted in MI group and followed by hypertensive diabetic smoker group. In the other groups levels of antioxidant decreased except diabetic group. Catalase level is reverse in diabetic group than those of other groups.
% deviation signature of lipid profile in male and female of different groups

Fig. VII – 6a: showing percent deviation signature of lipid profile in male and female of different groups.

MDM = male diabetic  FDM = female diabetic  MHTN = male hypertensive  FHTN = female hypertensive  MO = male overweight  FO = female overweight  MHTNDM = male hypertensive diabetic  FHTNDM = female hypertensive diabetic
% deviation signature of lipid peroxidation in male and female subject in different groups

MDM = male diabetic  FDM = female diabetic  MHTN = male hypertensive  FHTN = female hypertensive  MO = male overweight  FO = female overweight  MHTNDM = male hypertensive diabetic  FHTNDM = female hypertensive diabetic

Fig. VII – 6b: showing percent deviation signature of lipid peroxidation in male and female subject in different groups
Fig.VII-6c : showing percent deviation signature of antioxidant in male and female of different groups
The percentage deviations signature of lipid profile, lipid peroxidation and antioxidant in male and female subject of different groups are appended here in Fig.VII – 6a,6b and 6c.

The deviation of lipid profile is similar to female overweight, female hypertensive diabetic and male overweight groups (Fig.VII – 6a). In female overweight group the variation is higher in Tg level and this is followed by female hypertensive diabetic group and male overweight group. In female overweight group LDL-C is not too much deviated from control but in male overweight and female hypertensive diabetic group the level of LDL-C is altered more than the simple overweight group. The level of HDL-C is much lower in male overweight group than the female overweight group. The deviation of Tg level is lower in male diabetic with hypertensive group than the normal control group whereas the deviation of LDL-C is highest in the same group. The level of HDL-C is increased more than 10% in the same group while the trend of female hypertensive and female diabetic groups are very similar. In case of male hypertensive group, the levels of Tg and HDL-C is decreased slightly. In context of lipid profile male hypertensive and male diabetic groups are very similar except HDL-C level.

Individual cases of male diabetic, female diabetic, male hypertensive and female hypertensive, in these four groups levels of lipid peroxidation are similar and their deviations are nearly same (Fig.VII–6b). Lipid peroxidation level is observed highest in male diabetic hypertensive group and lowest in female overweight group. The level of ox-LDL is highest in female hypertensive diabetic group and the second highest observed in female hypertensive group. But lowest level of ox-LDL is observed in male diabetic group.

From the (Fig.VII–6c), it is observed that, antioxidant defence enzyme levels are nearly similar in male hypertensive, female hypertensive, male overweight and female overweight groups. The level of catalase is decreased except male diabetic and female diabetic groups only. Trend of all other antioxidant levels in other groups are nearly similar.
Fig. VII – 7a: Showing the comparative lipid profile in high risk groups
Comparison of lipid peroxidation levels of high risk groups

MO = male overweight FO = female overweight HTNDMSMOK = hypertensive diabetic smoker

Fig. VII - 7b: showing comparison of lipid peroxidation levels of high risk groups
Comparison of antioxidant in high risk groups

MO = male overweight  FO = female overweight  HTNDMSMOKE = Hypertensive diabetic smoker  MI = Myocardial infarction

Fig. VII - showing the comparison of antioxidant in high risk groups
Observably comparative lipid profile, lipid peroxidation and antioxidant level of high risk groups are in Fig.VII – 7a, 7b and 7c.

From the (Fig.VII – 7a), it is evident that Tg is increased in female overweight group, which is in second position after hypertensive diabetic smoker group, and it is also followed by MI group. Male overweight group having the lowest level of Tg value than the other groups, which is found less than 10%. Maximum increase of Tg is observed in hypertensive diabetic smoker group but the level of HDL-C level is decreased to about 30% and cholesterol / HDL-C level is increased above 66%, which is only 1.2% less than that of the myocardial infarction group. In between two extremes the lipid profile of female overweight occupies intermediate position of probable risk in comparison to simple male overweight with minimal risk in terms of lipid profile.

Lipid profile of myocardial infarction group is taken as a principle positive control. This group is taking preventive medicine, so in this case it is not observed to constitute a high lipid groups compared to the others. Over all profile of the all four groups are similar and coherent. Only the magnitude of deviation is highest in myocardial infarcted group and lowest in male overweight group. Lipid peroxidation level (Fig.VII – 7b) i.e.MDA is higher to a maximum level in MI group and lower in female overweight group. Development of auto antibody against ox-LDL is increased to maximum level in MI group and decreased to a minimum in male overweight group. Ratio of NO:MDA decreased maximum in MI group and decreased minimum in female overweight group. Male hypertensive diabetic smoker group is going almost side by side to myocardial infarcted group but maintaining its submission to myocardial infarcted group. Antioxidant levels (Fig.VII – 7c) of these groups vary to the extent of 20% to 60% compared to the normal control group.
Lipid profile signature of all subjects in all groups, male and female in percent deviation from control.

Fig. VII-8a: showing the lipid profile signature of all subjects in all groups, male and female in percent deviation from control.
Lipid peroxidation signature of all subjects, in all groups, male and female in percent deviation from control

Fig. VII - 8b: showing the lipid peroxidation signature of all subjects, in all groups, male and female in percent deviation from control
Antioxidant enzyme signature of all subjects, in all groups, male and female in percent deviation from control.

Fig. VII - 8c: showing the antioxidant signature of all subjects, in all groups, male and female in percent deviation from control.
% deviation of all parameter in all subjects, male, and female from control

Fig. VII-9: Showing percent deviation of all parameter in all subjects, male, and female from control.
Comparative trends of associated factors in order of gradient of percent deviation from control

Fig. VII-10: showing the comparative trends of associated factors in order of gradient of percent deviation from control
The gradient of percent deviation signature from control of all subjects, male and female groups as observed is presented in Fig.VII – 8a,8b and 8c.

From the Fig.VII-8a, it is observed that the level of cholesterol is increased in male than the female. In male group, cholesterol increased around 21.3%, whereas 10.6% in female group, which is nearly double. Tg level is high in male group about double of the female group. But HDL-C is very much lower than the female (one tenth). LDL-C level is nearly half of male group; cholesterol / HDL-C and LDL-C / HDL-C are also nearly half of the male group. MDA is very lower in female group than the male group. But ox-LDL is higher in female group than the other groups antioxidant levels are lower by nearly half of the male groups.

Percentage deviation of lipid profile, lipid peroxidation and antioxidant levels from control, of all male, all female for all parameters are provided here in Fig.VII – 9.

A comparison is made in between total male and female groups in respect of all parameters. Level of Tg is higher in male groups about nearly double than the female group. HDL-C level is very much higher in male than the female group (likely more than ten times).

The level of LDL-C of female group is half of male group. The level of cholesterol / HDL-C and LDL-C/HDL-C are almost half in female group than the male group.MDA is nearly double in male than the female group. But ox-LDL is reversed in case of female group. Ratio of NO:MDA is severely depressed in male but no such effect observed in case of females. Antioxidant enzymes are found doubly depressed than the female groups.

Comparative trend of associated factors in order of gradient of percent deviation from control as observed is entered Fig.VII – 10.

From the presented chart, it is observed that female group is less affected than her male counterpart except ox-LDL cholesterol, which is more than 120% of the normal control group. LDL-C and HDL-C are the least amount, which are increasing or decreasing but both are within 20%. The values of the linear trend lines suggest that the variations are persistent in male than the female, where $R^2$ of male is = 0.9361 and in female $R^2 = 0.7236$. So the trend of deviation in male is more conspicuous with a stiffer gradient in relation to the female.
Many epidemiological studies have reported high prevalence rates of diabetes among Indians. There occurs derangement in the metabolism of lipids and fat, which attributes to abnormal serum lipid pattern. Dyslipidaemia in relation with diabetes has long been shown to have a strong relation with CAD. In the case of diabetic group (61-80 years and 20-40 years of female) in this study (Tables IV.1-IV.6), Tg level is significantly (p<0.01) high against the control group, the same observation also made by many other workers. 7,8 Cholesterol level also increase with Tg, but not significantly except in males, and they are positively correlated (p<0.05). When the same age group (20-40 years) of male and female diabetic groups are compared against the same age group of non-diabetics, HDL-C is found significantly decreased (p<0.05) and LDL-C significantly increased (p<0.05). But in the 41-60 year age group females, HDL-C level is significantly increased compared with males. Both in male and female groups (Tables V.1-V.6), MDA is significantly (p<0.01) increased when compared with the control group. This study does not reveal any significant difference in the mean levels of auto antibody against ox-LDL (except 61-80 years of male and female group) and NO in the diabetics when compared against the control groups. But the ratio of NO: MDA level is found to have significantly (p<0.05) decreased in females of both 20-40 and 41-60 year in comparison with to the same age groups of control. A significant decreased level of GPx (p<0.01) activity is found in diabetic groups compared with the control groups (Tables VI.1-VI.6). This is likely to be due to severe oxidative stress. The level of SOD is significantly (p<0.01) lower than the control groups. This happens due to inactivation of SOD level by hydrogen peroxide that is formed from autooxidation of glucose. So, hydrogen peroxide accumulation may be an explanation for the observed decreased activity of SOD in this groups. From this study it may be concluded that increased level of Tg along with MDA level and decreased level of NO: MDA, SOD and GPx are unique features of diabetics, where oxidative stress and antioxidants are directly correlated with higher Tg levels.

Hypertension is an important modifiable risk factor for cardiovascular morbidity and mortality. It accounts larger for cardiovascular disease burden. It is a component of risk-factor cluster and an indicator of present or future development of other cardiovascular risk factors.
In the present study, level of LDL-C in hypertensive groups (Tables IV.1-IV.6) is significantly higher in females \((p<0.05)\) than in males (both in 41-60 and 61-80 years of age). Cholesterol is significantly \((p<0.001)\) higher and HDL-C is significantly \((p<0.01)\) lower in female hypertensive group than the control group. Auto antibody against oxidized LDL-C is significantly higher \((p<0.001)\) in male and female (61-80) years age groups compared with the same age group of control. MDA is significantly higher \((p<0.05)\) in all age groups of male and female. Nitric Oxide (NO) level is significantly lower \((p<0.01)\) when compared with the control in both male and female groups. NO: MDA is also significantly decreased when compared with the control. Ratio of NO: MDA is also significantly \((p<0.01)\) decreased when compared with the control and this relationship is well established\(^{11}\). NO is a well known potent vasodilator and there exists unequivocal evidence to demonstrate that there is basal NO-dependent vasodilatation in humans, which plays an important role in regulation of blood flow in healthy humans. NO has a direct effect on oxidative stress by scavenging ROS and NO inactivation is enhanced in the presence of excess ROS. A direct relation is found between hypertension and markers of oxidative stress and the susceptibility of lipids to oxidative modification in humans independent of other coronary heart disease risk factors\(^{10}\). Antibody against oxidized LDL-C is significantly high \((p<0.01)\) in 61-80 years of male and female groups compared with the control. Tables VI.1 to VI.6 shows the relationship between hypertension and antioxidant level, namely SOD, GPx and catalase activity. The mean SOD, GPx and catalase activity of hypertensive groups are compared with control groups and their levels are significantly low \((p<0.001), (p<0.01), (p<0.001)\) respectively and also show a negative association suggesting that hypertension is associated with a decreased activity of the erythrocyte cytoprotective enzyme SOD, GPx and catalase activity. So from this study it becomes clear that in hypertensive groups, lipid abnormality is very common along with it lipid peroxidation and antioxidant balance gets severely disrupted; which results in decreased ratio of NO and MDA and produce increased level of autoantibody against oxidized LDL. These events in succession trigger the formation of fatty streaks within the arterial wall ultimately leading to incidence of myocardial infarction.
Fig. VII – 11

Fig. VII – 11 and Fig. VII – 12 showing the antioxidant levels of male hypertensive and control groups
Fig. VII – 13

Fig. VII – 14

Fig. VII– 13 and Fig. VII – 14: showing the antioxidant levels of female hypertensive and control group.
Fig. VII – 15: showing the antioxidant levels of female hypertensive and control group.

Fig. VII – 16: showing the level of antibody against ox-LDL of male and female control and hypertensive group.
Overweight (i.e., high BMI) is the very common risk factor of coronary artery disease, which is thoroughly investigated in this study together with its influence to CAD in relation with lipid profile, lipid peroxidation and antioxidant levels. Tables IV.1-IV.6 gives the findings relating to that of overweight groups with lipid profile level. In the age group 20-40 year, the level of Tg (p<0.001) is significantly higher in females than in males. In overweight male groups, cholesterol is significantly (p<0.01) higher than the control. And in females, cholesterol and Tg are significantly (p<0.01) higher and HDL-C is significantly (p<0.01) lower than the control group. When males are compared with the females in the 41-60 year age group, both Tg and cholesterol are significantly (p<0.05) higher and HDL-C is significantly (p<0.05) lower in females than the males. In overweight males, age group of 60-80 years, significantly (p<0.05) higher level of LDL-C and lower level of HDL-C, and in the same age group of females, significant (p<0.01) higher level of Tg are found when compared with the control group. Lipid peroxidation level in overweight groups (Tables V.1-V.6) is observed. MDA level is found significantly higher (p<0.05) in the 20-40 year age group of males and in 60-80 year age groups of both males and females. The ratio of NO: MDA is found significantly (p<0.05) decreased in both 20-40 and 61-80 year age group of males and in 61-80 year age group of females when compared with the control group. Significantly higher (p<0.05) level of auto antibody against oxidized LDL is obtained only in the female 61-80 year group.

Antioxidant levels too are studied in the same age groups (Tables VI.17 to VI.22). The mean SOD level is significantly lower (p<0.05) in overweight group in comparison with the control group, and the measured values also show a negative association between SOD and BMI, suggesting that obesity is associated with a decreased activity of the cytoprotective enzyme SOD. These tables also show an inverse relationship between antioxidant level of GPx and BMI. The level of this enzyme in individuals with healthy BMI is significantly higher (p<0.01) than the corresponding values in those with high BMI and there is also a significant negative association between BMI and GPx level. An inverse relationship between antioxidant level catalase and BMI is also observed.
So from this study it is observed in 20-40 and 61-80 year of age group of males that cholesterol, Tg and MDA are significantly higher and are positively correlated and antioxidant levels are lower and negatively correlated. In 61-80 year age group of females, there is no significant correlation is observed in lipid profile parameter; but lipid peroxidation along with auto antibody against ox-LDL are significantly higher and antioxidant levels are significantly lower. So, in case of overweight groups, it may be concluded that lipid profile level partially demonstrates the relation of CAD with overweight risk factor. But lipid peroxidation and antioxidant balance together with lipid profile correlation make out a very distinct risk marker.

In Table IV.8 and IV.9, lipid profile levels of male and female diabetic hypertensive groups are estimated. In these groups, cholesterol and LDL-C are found significantly higher (p<0.01) compared with control group. Lipid peroxidation level (In Table V.8 and V.9) i.e. MDA, auto antibody against oxidized LDL are found significantly higher (p<0.05), (p<0.001), and the ratio of NO: MDA level is observed significantly lower (p<0.05) than the control group. The mean antioxidant level, (In Table VI.8 and VI.9) SOD (p<0.001), GPx (p<0.01) and catalase (p<0.001) of these groups are significantly lower than in the control group. It may, be concluded that diabetic with hypertensive groups are more prone to CAD than only diabetic group or hypertensive group.

As Table IV.10 depicts, lipid profiles of diabetic, hypertensive males with smoking habit shows significantly (p<0.01) higher levels of cholesterol, Tg, LDL-C, cholesterol/HDL-C and LDL-C/HDL-C and significantly (p<0.05) lower level of HDL-C is found. MDA, and auto antibody against oxidized LDL (Table V.10) are significantly increased (p<0.001) compared with the control group. The ratio of NO: MDA is significantly decreased (p<0.001) in subjects than in the control group. Antioxidant level i.e., SOD, GPx and catalase (Table VI.10) are significantly (p<0.001) decreased compared with the control group. So from this study it can be suggests that in hypertensive diabetic smoker group lipid profile, lipid peroxidation and antioxidant levels are severely disrupted from the others groups and which is maintaining very close
relationship with myocardial infarction group. So it needs very urgently to take care of these type of people to save their lives from early myocardial infarction.

When hypercholesterimic males and females (Table. IV.11 and IV.12), are compared with the normo cholesterimic control, significantly (p<0.001) increased levels of Tg, LDL-C, chol/HDL-C and LDL-C/HDL-C are observed in both cases. Lipid peroxidation levels i.e., MDA, of these groups (Table. V.11 and V.12), are evidently increased in both cases. Nitric oxide level characteristically decreased more in females than in males. Level of auto antibody against oxidized LDL is found to be significantly (p<0.001) increased in females only. The mean SOD, GPx and catalase (Table VI.11 and VI.12) activity in hypercholesterimic persons are found to be not adequately correlated. So the hypercholesterimic females are more prone to CAD than males are.
Fig. VII – 17, Fig. VII – 18 and Fig. VII – 19 showing the antioxidant levels of male hypertensive diabetic smoker and control group.

Fig. VII – 20 showing the MDA and NO levels of male hypertensive diabetic smoker and control group.
**Fig. VII - 21**

Auto antibody against ox-LDL of diabetic hypertensive smoker and control group.

**Fig. VII - 22**

Ratio of NO:MDA in diabetic hypertensive smoker and control group.

**Fig. VII - 21** showing the auto antibody against ox-LDL level of male hypertensive diabetic smoker and control group.

**Fig. VII - 22** showing the ratio of NO:MDA level of male hypertensive diabetic smoker and control group.
Lipid profile of hypertriglyceridimic males and females (Table IV.13 and IV.14) are compared with the normo triglyceridimic control group, and significantly (p<0.001) increased levels of cholesterol, LDL-C, are found. Lipid peroxidation level (Tables V.13 and V.14), i.e., MDA is significantly increased (p<0.001) in males but not in females when compared with the control. Both in males and females, NO level does not change comparison with the control group. The ratio of NO: MDA level does not significantly change. Auto antibody against ox-LDL is found significantly higher in males (51.1 ± 12.1) year of age group only but no change is observed in female group. Antioxidant levels (Tables VI.13, VI.14), SOD, GPx and catalase activity in hypertriglyceridimic persons are found not to be significantly correlated. It may therefore be concluded that hypertriglyceridimia is found to be more harmful in the 51.1 ± 12.1 year of age group of males only.

Lipid profile levels are compared between male and female groups, who have (Table IV.15, IV.16) low levels of HDL-C against high level of HDL-C groups. In male and female groups Tg, cholesterol/HDL and LDL/HDL are observed noticeably higher (p<0.05) than control groups. The lipid peroxidation level (Tables V.15, V.16), only the ratio of NO: MDA and auto antibody of oxidized LDL are significantly higher (p<0.001) in male groups of low levels of HDL-C compared to control male groups. HDL-C increased (positively) with the ratio of NO: MDA and auto antibody of oxidized LDL. In females no significant variation of any parameter is observed. Antioxidant levels (tables VI.15 and VI.16), SOD, GPx and catalase activity are distinctly (p<0.001) correlated with low levels of HDL-C containing groups. So, low level of HDL-C in the age group (57±12) years of male and female groups exhibited more severe implication for CAD than in the other male and female age groups.
Fig. VII - 23: showing the ratio of NO and MDA in different pathological conditions
Ratio of NO:MDA in different physiological conditions

Fig. VII - 24: showing the ratio of NO:MDA in different physiological conditions
Overall, the observed ratios of NO and MDA in association with various risk factors are shown in the table VII.1.

<table>
<thead>
<tr>
<th>The ratio of NO: MDA in various conditions</th>
<th>NO: MDA ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control subjects</td>
<td>2.6±0.70</td>
</tr>
<tr>
<td>Hypercholesteremic male subjects</td>
<td>2.0±1.2</td>
</tr>
<tr>
<td>Hypertriglyceremic male subjects</td>
<td>1.8±0.9</td>
</tr>
<tr>
<td>Female overweight subjects (age 41-60 years)</td>
<td>1.8±0.83</td>
</tr>
<tr>
<td>Female overweight subjects (age 20-40 years)</td>
<td>1.7±0.83</td>
</tr>
<tr>
<td>Male diabetic subjects (age 20-40 years)</td>
<td>1.7±0.90</td>
</tr>
<tr>
<td>Male overweight subjects (age 41-60 years)</td>
<td>1.6±0.83</td>
</tr>
<tr>
<td>Female diabetic subjects (age 20-40 years)</td>
<td>1.6±1.1</td>
</tr>
<tr>
<td>Male diabetic subjects (age 61-80 years)</td>
<td>1.5±0.8</td>
</tr>
<tr>
<td>Low level of HDL-C in female subjects</td>
<td>1.5±0.37</td>
</tr>
<tr>
<td>Male overweight subjects (age 20-40 years)</td>
<td>1.5±0.83</td>
</tr>
<tr>
<td>Female diabetic subjects (age 61-80 years)</td>
<td>1.3±0.7</td>
</tr>
<tr>
<td>Male hypertensive subjects (age 41-60 years)</td>
<td>1.3±0.89</td>
</tr>
<tr>
<td>Hypercholesteremic female subjects</td>
<td>1.3±0.6</td>
</tr>
<tr>
<td>Hypertriglyceremic female subjects</td>
<td>1.3±0.39</td>
</tr>
<tr>
<td>Low level of HDL-C in male subjects</td>
<td>1.3±0.8</td>
</tr>
<tr>
<td>Male overweight subjects (age 61-80 years)</td>
<td>1.3±0.78</td>
</tr>
<tr>
<td>Female overweight subjects (age 61-80 years)</td>
<td>1.3±0.53</td>
</tr>
<tr>
<td>Hypertensive diabetic male subjects</td>
<td>1.2±0.94</td>
</tr>
<tr>
<td>Female diabetic subjects (age 41-60 years)</td>
<td>1.2±0.6</td>
</tr>
<tr>
<td>Female hypertensive subjects (age 41-60 years)</td>
<td>1.2±0.68</td>
</tr>
<tr>
<td>Male hypertensive subjects (age 61-80 years)</td>
<td>1.1±0.74</td>
</tr>
<tr>
<td>Female hypertensive subjects</td>
<td>1.1±0.62</td>
</tr>
<tr>
<td>Hypertensive diabetic female subjects</td>
<td>1.1±0.84</td>
</tr>
<tr>
<td>Hypertensive, diabetic and smoker subjects</td>
<td>0.99±0.70</td>
</tr>
<tr>
<td>Myocardial infarcted subjects</td>
<td>0.88±0.241</td>
</tr>
</tbody>
</table>
From this detailed tabulation it may be observed that in the control group the ratio of NO and MDA is evidently higher and in MI subjects it is significantly lower. And in all other risk-factor groups these are having a decreased trend in comparison with the same in the control group.

This index may easily be used to calculate individual probable risk to coronary artery disease. It is therefore indeed possible to consider a more cautious approach to circumvent incidence of MI. Not only that these tabulated results and other research findings may lead to arrive at the following conclusions:

a) Cutoff value of lipid profile level as CAD risk marker set down by the NCEP, leaves a scope for modification the case of Indians, especially for those in the North-East region.
b) Diabetic subjects who have hypertension are more prone to CAD than those who have only diabetes or normal as in control.
c) Diabetic, hypertensive males with smoking habit are very prone to CAD.
d) Cutoff value of cholesterol in the case of hypertension needs to be decreased, as warranted by our study, which shows significantly lower values than the values obtained by the NCEP.
e) Elevated fasting triglyceride level is positively correlated with CAD.
f) High level of cholesterol, especially in females of 50-70 years age group, signals more danger than for others.
g) High Tg levels are not always harmful, but in the case of the diabetics it spells more danger when correlation with oxidative stress and antioxidant level is taken in to account and clearly it is very atherogenic among males of 40-60 years age group.
h) Low level of HDL-C indicates higher susceptibility to atherogenic properties.
i) Overweight males of 20-40 and 61-80 years and females of 61-80 years of age are more prone to CAD.
j) High cholesterol, Tg, LDL-C or low-level of HDL-C are not always riskful for CAD, but under complicated conditions they are so, specifically when free radical generation is increased and antioxidant level tripped.

k) Auto antibody against oxidized LDL may be used as an early marker of coronary artery disease.

l) The ratio of NO and MDA may serve as a good indicator for the purpose of coronary risk assessment.
REFERENCES


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