CHAPTER - IV

Discussion
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<table>
<thead>
<tr>
<th>SL.NO.</th>
<th>CONTENTS</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.10.</td>
<td>CORNARY HEART DISEASE</td>
<td>99</td>
</tr>
<tr>
<td>4.20.</td>
<td>CORONARY RISK FACTORS AND RISK FACTORS STATUS</td>
<td>100</td>
</tr>
<tr>
<td>4.30.</td>
<td>INDEPENDENT CORRELATES</td>
<td>101</td>
</tr>
<tr>
<td>4.40.</td>
<td>WHR AND CORONARY RISK FACTORS</td>
<td>102</td>
</tr>
<tr>
<td>4.50.</td>
<td>TRACE ELEMENTS</td>
<td>104</td>
</tr>
</tbody>
</table>
4.10. Coronary Heart Disease

Coronary heart disease is the leading cause of death in the older population (Kannel, 1976; Thiene and Valente, 1990; Wenger, 1992 and Gupta and Gupta, 1996). The death rate from CHD increases exponentially with aging. Of the deaths from CHD, 80% occur in older people who are generally more than 65 years (Health statistics, 1980, Kannel et al, 1985 and Hazzards, 1992). In developing countries CHD occur in people aged 65 years and older (Health statistics, 1980). Meta analysis of various epidemiological studies of coronary heart diseases conducted in various regions in India shows that prevalence of CHD increases with age in both urban and rural areas. In the present study prevalence of CHD is slightly lower in females than males. As no significant difference is observed in both sexes, this could be due to chance only. (Table 6). In a hospital study conducted in Vellore, South India reveals total prevalence of 58.82% in 61 - 70 age group and 2.79 per cent in 71 - 80 age group (Table 8). In another hospital study from Tirupati, South India Subramanyam et al (1996) reports 16.66% prevalence of CHD in 61 - 70 age group and 6.33 percent in 71 - 80 age group. In the present study 9.16% prevalence of CHD in 61 - 70 age group and 3.75% in 71 - 80 age group is observed. Kannel (1976) reports higher prevalence of CHD in men than women in greater than 60 years. Maurice et al (1993) have reported 18%, 18.6%, 22.7% prevalence of myocardial infarction in 65-69, 70-74 and 75-79 age groups and angina in the following percentage 21.1%, 21.6% and 24.8% in 65-69, 70-74 and 75-79 age groups respectively. In the present study also higher prevalence of CHD is observed in men than women except in 65 to 69 age group (Table 9).
4.20. Coronary risk factors and risk factor status

Multiple risk factors for the development of CHD have been identified based on the results of large epidemiological studies. The commonly recognized risk factors for CHD are male sex, cigarette smoking, diabetes mellitus, hypertension, sedentary life style, family history of CHD, obesity and type ‘A’ personality have been implicated as risk factors, but opinion divided about the degree to which they contribute to the development of CHD. During the past quarter century the mortality from CHD has steadily declined (Stern, 1979). This decrease has been attributed, at least in part, to successful modification of some coronary risk factors such as hypertension (Stamer, 1985), yet, despite this general decline, the proportion of elderly individuals dying from CHD has actually risen (Levy, 1981). While this may be partly attributable to the aging of general population, other factors may also play a role. Most of the patients followed up in the large epidemiological studies were middle aged. The impact of traditional risk factor for the development of coronary heart disease in the elderly is uncertain (Mukerji, 1989).

Framingham study reports that 20% to 30% of the elderly are obese, 20% smoke, 6% have impaired glucose metabolism, and 23% are hypertensive (Kannel, 1992). Singh et al (1995) have reported 35.7%, 4.2%, 5.3%, 3.5%, 15.0%, 13.5% of smoking, hypertension, diabetes, hypercholesterolemia, hypertriglyceridaemia, low HDL-C, and central obesity in males and 26%, 2.9%, 3.4%, 5.1%, 3.8%, 10.2% and 38.2% prevalence of smoking, hypertension, diabetes, hypercholesterolemia, hypertriglyceridaemia, low HDL-C and central obesity in females, Mukerji (1989)
reports male sex, cigarette smoking, and diabetes are major risk factors in his study on elderly. Subramanyam et al (1997) have reported higher serum cholesterol and glucose levels and tobacco chewing, non-institutionalized subjects than institutionalized subjects. In the present study higher percentage of tobacco chewing (50%), stress (73%), hypercholesterolaemia (34%), hypertension (57%), and truncal obesity (76%) is in females than males (Table 3). No statistically significant difference in prevalence of coronary risk factors in subjects with and without CHD in both sexes is observed except in case of BMI in females.

Wander et al (1994) have reported prevalence of 16.7% single risk factor and (2.4%) two risk factors from rural Punjab population involving all age groups. In the same population prevalence of 47% single risk factor, 12% of two risk factors and 3% of three risk factors is observed in CHD subjects. Upasini and Wasir (1994) have reported prevalence of 9.6% and 5.9% three risk factors in males and female CHD patients. Subramanyam et al (1996) have reported >3 risk factors in 2.4% of male CHD subjects. In the present study no significant difference is observed in prevalence of number of risk factors in subjects with and without CHD (Table 5). The median number of risk factors with CHD in both sexes is four, whereas, it is three in males and two in females without evidence of CHD.

4.30. Independent correlates

Age, sex, stress, diabetes, zinc, copper, HDL-C are considered independent correlates for CHD in both sexes and the same is examined using logistic regression
an~sis. Greater than 70 years, sex, HDL-C and zinc variables have shown positive association with CHD but statistically not significant, whereas, copper has shown negative association and statistically significant (P<0.005). This shows that lower copper levels is associated with CHD in elderly and may enhance the susceptibility.

Copper absorption and retention is so strongly influenced by a number of other mineral elements and dietary components that a series of minimum copper requirements exist, depending on the extent to which these influencing factors are present or absent from the diet and on the criteria of sufficiency employed.

Copper is an essential trace element in the maintenance of the cardiovascular system. Copper-deficient diet can elicit, in animals, structural and functional changes that are comparable to those observed in coronary heart disease (Hamilton et al, 2000). Copper is essential for antioxidant enzymes in vivo and animal studies shows that copper deficiency is accompanied by increased atherogenesis and LDL susceptibility to oxidation (Turley et al, 2000). The copper deficiency in the elderly of the present study may be due to antagonistic effect of manganese which is revealed by significant correlation with manganese when examined using linear regression and may also due to the presence of 12.5% of anemic subjects.

4.40. WHR and coronary risk factors

In the past few years the dominant index of the body fat distribution pattern has been the waist hip circumference ratio(WHR) (Haffner et al, 1987; Van Gaal al,
The percentage prevalence of truncal obesity is greater in women than men (76% to 59%). Gupta and Majumdar (1994) have reported positive correlation between WHR and BMI, SBP, DBP. In the present study, further linear regression analysis WHR has shown positive relationship with HDL-C and LDL-C/HDL-C ratio in females. Persons with increased WHR have higher prevalence of diabetes, hyperinsulinemia and premature atherosclerosis. It is an important coronary risk factor in both males and females. (McKeigue et al, 1991). In the present study prevalence of diabetes in females and CHD in both sexes is greater among individuals with high WHR ratio. Folsom et al (1989) have reported that the prevalence of hypertension is significantly and positively associated with WHR. Terry et al (1992) has reported that WHR contribute to the risk of premature CHD mortality. Prevalence of CHD increased with WHR in both sexes. Ley et al (1992) have reported that rapidly dwindling estrogen levels in postmenopausal women are associated with a redistribution of fat into central stores with adverse effects on levels of lipoproteins and insulin resistance that result in cardiovascular disease. Several studies (Stern and Haffner, 1986; Donahue et al, 1987; Reaven, 1988; Depress et al, 1990; Defronzo and Ferrara, 1997; Bajaj, 1993) have suggested that abnormal glucose-insulin metabolism, hypertension and changes in plasma lipoprotein levels and lipid metabolism is the mechanism for developing cardiovascular disease. Increased WHR is associated with peripheral hyperinsulinaemia due to altered insulin metabolism (Despress et al, 1990 and Bajaj, 1993) but the exact mechanism by which it leads to atherosclerosis need explanation. In the present study higher
levels of total-C, triglycerides, LDL-C, LDL-C/Total-C and HDL-C/total-C is observed with higher WHR ratio in both sexes.

It is possible that hepatic handling of insulin is modulated by habitual fat intake and with diet of high fat content, secretion of insulin could rise in order to suppress hepatic production of glucose, resulting in insulin resistance syndrome characterized by central obesity. Because Indians are adapted to survival with low-fat diet and physically demanding occupations, even modest increases in fat intake above 21% energy intake/day in association with a sedentary lifestyle may be enough to initiate central obesity (Singh et al, 1998). The WHR values of present study are in agreement with Singh et al (1998) study.

4.50. Trace Elements:

Studies on trace metals are of particular importance at the present time since there are many man made alterations of the environment. Now, it is well established that several trace elements are of great importance in a number of biological processes mostly through their action as activators or inhibitors of enzymatic reactions by competing with other elements and proteins for binding sites, by influencing the permeability of cell membranes or through other mechanisms. It is therefore reasonable to assume that these minerals would exert an action, either directly or indirectly also on the cardiac cell or the blood pressure regulating centres, or on other systems related to cardiovascular function for instance by altering the lipid metabolism (Masironi, 1969).
Allen and Kleavay, (1978) and Kromhout et al (1985) have observed negative effect of age on serum zinc and Zn/Cu ratio. Koo et al (1981 and 1984) and Carter et al (1984) have reported association of zinc status and LDL-C. Latinen et al (1984) have reported association between serum zinc and LDL-C. In the present study zinc has shown positive association with DBP in males. Latinen et al (1989) and Jiang He (1992) have reported inverse association between serum copper and HDL-C. In the present study men shown positive relationship with HDL-C. Vijaya (1996) has observed significant relationship of serum lipids with manganese. In the present study in men manganese has shown positive relationship with SBP, DBP, LDL-C/HDL-C ratio. Johnson et al (1992) have observed an interaction between Mn and Cu. Similar findings is observed in the present study when examined using linear regression analysis. Mutual biological antagonism between the elements (Zn/Cu/Mn) be therefore occur as a consequence of the isomorphous replacement of one element by another at some functional site. Similar results are reported by Hill et al (1970), Bremner and Marshal (1974 a and b) and Suciu et al (1992).

The results of the present study shows that trace elements are significantly correlated and influencing the risk factors. This suggests that in addition to traditional risk factors, trace elements should be considered as risk factors for CHD. More attention should be paid towards trace element adequacy.

Clinical, epidemiological and experimental studies have shown a relationship between trace elements and cardiovascular disease. The cardiovascular disease like many other diseases may be due to metabolic disturbances caused by trace element imbalance thus causing secondary changes in the trace element content of some
Masironi et al (1969, 1970 and 1976) has reported that a number of trace elements have been shown to influence individual risk factors for cardiovascular diseases.

All metabolic pathways in the body are trace elements dependent. The biological availability of trace elements depends on the form in which the element occurs in food and the presence of phytates and other substances that bind the element. Trace elements interact with each other and such interaction may occur at any one or more loci. The interaction may occur during gastrointestinal or cellular absorption and during incorporation into binding sites on enzymes, transfer proteins, storage compounds and cellular structural proteins. Interactions between trace elements occur to such an extent that the margin between the levels at which the effects on the organism are beneficial and those that are toxic may be quite small or even overlap. A trace element deficiency occur from failure in the supply of essential nutrient or due to excessive concentration one element which prevent the effective utilization of another element. Toxicity of trace element is due to the inherent ability of certain metal ions to antagonize the essential function of other elements.

The people living in different geographical environments may have an enhanced or depressed intake of certain elements reflecting the chemical composition of the environment. The mineral imbalance is affected by a large number of human activities, including air and water pollution, water treatment, irrigation, food processing and the use of agricultural chemicals. The natural geographical differences and temporal trends in incidence might therefore be the reflection of differences in the environmental mineral imbalance.