

**Biochemical, Haematological
and Coagulation Parameters,
and I/D Polymorphism in the
ACE gene as Markers for
Coronary Heart Disease in
the Saudi Arabs**

Introduction

Coronary heart disease (CHD) is reported at a frequency of around 5.5% in the Saudis population, with the prevalence increasing significantly with age (9.3% in 60-70 years old). Major contributors to CHD in the Saudis are smoking and hyperlipidaemia. In addition studies have also shown a high frequency of diabetes mellitus and obesity in this population [1-4].

Coronary heart disease is a multifactorial disorder with both genetic and environmental factors contributing to its etiology. Several genes have been shown to contribute to the development of CHD [5-6].

This study was designed with the aim of studying relevant biochemical, haematological and coagulation parameters in Saudi CHD patients and to investigate the Insertion/Deletion (I/D) polymorphism in the 16 intron of the angiotensin converting enzyme (ACE) gene.

Material and Methods

The study group included 111 adult patients (male = 69; females = 42), diagnosed as suffering from CHD and being attending outpatient and inpatient clinics at the King Khalid University Hospital. The demographic information was recorded, and 5-10 ml of blood was drawn by venepuncture in heparinized or EDTA tubes after overnight fast from each individual. The following analysis were carried out:

- Haematological parameters (including red cell indices) Coulter Counter
- Biochemical parameters (liver, renal, bone and cardiac function tests, lipids, uric acid, glucose) Autoanalyser
- Apo A1 & B RID (Medic)
- Leptin RIA (Linco Research)
- Lp (a) RIA (Sigma kits)
- Coagulation parameters (PT, APTT, Ptinr and fibrinogen) Kits (BioMeri)

DNA was extracted from the buffy coat [7] and used for the study of I/D polymorphism of ACE gene [8].

Results

The age, height, weight, Body Mass Index (BMI) systolic and diastolic blood pressure (BP) in the CHD patients and control group are presented in Table 1. The patients were all adults with age ranging from 25-76 years. Except for height, none of the other parameters showed any differences between the male and female CHD patients. BMI, systolic and diastolic BP were higher in the CHD patients compared to the control group.

The biochemical parameter values are presented in Table 2 in comparison with the values obtained in the normal controls. Levels of leptin, Lp(a), Apo A and Apo B are also presented in Table 2. Several significant differences were seen between the CHD patients and control group. The cardiac enzymes, leptin, Lp(a), cholesterol, triglycerides, LDL and VLDL were significantly higher while HDL level was significantly lower in the CHD patients. The values of haematological parameters in the male and female CHD patients and the control group are presented in Table 3.

Contd.

Results

Coagulation parameters were compared between the CHD patients and controls and the results are presented in Table 3. The ACE genotypes II, ID and DD were identified on electrophoresis (Figure 1) and the frequency of the genotypes and I and D alleles are presented in Table 4. The frequency of ACE genotype and alleles were not different significantly in the CHD patients and the control group. However, when the CHD patients with and without hypertension were separated and compared, the DD genotype was significantly higher while the II genotype was significantly lower in the CHD patients with hypertension compared to those without hypertension (Table 5). I & D allele frequencies also showed a significant difference.

Discussion

This study has compared the values of biochemical, haematological and coagulation parameters as possible markers of CHD. Significant differences in the values of coagulation parameters compared to the normal control, point to the usefulness of these parameters in CHD patients.

In Saudis, majority of the CHD patients were overweight or obese and had elevated systolic or diastolic bp or both.

Several biochemical parameters may also be used as indicators of CHD development, in particular, the lipids lipoproteins. Of these cholesterol LDL and VLDL were elevated in majority of the patients, while HDL was lower than the normal range.

Variation in the levels of haematological parameters were also seen between the CHD patients and normal controls, though these are relatively non-specific and may be a result of a number of other contributing factors.

Contd...

Discussion

Fibrinogen was elevated in majority of the patients, indicating that its assessment and elevation in normal individuals is an indicator of a possible CHD development.

Leptin and Lp(a) were of special significance as both were significantly elevated in CHD patients. Lp(a) has been considered as a useful indicator of CHD.

Finally, the I/D polymorphism of ACE gene did not exist between the CHD patients on the whole compared to the normal controls. However, within the CHD patients group, presence of hypertension correlated significantly with the D allele.

References

Khattab MS; Abolfotouh MA; Alakija W; al-Humaidi MA; al-Wahat S Risk factors of coronary heart disease: attitude and behaviour in family practice in Saudi Arabia. East Mediterr Health J 1999 Jan;5(1):35-45.

-Rahman Al-Nuaim A : High prevalence of metabolic risk factors for cardiovascular diseases among Saudi population, aged 30-64 years. Int J Cardiol 1997 Dec 19;62(3):227-35.

-Ashouri K; Ahmed ME; Kardash MO; Sharif AY; Abdalsattar M; al Ghozeim A Acute myocardial infarction at high altitude: the experience in Asir Region, southern Saudi Arabia. Ethn Dis 1994 Winter;4(1):82-6.

-Awada A; al Rajeh S; Bademosi O; Ismail H; al Freihi H; Larbi E; Ibrahim AW Accidents vasculaires cerebraux des adultes jeunes en Arabie Saoudite. Etude de 136 cas. Rev Neurol (Paris) 1992;148(8-9):550-4.

-Johansen K; Dunn B; Tan JC; Kwaasi AA; Skotnicki A; Skotnicki M Coronary artery disease and apolipoprotein A-I/C-III gene polymorphism: a study of Saudi Arabians. Clin Genet 1991;39(1):1-5.

-Kordy MN; el-gamal FM A study of pattern of body mass index (BMI) and prevalence of obesity in a Saudi population. Asia Pac J Public Health 1995;8(2):59-65.

-al-Shammari SA; Ali M; al-Shammari A; al-Maatouq M; Tennier A; Armstrong K Blood lipid concentrations and other cardiovascular risk factors among Saudis. Fam Pract 1994 Jun;11(2):153-8.

-El-Hazmi, M.A.F., Al-Swailem, A.R., Warsy, A.S., Al-Sudairy, F., Sulaimani, R., Al-Swailem, A.M. and Al-Meshari, A.A. (1995). The prevalence of diabetes mellitus and impaired glucose tolerance in the population of Riyadh. Annals of Saudi Medicine 15(6): 598-602.

- **- El-Hazmi, M.A.F., Warsy, A.S., Al-Swailem, A.R., Al-Swailem, A.M., Sulaimani, R. and Al-Meshari, A.A. (1996). Diabetes mellitus and impaired glucose tolerance in Saudi Arabia. Annals of Saudi Medicine 16: 381-385.**
- **El-Hazmi, M.A.F. and Warsy, A.S. (1997). Prevalence of Obesity in Saudi Population. Ann Saudi Med 17(3): 302-306.**
- **El-Hazmi MAF and Warsy SA. (1999). Hypertension in Saudi Arabia. Saudi J Kidney Dis Transplant;10(30): 365-371**
- **A.S. and El-Hazmi, M.A.F. (1999). Diabetes, hypertension and obesity - common multifactorial disorders in Saudi Arabia. East Med Health Journal. 5(6);1236-1242.**