# FREQUENCY OF CORONARY ARTERY DISEASE (CAD) RISK FACTORS IN ARMED FORCES

**Sultan Mehmood Kamran, Raheel Iftikhar*, Fahim Akhtar, Kumail Abbass****
Combined Military Hospital Okara, *Pakistan Air Force Base Samungli Quetta, **Combined Military Hospital Multan

## ABSTRACT

***Objective:*** To determine the frequency of risk factors of coronary artery disease (CAD) in apparently healthy soldiers of Pakistan Armed Forces.

***Study Design:*** Cross sectional descriptive study.

***Place and Duration of Study:*** Department of medicine, CMH Okara from July 2012 to Dec 2012.

***Patients and Methods:*** The study included 2215 male currently serving soldiers in age range of 18 to 52 years by consecutive sampling. Relevant history, body mass index (BMI), waist circumference (WC) and blood pressure (BP) of each subject were recorded. BMI > 25 kg/m² and WC > 90 cm was considered obesity and abdominal obesity respectively. BP > 140/90 mmHg was defined as hypertension. All the participants of study underwent blood glucose fasting, blood glucose random, ECG recording, personality assessment and lipid profile. Risk estimation was done using Eric Brittain scoring system.

***Results:*** In our study group 95.5% patients were having at least 1 risk factor of CAD, 54 % were having 2 to 4 risk factors while 3.93% had > 4 risk factors. Risk estimation of CAD using Eric Brittain scoring system showed that a large proportion of study group had high probability of developing ischemic heart disease in next 6 years.

***Conclusion:*** A large proportion of our soldiers are harboring risk of CAD due to increase in frequency of 8 conventional CAD risk factors especially obesity.

**Keywords:** CAD, Hypertension, Obesity, Risk factors.

## INTRODUCTION

Coronary artery disease (CAD) is projected to become the leading cause of global morbidity and mortality by 2020[1]. There is a high frequency of CAD risk factors in Pakistan with more than 30% of population over 45 years of age affected by the disease[2]. A large study by Joshi, et al in 2007 compared prevalence of CAD risk factors between South Asian and other countries which concluded much higher prevalence of each of the CAD risk factors in South Asians[3]. Various risk factors associated with CAD, as brought out by previous studies include obesity, physical inactivity, smoking, type "A" personality, hyperlipidemia, hypertension, diabetes mellitus, and positive family history of CAD. These eight risk factors plus alcohol consumption/dietary patterns were studied at a large scale in CAD patients from 52 countries in INTERHEART study[4]. These nine factors accounted for over 90 percent of the population attributable risk (PAR) of a first myocardial infarction (MI)[4]. However few studies also concluded that 50 % cases of CAD had none of these conventional risk factors present other than age and gender and thus warrants more search for many hidden emerging risk factors[5]. Obesity and abdominal obesity not only directly increases risk of CAD but also predispose to other CAD risk factors like hypertension, DM, hyperuricemia, hypercholesteremia and physical inactivity. Different scoring system to determine probability of developing CAD in preceding years in individuals with one or many CAD risk factors has been devised in past. Notably third report on National Cholesterol Education Programme (NCEP)[13], first Framingham study[14], SCORE[15] and scoring system of Erica Brittain technical report at Standford University on probability of developing coronary heart disease[16] . In this study we used Eric Brittain technical report owing to selection of almost same variables and simplicity of the scoring system. The purpose of this study was to determine the frequency of CAD risk factors in apparently healthy soldiers of Armed Forces and to estimate probability of developing CAD

**Correspondence:** Dr Sultan Mehmood Kamran, Medical Specialist, House No. 26/A, Shami Road, 68 Med Bn, Okara, Pakistan
*Email: sultanmajoka79@hotmail.com*
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in next 6 years.

## PATIENTS AND METHODS

This cross sectional descriptive study was carried out in department of medicine, Combined Military Hospital Okara, from July 2012 to December 2012. Informed written consent was taken from each patient and permission from hospital ethical committee was also sought. In this study we selected 2215 adult male soldiers in age range of 18 years to 52 years by consecutive sampling. These soldiers were working in different units of 14 Division of Okara Garrison and were selected for this study. Those with pre-existing chronic kidney disease, NSAIDS use, endocrinopathies and those with other causes of secondary hypertension were excluded from study. Detailed history and examination of each individual was conducted and data entered in pre designed performa. Each patient was asked about age, education status, physical activity, smoking, marital status, family history and personality type. Individuals whose first degree relatives had any of the conditions, namely exertional angina, old or recent myocardial infarction, diagnosis of IHD or sudden death were considered to be having positive family history for CAD and regarded 'at risk'. A self administered adjective check list consisting of 39 adjectives for type A personality and 26 adjectives for type B personality was used[17]. Each of these 39 adjectives for type A personality was rated on a scale of 7, i.e. 1 to 7 and each of 26 adjectives for type B personality was scored by subtracting the rating marked by individual from number 8 (one number higher than the maximum score of each adjective in order to avoid getting zero). Persons with score of below 228 were considered to be belonging to personality type B and those with score of 228 or above belonging to personality type "A" which is a risk factor for IHD. Physical activity level was judged by profession of the soldiers. Clerks, munshi, painters, drivers, laboratory workers, khateebs, vehicle mechanics, down categorized individuals due to chronic ailments and cooks were considered physically inactive as they use to spend most of the time in sitting activities. Such soldiers are usually exempted from physical training, games and route marches owing to different nature of their jobs. For blood pressure measurement, each patient was asked to sit quietly in a chair with his or her back supported for 5 minutes in a private, quiet and warm room. Blood pressure was measured three times by the same physician with a table sphygmomanometer and the mean of the three measured values was noted. Use of the correct cuff size with the air bladder encircling at least 80% of the arm was ensured. Centre of cuff was placed at heart level. Width of cuff was kept equal to at least 40% of arm circumference. Rate of deflation was fixed at 2 mmHg/Sec. Weight and height measurement of each subject recorded; waist circumference (WC) was measured with measuring tape at level of anterior superior iliac spine and was recorded in cm to document abdominal obesity. WC > 90 cm was taken as abnormal. BMI ($kg/m^2$) was calculated for each individual using formula weight (kg)/ height ($m^2$). Those with BMI of 23-24.9 $kg/m^2$ were labeled as overweight while those having BMI more than 25 were considered obese[18]. All the participants of study underwent blood sugar fasting (BSF), blood sugar random (BSR) and serum Total cholesterol. Serum cholesterol > 200 mg/dl, BSF > 7 mmol/l, random more than 11.1 mmol/l were considered abnormal for purpose of study. Electrocardiogram (ECG) was done in all subjects to document presence of ECG evidence of left ventricular hypertrophy. Variables included in study were age, education, smoking, physical activity, blood glucose, lipid profile, family history, blood pressure recording and BMI. Individual risk factor for developing ischemic heart disease was calculated using scoring system of Eric Brittain technical report on probability of developing coronary heart disease[16]. This scoring system was used to give separate points ranging from 0 to 10 for degree of CAD risk factors like systolic blood pressure, smoking history, glucose intolerance and age/serum cholesterol level. Left ventricular hypertrophy (LVH) was not included in this scoring. Continuous variables were derived as means and standard deviation while categorical variables were described in

percentages/frequencies. All the data had been analyzed using SPSS version 16. Descriptive statistics were used to describe the results i.e, mean and standard deviation (SD) for quantitative variables while frequency and percentages for qualitative variables.

**Table-1 : Frequency of individual risk factors of CAD in study population (n=2215).**

| Sr. No | Risk factor | Frequency | Percentage (%) |
|---|---|---|---|
| 1 | Obesity | 785 | 35.4 |
| 2 | Smoking | 300 | 13.5 |
| 3 | Diabetes Mellitus | 114 | 5.1% |
| 4 | Hypercholesterolemia | 455 | 20.5 |
| 5 | Personality type A | 624 | 28.2 |
| 6 | Hypertension | 217 | 9.8 |
| 7 | Family history | 561 | 25.3 |
| 8 | Physical inactivity | 641 | 28.9 |

**Table-2: Frequency of number of risk factors for CAD in study population (n=2215).**

| Number of risk factors | Number of subjects | Percentage (%) |
|---|---|---|
| None | 100 | 4.5 |
| 1 | 835 | 37.7 |
| 2 | 567 | 25.6 |
| 3 | 396 | 17.9 |
| 4 | 230 | 10.4 |
| 5 | 45 | 2.0 |
| 6 | 19 | 0.86 |
| 7 | 14 | 0.63 |
| 8 | 9 | 0.41 |

**Table-3: Probability of developing IHD within 6 years* (n=2215).**

| % Probability of CAD in 6 yrs | Frequency | Percentage (%) |
|---|---|---|
| 0-4 | 1419 | 64.1 |
| 5-9 | 459 | 20.7 |
| 10-15 | 189 | 8.5 |
| 16-20 | 72 | 3.2 |
| 21-25 | 51 | 2.3 |
| 25-30 | 19 | 0.86 |
| 30-33 | 6 | 0.27 |

## RESULTS

Out of total 2215 subjects, age ranged from 18 to 52 years with mean age of 29.69 years (SD=1.501). BMI ranged from 16.4 to 31.6 kg/m² with mean of 22.7 kg/m² (SD= 1.59). Out of study group 763 patients (34.4%) were overweight and 785 patients (35.4%) were obese. In our study 641 (28.9%) were physically inactive. We had 300 individuals (13.5%) who were current active smokers for more than 5 years. BSF ranged from 3.4 mmol/l to 18.9 mmol/l with mean value of 4.75 mmol/l (SD=.884), BSR ranged from 6.4 mmol/l to 23.7 mmol/l with mean value of 8.6 mmol/l(SD=2.45). As per diagnostic criteria 114 (5.1%) patients were found to be suffering from diabetes mellitus. Mean cholesterol levels were 147 mg/dl (SD=1.89) ranging from 117 mg/dl to 357 mg/dl. There were 455 (20.5%) patients with hypercholesterolemia. As per questionnaire for personality assessment 624 (28.2%) individuals were having type "A" personality (table-1). We had 561 participants (25.3 %) with history of CAD among first degree relatives. Mean systolic blood pressure of study group was 118 mmHg (SD=8.73) and mean diastolic blood pressure was 81 mmHg

(SD=7.91). Out of study population 217 patients (9.8%) were found to be hypertensive. In our study group 95.5% patients were having at least 1 risk factor for CAD, 54 % were having 2 to 4 risk factors while 0.41% patients had all risk factors present (table 2). Using Eric Brittain scoring system probability of developing CAD in next 6 years was calculated as shown in table-3.

## DISCUSSION

Our study is one of the major surveys for estimation of burden of CAD risk factors among young apparently healthy soldiers of Pakistan Army. A somewhat similar study was carried out by Fazal et al[19] in 2008 in Armed Forces Pakistan where 137 patients of acute myocardial infarction (MI) were selected and retrospectively history was taken to find out presence of conventional CAD risk factors. So in Fazal et al study outcome was known and CAD risk factors were traced retrospectively where as our study in contrast just predicts the outcome in future depending upon presence of CAD risk factors in apparently healthy soldiers. They found that 64.2% patients were smokers, 30.7% had positive history of IHD whereas 14.6%, 12.4%, 7.3% and 5.1% had hypercholesterolemia, obesity, hypertension and diabetes mellitus respectively. In our study 1548 (70%) of the soldiers were found either overweight or obese which is quite alarming when we compare it with previous studies[19,20] of Pakistan. One of the reasons for this disparity may be the adoption of the more strict criteria of WHO for defining overweight and obesity in Asian countries[18] in our study. The other reasons may be a continuous upwards trend in obesity in our region and tremendous improvement in soldier's menu over the last decade. Another similar community survey was conducted in 2004 in Karachi by Dodani et al[21] in which 52.2% population was found either overweight or obese despite the fact that a BMI criteria of WHO for Non Asian countries was selected here where a BMI> 25 kg/m$^2$ was overweight and > 30 kg/m$^2$ was obese[22]. In our study only 28.9% of the soldiers were having sedentary life style as compared to 64.8% in Dodani et al[21] study. This may be because of more active life pattern of a typical soldier as compared to a civilian individual. Frequency of hypertension and diabetes were 38.5 and 9.1% respectively in Dodani et al study which is much higher than our results. This can be explained by a smaller population group selection with more female subjects. However our study showed 20.5% population with raised cholesterol which is much higher than other studies like Dodani et al[21] in Karachi. It may be due to more fatty and high caloric diet of soldiers than general population. This observation indicates the need for risk factor modification early in life. If these susceptible individuals wait for the first CAD event, 25% or more will die unexpectedly and suddenly outside the hospital. However proportion of hypercholesteremia in our study was lower than the study Dutta et al[23] where 38.8% population had high blood cholesterol levels owing to small study group comprising of more physically inactive and smoker subjects than our population. It is anticipated that in next 6 years 64% of the study population have 0 to 4% chances, 20.7% population have 5 to 9% and 8.5% of the population will have 10 to 15% chances of developing CAD. This probability remains subject to verification by a prospective study which is very strongly suggested.

## CONCLUSION

A large proportion of our soldiers are harboring one or more conventional risk factors of CAD particularly obesity, physical inactivity and type A personality. These patients are expected to suffer from major health issues in near future if not addressed and treated in time.

## CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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