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The mosaic of CVD risk factors — A study on 10,000 Pakistani cardiac patients

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Summary
Objective: To determine the cardiovascular disease risk factor profile of Pakistani patients.
Material and methods: In this cross sectional study, 10,000 patients with CVD were recruited. This 1 year study was conducted in the outpatient department of Armed Forces Institute of Cardiology/National Institute of Heart Diseases (AFIC-NIHD), which provides primary, secondary and tertiary cardiac care to patients from all over the country. The CVD risk factors studied included hypertension, diabetes, dyslipidemia, obesity, smoking, alcohol intake, inactivity, eating <5 portions of fruits and/or vegetables per day.
Results and discussion: Of the study participants 73.5% were males while 26.5% were females. Their average age was 53.83 ± 14.18 years and 51.68 ± 15.83 years, respectively. The frequency of premature CVD was 27.2% in males and 49.1% in females. 46.9% males and 77.4% females had abdominal obesity, 15.6% men and 1.9% women being current smokers. Blood cholesterol levels were >200 mg/dl in 10% of all study subjects. In a decreasing order, poor lipid values were seen for HDL, VLDL, TG, cholesterol, LDL and LDL/HDL. Diabetes and hypertension affected 18.5% and 8% study subjects, respectively. Mean BMI was 21.02 kg/m^2 in men and 22.41 kg/m^2 in women. 64.5% participants did not take five or more servings of fruits and/or vegetables per day. 66% males and 68% females were physically inactive.
Conclusion: Risk factors in Pakistani patients can be rank ordered as abdominal obesity, eating <5 portions of fruits and/or vegetables per day, HDL, physical inactivity, diabetes, VLDL, TG, smoking, cholesterol, hypertension, obesity, LDL, LDL/HDL and alcohol.

Introduction

The term cardiovascular disease (CVD) includes coronary heart disease (CHD), stroke, heart failure, hypertension,

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peripheral arterial diseases, congenital causes and rheumatic heart disease (RHD) [1]. CVD is the leading cause of morbidity and mortality all over the world [2,3], with the exception of Sub Saharan Africa [4]. Globally, CVD caused 17.1 million deaths in 2004, as per World Health Organization (WHO) estimates [5]. Eastern Mediterranean Region (EMR) countries [6], which include Pakistan, are plagued with the double burden of disease. South-Asia bears an outsized share of the global burden of CVD. Pakistan is among the worst-hit countries [7].

Multiple factors have been incriminated for CVD aetiology. These risk factors play an important role in a person's chances of developing the disease. The common modifiable risk factors include unhealthy diet, physical inactivity and tobacco smoke; while others are nonmodifiable, like age, male gender and heredity. Still others are termed as intermediate risk factors like hypertension, diabetes, abnormal blood lipids, and overweight/obesity [8]. Psycho-social stress, socio-economic status (SES), and history of taking contraceptive pills [9] are other known risk factors. Some novel risk factors [10] are being increasingly considered for their contribution to CVD.

The CVD risk factor profile of South-Asians from Pakistan, India, Nepal, Bangladesh and Sri Lanka etc. is different from that of other ethnic groups. There are variations within the different Asian groups themselves and also between the various countries [11]. Publication have extensively elucidated the phenomenon ''South-Asian paradox''. South Asians have a greater susceptibility to CVD due to an increased risk of atherosclerosis and are affected at a relatively younger age, despite low risk factor density. Their disease is more severe, extensive and associated with adverse outcomes, as compared to their European, American, and other Asian counterparts. Unfortunately, few individuals can be labelled as having ideal cardiovascular health [11].

We carried out the study with the objective of compiling a risk factor profile of Pakistani patients suffering from CVD. Our work on the subject has significance as we have attempted to study CVD in a Pakistani context, which is important.

Management of CVD imposes a substantial financial burden on health care payers and Pakistan is a developing, resource-constrained country. It is located in South Asia, a region badly affected by the CVD epidemic and its resultant high mortality. Moreover, it is an EMR country, a region grappling with the double burden of disease. Furthermore, it is one of the most populous countries of the world, a fact that increases the vulnerabilities manifold.

Material and methods

This cross sectional study was conducted at Armed Forces Institute of Cardiology/National Institute of Heart Diseases (AFIC-NIHD), located in Rawalpindi, Pakistan, which provides primary, secondary and tertiary cardiac care not only to military personnel but also civilian population. Our military beneficiaries comprise of serving and retired (army, navy and air force) officers and soldiers and their entitled family members. Our civilian clientele includes employees and the entitled family members of Federal government and panel organizations along with the civilians paid out of the defence budget, civilians paying out-of-pocket and the poor and needy, whose treatment charges are borne by Zakat and Bait-ul-maal (social welfare funds).

The study was carried out from March 2009 to March 2010, after obtaining necessary approval from the institutional review board. The study subjects were a cohort of self reporting, doctor diagnosed patients with CVD, reporting to the out-patients department of AFIC-NIHD, in the course of their routine medical check-up. Those who were >20 years of age and gave their voluntary, informed consent for participation, were included in the study through consecutive sampling. The exclusion criteria were any acute cardiac event warranting treatment forthwith, known advanced stage of any form of cancer, liver disease, kidney failure, psychiatric ailment, dementia, mental retardation and pregnancy.

The study instrument was a detailed interviewer-administered questionnaire, in which the respondents were asked to comment on their demographic attributes, family history and CVD risk profile.

After an overnight fast of 12 h, blood samples were drawn by trained nursing assistants. A central laboratory analyzed the specimens for fasting plasma glucose and lipid profile. The reports were handed over to patients within a few hours, who subsequently proceeded to the out-patients department. In the waiting area, all information from patients was gathered by a team of trained, junior medical officers, who endorsed results of the patients' laboratory findings and also assessed their BP, height, weight, WC and calculated their BMI.

All socio-demographic variables were operationally defined. Educational level was defined as under or above matriculation depending upon completing/not completing 10 years of formal schooling.

Based on their area of birth, Pakistani nationals were sub-classified as belonging to Punjab, Sindh, NWFP, Balochistan and Kashmir. Place of residence was further divided into urban and rural. Urban areas were defined as cities and towns having a population of >100,000 people.

Income was defined as money received on a monthly basis from all sources. Income was divided in classes as: Rs. <10,000, 10,000—25,000 and >25,000.

In the family history, the presence of hypertension, diabetes, obesity and hypercholesterolemia in a parent, siblings and first degree relatives was questioned.

The definition of smoking only pertained to cigarettes and was based upon the individuals' self reporting. Subjects were divided into three categories of current, former (left smoking 1 year ago) and never smokers. Abnormal lipids were defined as all lipid values, above the normal/reference range or a history of taking lipid lowering drugs. These reference ranges were: cholesterol < 200 mg/dl, triglyceride (TG) < 200 mg/dl, low density lipoprotein (LDL) < 150 mg/dl, very low density lipoprotein (VLDL) < 38 mg/dl, high density lipoprotein (HDL) < 38 mg/dl and HDL/LDL ratio <4. Diabetes was defined as a fasting plasma glucose level $\geqslant$126 mg/dl. Hypertension was defined as systolic blood pressure (BP) $\geqslant$ 140 mm Hg and/or diastolic BP $\geqslant$ 90 mm Hg measured 20 min apart, on two separate occasions. Obesity was defined as body mass index (BMI) $\geqslant$ 30.0 kg/m^2 and BMI in turn was calculated as

height in kg/m^2. Central obesity was defined as waist circumference (WC) in men $\geqslant$ 88 cm; and in women $\geqslant$ 80 cm and WC was measured mid way between the last rib and the iliac crest with an inch-tape. The study subjects were also asked about their daily consumption of fruits and/or vegetables. Eating <5 portions per day was considered a risk factor. Physical inactivity was a dichotomous variable, which was defined as the lack of physical activity. Physical activity was defined as doing vigorous exercise for 20 min or more three or more times per week. It was gauged subjectively by asking the participants about their leisure time activity. Alcohol users were categorized as current, former and never users.

All submitted questionnaires having missing data values for any variable were not included in the study.

Data was analyzed using SPSS version 15. For quantitative variables, mean and standard deviation (SD) and for qualitative variables, frequencies along with percentage were used for description of variables. Independent sample's *t*-test was used for comparison of quantitative variables while chi-square test was used for comparison of qualitative variables between different groups. A two-tailed $p < 0.05$ was considered statistically significant.

Results

The study spanned a period of 1 year during which a total of 10,000 patients with CVD were recruited. All were Pakistani nationals. The details of their socio demographic profile are depicted in (Table 1).

7350 were males and 2650 were females. Average age for men and women was 53.83 ± 14.18 years and 51.68 ± 15.83 years, respectively. The age group most affected by CVD, in males was 50—59 years and in females was 60—69 years. The frequency of premature CVD (onset of CVD before the age of 45 years in men and 55 years in women) was 27.2% in males and 49.1% in females. Risk factors clustered in the 45—65 years age bracket (Fig. 1).

Among those recruited, 42.2% males and 75.5% females were under-matriculation. The difference in education level between genders was highly significant.

Table 1 Socio demographic profile of patients.

Patient attributes	Male 7350 (73.5%)	Female 2650 (26.5%)	*P*
Age groups (years)			
20—29	300 (4.1%)	400 (15.1%)	<0.001
30—39	900 (12.2%)	250 (9.4%)	
40—49	1400 (19%)	500 (18.9%)	
50—59	2150 (29.3%)	400 (15.1%)	
60—69	1400 (19%)	700 (26.4%)	
70—79	900 (12.2%)	350 (13.2%)	
^{3}80	300 (4.1%)	50 (1.9%)	
Educational level			
Under-matriculation	3100 (42.2%)	2000 (75.5%)	<0.001
Above matriculation	4250 (57.8%)	650 (24.5%)	
Marital status			
Married	7050 (95.9%)	1950 (73.6%)	<0.001
Separated	100 (1.4%)	0 (0%)	
Unmarried	50 (0.7%)	200 (7.5%)	
Widowed	150 (2%)	500 (18.9%)	
Province of birth			
Punjab	5250 (71.4%)	2250 (84.9%)	<0.001
NWFP	800 (10.9%)	350 (13.2%)	
Sindh	400 (5.4%)	0 (0%)	
Balochistan	150 (2%)	0 (0%)	
Kashmir	750 (10.2%)	50 (1.9%)	
Area of residence			
Rural	4400 (59.9%)	1450 (54.7%)	<0.001
Urban	2950 (40.1%)	1200 (45.3%)	
SES (in Pakistani Rs.)			
<10,000	2400 (32.7%)	700 (26.4%)	<0.001
10,000—25,000	3100 (42.2%)	1500 (56.6%)	
>25,000	1850 (25.2%)	450 (17%)	

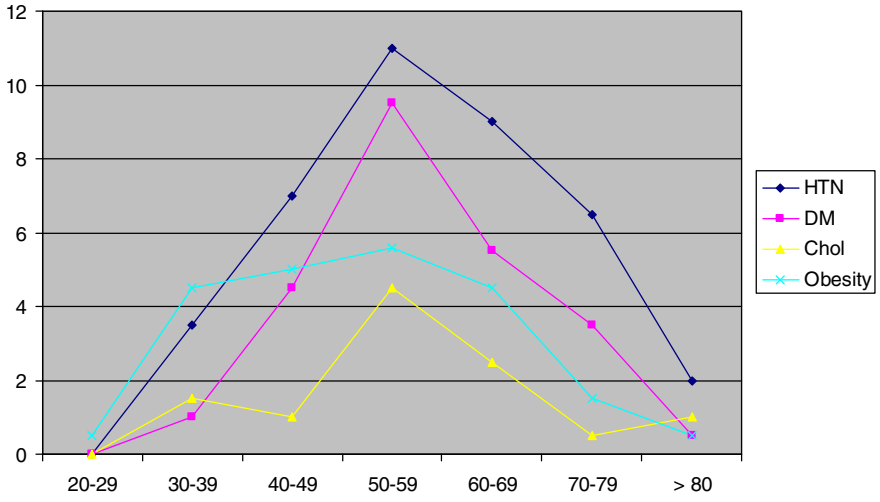

Figure 1 Clustering of risk factors in respective age groups.

As regards marital status 95.9% males and 73.6% females were married. The difference between genders for marital status is also highly significant. As regards area of residence, 58.5% participants belonged to rural areas. Highly significant difference were seen between genders for areas of residence and also between genders for socio-economic status.

The values for all the risk factors studied are summarized in (Tables 2 and 3). Smoking was found to be a major risk factor in men. Of the men and women 15.6% and 1.9% were current smokers, respectively. A significant association was observed between smoking and gender.

Average cholesterol levels in men and women were found to be 149.66 and 150.49 mg/dl, respectively. Blood cholesterol levels were in excess of 200 mg/dl in 10% of all study subjects, the rates being 9.5% in men and 11.3% in women. In a decreasing order bad lipids were depicted by HDL, VLDL, TG, Cholesterol, LDL/HDL and LDL.

The frequency of diabetes mellitus was 18.5% in all study subjects.

Hypertension was detected in 8% of the adult population.

For obesity, BMI was calculated. Mean BMI was found to be 21.02 kg/m^2 in men and 22.41 kg/m^2 in women. Of all the study subjects, 5.5% were labelled as obese, 4.1% of men

Table 2 Risk factor profile of patients.

CVD risk factors	Male	Female	*P*
Smoking			
Current smokers	1150 (15.6%)	50 (1.9%)	<0.001
Cholesterol			
Blood lipids > 200 mg/dl	700 (9.5%)	300 (11.3%)	<0.05
TG > 200 mg/dl	1200 (16.3%)	450 (17%)	>0.05
HDL < 38 mg/dl	2400 (32.7%)	900 (34%)	>0.05
LDL > 150 mg/dl	250 (3.4%)	200 (7.5%)	<0.001
VLDL > 38 mg/dl	1250 (17%)	550 (20.8%)	<0.001
LDL/HDL ratio > 4	350 (4.8%)	100 (3.8%)	<0.05
Diabetes			
Fasting plasma glucose > 126 mg/dl.	1350 (18.4%)	500 (18.9%)	>0.05
Hypertension			
BP > 140/90	500 (6.8%)	300 (11.3%)	<0.001
Obesity BMI $\geqslant$ 30 kg/m^2	300 (4.1%)	250 (9.4%)	<0.001
Abdominal obesity			
Men $\geqslant$ 88 cm	3450 (46.9%)	2050 (77.4%)	<0.001
Women $\geqslant$ 80 cm			
Eating <5 portions of fruits and or vegetables/day	4650 (63.3%)	1800 (67.9%)	<0.001
Physical inactivity at leisure time	5000 (68%)	1750 (66%)	<0.001
Alcohol intake	200 (2.7%)	50 (1.9%)	<0.05

Table 3 Description of numeric variables.

Variables	Male (n = 7350)		Female (n = 2650)		P
	Mean	SD	Mean	SD	
Age	53.83	14.13	51.68	15.88	<0.001
Systolic BP	119.92	13.55	120.96	14.88	<0.05
Diastolic BP	76.70	9.92	76.58	10.97	>0.05
BMI	21.02	3.68	22.40	6.48	<0.001
WC	74.95	30.36	87.83	23.69	<0.001
BSF	109.39	47.47	111.15	52.16	>0.05
Cholesterol	149.66	36.16	150.49	46.60	>0.05
TG	156.43	108.61	144.49	856.89	<0.001
HDL	43.01	17.90	41.00	9.56	<0.001
LDL	84.48	34.75	85.28	36.20	>0.05
VLDL	28.48	15.69	30.46	20.35	<0.001
LDL/HDL	2.15	1.02	2.15	0.93	>0.05

and 9.4% women. For central obesity WC was calculated. On this basis 55% of the patients were obese.

Participants were asked about their intake of five or more servings of fruits and/or vegetables per day, to which 64.5% replied in the negative.

Almost the same level of physical activity was observed in both males and females though males were found to be slightly more active than females.

Alcohol users were very few among the study subjects i.e. 2.5%. The frequency in males and females was 2.7% and 1.9%, respectively.

Discussion

This study was conducted to determine the risk factor profile of Pakistani patients. Our study cohort comprised of 10,000 CVD patients, all Pakistani nationals by birth. All the four provinces and Kashmir as well as the urban and rural areas of the country were adequately represented.

The mean age of study participants and the frequency of premature CVD indicate that women are affected earlier. These statistically significant differences have implications in terms of healthcare costs. Various studies from Bangladesh, India and Sri lanka [12—14] have confirmed these findings.

95.9% males and 73.6% females were married. The difference in marital status between the genders was highly significant. As a proxy measure, it showed that women tend to live longer and hence after spousal death, suffered social isolation. Others [15] have also confirmed that married individuals are at a reduced risk of CVD morbidity and mortality.

Sederholm et al. [16] have highlighted the gender differential and concluded that women have a higher risk factor burden than their male counterparts. The largest gender difference was seen for hypertension and diabetes, with a 50% higher rate in women as compared to men. In our study the largest gender difference was seen in abdominal obesity which was 77.4% in females and 46.9% in males.($p < 0.001$).

We studied the risk factors hypertension, diabetes, dyslipidemia, abdominal obesity, smoking, alcohol intake, inactivity, eating <5 portions of fruits and/or vegetables per day. Together they accounted for 92.5% of our CVD burden. Only for 7.5% patients, no risk factor could be incriminated. According to Grau et al. [17], hypertension, diabetes, dyslipidemia, obesity and smoking explain 97% of the CVD burden.

In order of decreasing frequency, risk factors in Pakistani males were physical inactivity, decreased consumption of fruits and or vegetables, abdominal obesity, HDL, diabetes, VLDL, TG, smoking, cholesterol, hypertension, LDL/HDL, obesity, LDL and alcohol. In Pakistani females they were abdominal obesity, decreased consumption of fruits and or vegetables, physical inactivity, HDL, VLDL, diabetes, TG, hypertension, cholesterol, obesity, LDL, LDL/HDL, smoking and alcohol.

We found a single risk factor in 25.5% of CVD patients, two in 31.5%, three in 27.5%, four in 6.5 of the patients. None of the patients presented with 5, 6, 7 or 8 risk factors. Iqbal [18] has studied the proportions of three risk factors occurring singly, doubly and all three together and has discovered the respective frequencies to be 39%, 11% and 1%. Khot [19] found that only 10—15% of patients lacked any of the four conventional risk factors (smoking, diabetes, hyperlipidemia and hypertension) and 1 of the 4 risk factors was present in 84.6% of women and 80.6% of men.

Males were found to be more active than females. Similar results have been reported by other researchers [20,21].

Our results are similar to Gupta's [22] for female smoking but differ markedly from others [23]. Our study showed a smoking frequency of 15.6% in men and 1.9% in women which is similar to Motlagh's [24] estimates. We differ from those of a Karachi based study [25] which found the frequency to be 21—33%.

Our study colludes with other studies [21,22] in similarity of diabetes frequency in men and women.

The estimates for obesity (as per BMI) vary markedly in various studies. Our noted frequencies of 4.1% in men and 9.4% in women, are strikingly different from those of Gupta's [22] figures of 54.5% and 61.3%, respectively. In Middle East [24] the frequency was 24.5% and women were found to be affected, more commonly. Jafar's [21], results are similar. Nanan [26], has reported the frequency of obes-

ity as 23% and 40% in 45–64 year old Pakistani men and women, respectively.

The prevalence of abdominal obesity as per our study was 46.9% in men and 77.4% in women. Gupta [22] noted it to be 61.0% and 54.30%; respectively.

For hypertension, our findings are very different from those of Gupta [22] but somewhat closer in frequency, to a Middle Eastern [23] estimate of 21.7%. Our results are in agreement with others [21] with hypertension occurring more commonly in women.

Generally, women [27] have more dyslipidemia. Higher levels of HDL-C, are found in Latin America, while lower levels are found in England and China [28]. Our HDL-C findings are similar to those of some researchers [22].

Our average cholesterol levels in men and women were 149.66 and 150.49 mg/dl, respectively and affected 9.5% men and 11.3% women. They are markedly different from Gupta's findings (32.6% men and 39.5% women).

Higher triglycerides values were found in 16.3% men and 17% women which match some other research results [29] but differ from Gupta's [22] (42.9% in men and 43.4% in women).

Only 36.7% men and 32.1% women consumed fresh fruits and vegetables. A study from Karachi [30] revealed higher frequencies.

Limitations of the study

Some limitations of our study should be noted. Although we are confident that our observations are an accurate representation of Pakistani patients; caution must be exercised when our conclusions are extrapolated to apply to healthy Pakistanis or those in other parts of the world. This was a facility-based study, confined to adult CVD patients and our data pertained to a single-centre. Among all known risk factors, we could not account for especially psycho-social stress; however, we identified and studied the major ones. Moreover, estimation of variables such as consumption of <5 portions of fruits and/or vegetables per day, physical inactivity, alcohol and smoking was based solely on patients' self-reports. Recall bias may have distorted some of our results. Data were collected by especially trained medical officers; still there were missing values in 1.3% of questionnaires. As is true for all cross-sectional studies, the study design did not provide direct evidence of incidence, outcome and inference of causality or allow assessment of change. These deficiencies can be best addressed in subsequent, adequately powered studies.

Strengths of the study

The study sample was large, nationally representative and had no urban bias. This fairly allows for a generalization of our results. Traditional CVD risk factors namely diabetes, hypertension, obesity and dyslipidemia were objectively measured after the initial patients' accounts. This makes our findings valid and reproducible for Pakistanis residing within their native country. All blood specimens were analyzed by a central laboratory. Observer bias was overcome by imparting extensive training to the data collectors.

Potential implications

This study has potential implications, at multiple levels. Locally, an in-depth knowledge of the risk factor profile of our patients will help us improve our functions as an institute. Evidence-based operation of individual risk factor clinics, cardiac rehabilitation programs, exploration of newer research avenues, meaningful health promotion and disease prevention endeavors will translate into effective and efficient health service organization and delivery. Nationally, a chronic disease policy can be formulated and adopted. Exercising allocative efficiency will strengthen the case for CVD preventive interventions, like provision of enabling environments for physical activity to all, at the community level as well as in the high risk groups. Internationally, it will act as a stable research base for detecting gender and ethnic differences in the prevalence of CVD.

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References

[1] Lamonte MJ. Epidemiology of cardiovascular disease. In: Durstine JL, Moore GE, Lamonte MJ, Franklin BA, editors. Pollock's textbook of cardiovascular disease and rehabilitation. USA: Human kinetics; 2008. p. 9–16.
[2] Backer GD. Prevention of cardiovascular disease in asymptomatic people. Heart 2010;96:477–82.
[3] Berger JS, Jordan CO, Lloyd-Jones D, Blumenthal RS. Screening for cardiovascular risk in asymptomatic patients. J Coll Cardiol 2010;55:1169–77.
[4] Gaziano TA. Reducing the growing burden of cardiovascular disease in the developing world. Health Affairs 2007;26(1):13–24.
[5] Lock K, Pomerlau J, Causer L, Altman DR, McKee M. The global burden of disease attributable to low consumption of fruit and vegetables: implications for the global strategy on diet. Bull World Health Organ 2005;83(2), 81–100–106.
[6] Mackay J, Mensah G. Atlas of heart disease and stroke. World Health Organization Geneva; 2004.
[7] Zoughbie DE. Community-based diabetes program: the microclinic project. Eastern Mediterranean health journal 2009;15(4):1021–6.
[8] Michael Gaziano J. Screening for coronary heart disease and its risk factors. In: Braunwald E, Goldman L, editors. Primary Cardiology. Philadelphia: Saunders; 2007. p. 261–9.
[9] Preventing chronic diseases: a vital investment. WHO global report. Geneva World Health Organization; 2006. p. 48.
[10] Enas EA, Chacko V, Pazhoor SG, Chennikkara H, Devarapalli HP. Dyslipidemia in South-Asian patients. Curr Atheroscler Rep 2007;9(5):367–74.
[11] Donald M et al. Defining and setting national goals for cardiovascular health promotion and disease reduction. Circulation 2010;121:586–613.

[12] Silbiger JJ et al. Atherosclerotic heart diseases in Bangladeshi immigrants: risk factors and angiographic findings. Int J Cardiol 2009. doi:10.1016/j.icard.2008.12.175.
[13] Singh RB, Tomlinson B, Thomas GN, Sharma R. Coronary artery disease and coronary risk factors: The South- Asian paradox. J Nutr environ Med 2001;11:43—51.
[14] Wijewardene K et al. Prevalence of hypertension, diabetes and obesity: baseline findings of a population based survey in four provinces in Sri Lanka. Ceylon Medical Journal 2005;50(2):62—70.
[15] Randall G, Bhattacharyya MR, Stetoe A. Marital Status and heart rate variability in patients with suspected coronary artery disease. Ann Behav Med 2009;38(2):115—23.
[16] Sederholm S, Stenestrand U, Lagerqvist B, Wallentin L, Swahn E. Gender perspective on risk factors, coronary lesions and long term outcome in young patients with ST-elevation myocardial infarction. Heart 2010;96:453—9.
[17] Grau M et al. Prevalence of cardiovascular risk factors in men with stable coronary heart disease in France and Spain. Arch Cardiovasc Dis 2010;103(2):80—9.
[18] Iqbal SP, Dodani S, Qureshi R. Risk factors and behaviours for coronary artery disease (CAD) among ambulatory Pakistanis. J Pak Med Assoc 2004;54(5):261—6.
[19] Khot UN et al. Prevalence of conventional risk factors in patients with coronary heart disease. JAMA 2003;290(7):898—904.
[20] Arsenault BJ. Beyond low-density lipoprotein cholesterol. J Am Coll Cardiol 2010;55(1):35—41.
[21] Jafar TH, Qadri Z, Chaturvedi N. Coronary artery disease epidemic in Pakistan: more electrocardiographic evidence of ischemia in women than in men. Heart 2008;94:408—13.
[22] Gupta R. Trends in prevalence of coronary risk factors in an urban Indian population: Jaipur Heart Watch-4. Indian Heart J 2007;59(4):346—53.
[23] Mackay J, Eriksen M. The tobacco atlas. WHO; 2002. p. 98.
[24] Motlagh B, O'Donnell M, Yusuf S. Prevalence of cardiovascular risk factors in the Middle East: a systematic review. Eur J Cardiovasc Prev Rehabil 2009;16(3):268—80.
[25] Maher R, Devji S. Prevalence of smoking among Karachi population. Pak Med Assoc 2002;52(6):250—3.
[26] Nanan DJ. The obesity epidemic-implications for Pakistan. J Pak Med Assoc 2002;52(8):342—6.
[27] Lombard C, Deeks A, Jolley D, Teede HJ. Preventing weight gain: the baseline weight related behaviors and delivery of a randomised controlled intervention in community based women. BMC Public Health 2009;9(1):2.
[28] Natarajan P, Ray KK, Cannon CP. High-density lipoprotein and coronary heart disease Current and future therapies. J Am Coll Cardiol 2010;55(13):1283—9.
[29] Opadijo OG, Akande AA, Jimoh AK. Prevalence of coronary heart disease risk factors in Nigerians with systemic hypertension. Afr J Med Med Sci 2004;33(2):121—5.
[30] Qidwai W, Mangi AR, Bux R. Life style related risk factors for cardiovascular disease among patients at a teaching hospital in Karachi. JAMC 2005;17(3):3—6.