



## Study on Cardiovascular Risk Factors among Tertiary Hospital Employees

Authors

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### ABSTRACT

*The aim of the present study was to estimate the prevalence of cardiovascular risk factors among employees working at a tertiary hospital. Material and Methods: A cross sectional survey was conducted among a total of 503 individuals aged 30 years and above. The mean age of the study group was 48.30±2.31 years. There was a high prevalence of major cardiovascular risk factors – current smoking (26.03), tobacco consumption (17.82), family history, diabetes mellitus (11.65), hypertension (21.23), hypercholesterolemia (41.12), hypertriglyceridemia (51.23), physical inactivity (46.23), body mass index (56.23), central obesity (44.14), inadequate fruits and vegetables consumption (36.13), heavy drinking (9.01). This indicates an urgent need to initiate a comprehensive health promotion and cardiovascular disease prevention Programme at working place.*

**Keywords:** Tertiary hospital employees, prevalence and cardiovascular risk factors

### 1. INTRODUCTION

The global burden of disease is shifting from infectious diseases to non-communicable diseases (NCDs).<sup>1</sup> As the infections and nutritional deficiencies are receding as leading contributors to death and disability, cardiovascular diseases (CVDs), cancers, diabetes, neuropsychiatric ailments, and other chronic diseases are becoming major contributors to the burden of the disease.<sup>2</sup> This shift in the pattern of diseases from communicable to non-communicable is occurring at a faster rate in developing countries than in industrial nations. India at present is facing double

burden of both communicable and non-communicable diseases.

Of all the NCDs, the cardiovascular diseases are the most rampant. They have become the leading cause of morbidity and mortality in most countries of the World. According to World Health Organization (WHO) estimates (2005), 17.5 million people around the world died of CVDs. This is 30% of all deaths globally.<sup>3</sup>

According to National Health Profile 2007, The estimated number of cases of coronary heart disease in India in 2005 was approximately 36 million.<sup>4</sup> It is also expected that the CVD burden

of India Would double in the next two decades, making it the single largest cause of death and the second largest cause of disability by the year 2010.<sup>5</sup> Most of this increase will occur on account of coronary heart disease.<sup>6</sup> This increasing trend would not only adversely affect the health status of the people but also take a toll on the country's economy as well. India is expected to lose \$237 billion in national income due to chronic non-communicable diseases including cardiovascular diseases, over the next 10 years.<sup>7</sup>

Despite this high burden, there is poor awareness among Indians, in addition to low detection and control rates.<sup>8</sup> This can be attributed to inadequate preventive health behavior among the Indian population. There are various external and internal factors affecting the preventive health behavior and health-seeking behavior undertaken by an individual. The external factors are resource availability<sup>9</sup> – financial resources and accessibility to healthcare services, literacy status, socio-economic status,<sup>10</sup> health awareness and knowledge, and cultural patterns. The internal factors include attitudes and beliefs.

Indian population has better accessibility to healthcare facilities, proximity to healthcare professionals, and more exposure to public health. Therefore, the present study aimed to assess cardiovascular risk factors among employees and families of a tertiary hospital.

## Objectives

To estimate the prevalence of cardiovascular risk factors among employees working at a tertiary care hospital.

## 2. MATERIAL AND METHODS

### 2.1 Study design and setting

Study was conducted among RL Jalappa employees aged 30 years and above. A total of 503 individuals were included in the study using convenience sampling. The employees were approached in their office.

### 2.2 Study questionnaire

Data was collected by means of questionnaire. Questionnaire consisted of three sections I. Demographic profile: related to demographic characteristics, age, gender, marital status, employment status, and educational qualification, number of family members, family income and details of family members II. CVD risk factor profile: pertaining to various cardiovascular risk factors, smoking, tobacco use, alcohol use, hypertension, diabetes mellitus, previous history of cardiac investigations or surgery, and family history, and life style related risk factors (dietary pattern, fruits and vegetables consumption, type and quantity of oil used for cooking, nut consumption) and physical activity. III. Bio physiologic parameter profile: for anthropometric and clinical measurements weight, height, body mass index, waist circumference, hip circumference, waist-hip ratio and blood pressure and biochemical investigations, fasting blood glucose and serum lipid profile.

### 2.3 Procedure for data collection

Data for the study was collected from October 2013 to April 2014. A convenient time was fixed with the employees who consented for participating in the study. Participants were explained regarding the study. Participant information sheet will be given and informed written consent was taken. After interview, anthropometric and clinical measurements will be taken in separate room at the office. Then a date, time and venue were fixed with the participant as per his/her convenience for collection of blood sample for biochemical investigations. Instructions regarding fasting for at least 8 hours prior to the test were advised. The participant was reminded a day before regarding the blood sample by telephonic call and also the instructions for fasting was repeated. The blood sample was collected and given at the central laboratory of RL Jalappa Hospital and Research Center. The report was collected and a duplicate copy was given to the participant. The participants were also giving informal health education regarding their risk

factors and ways to modify their life-style as appropriate.

#### 2.4 Anthropometry and clinical measurements

The equipment's used for measuring anthropometric and clinical parameters- the weighing machine, the electronic blood pressure machine and the tape measure was calibrated and certified for their accuracy by central work shop and also inter rater reliability was obtained for each of the parameters.

Weight was measured (to the nearest 0.5 kg) with the participant standing motionless weighing scale without shoes or any heavy outer garments, and weight equally distributed over each leg. Height was measured (to the nearest 0.1cm) using a standard non-elastic tape measure with the participant standing erect against a wall, without shoes, and the head looking straight. Waist circumference was measured using a standard non-elastic tape measure (to the nearest 0.1cm). The participant was asked to stand with the arms by the sides and to breathe out normally. Standing to the side of the participant, the inferior margin (lowest point) of the last rib and the crest of the ilium (top of the hip bone) was located and marked with a skin marker. The midpoint between the two was marked and measurement for waist circumference will be taken at the level of this midpoint. The hip circumference was measured around the maximum circumference of the hips. Sitting blood pressure (BP) was measured using blood pressure apparatus (to the nearest 1mm Hg). Two readings were taken at an interval of 10 min. If difference between the two readings was more than 10 mm Hg, a third reading of BP was recorded. The mean of 2 (or 3) readings was taken as the final measurement.

#### 2.5 Biochemical investigations

The department of Biochemistry at the RL Jalappa Hospital and Research Center was responsible for biochemical standardization. Fasting blood glucose was estimated by glucose/oxidase peroxidase-4-aminophenazonephenol; Randox method. In lipid profile, cholesterol was estimated

by cholesterol oxidase/p-aminophenzone, Randox method; triglycerides by glycerol phosphate oxidase peroxidase aminophenazone method, high-density lipoprotein (HDL) by the precipitation method using phosphotungstate/magnesium. LDL and VLDL were calculated using Friedewald's formula.

#### 2.6 Definition of risk factors and diagnostic criteria

The definition of the risk factors and the diagnostic criteria was used as follows:

**Current smoker:** An adult who has smoked 100 cigarettes in his or her life time and who currently smokes cigarettes every day or some days.<sup>11</sup>

**Former smoker:** An adult who has smoked at least 100 cigarettes in his or her lifetime, but who had quit smoking at the time of interview.<sup>11</sup>

**Tobacco use:** Consumption of any form of tobacco other than smoked in the past 6 months. The type of tobacco consumption considered include oral (tobacco chewed, pan masala, any other form, etc.) and inhaled forms (snuff).

**Family history:** Those who have history of cardiovascular event in their immediate family members (i.e. in patients and siblings).

**Body mass index classification:** As per WHO guidelines<sup>12</sup> normal- BMI 18.5-24.99; over weight- BMI  $\geq 25$ -29.99; obesity- BMI  $\geq 30$ .

As per India-specific guidelines<sup>13</sup>; normal- BMI 18.5-22.9; over weight- BMI  $\geq 23$ -24.9; obesity BMI  $\geq 25$ .

**Central obesity:** As per National Cholesterol Education Program- Adult Treatment Panel III guidelines (NCP-ATP III)<sup>14</sup> - waist circumference > 102 cm for men and > 88 cm for women

As per India-specific guidelines<sup>13</sup>: - waist circumference > 90 cm for men and > 80 cm for women.

As per WHO<sup>15</sup>: waist-Hip Ratio (WHR) > 0.9 for men or > 0.85 for women

**Pre-hypertension and hypertension:** According to Joint National Committee VII guidelines<sup>16</sup> - pre-hypertension: 120-139/80-89 mmHg; Hypertension:  $\geq 140/\geq 90$  mmHg.

**Self-reported hypertension:** History of diagnosis or treatment of hypertension

Impaired Fasting Glucose (IFG) and Type 2 diabetes mellitus (DM): As per American Diabetes Association <sup>17</sup> – IFG:  $\geq 110$ -125 mg/dl and type 2 DM:  $\geq 126$ mg/dl

**Self-reported diabetes:** History of diagnosis or treatment of diabetes.

**Diet:** The dietary patterns were classified as American Heart Association <sup>18</sup> into total vegetarian/vegan, lacto-vegetarian, lacto-ovo-vegetarian and non-vegetarian.

**Fruit and vegetable consumption:** As per WHO <sup>19</sup>

**Adequate fruit and vegetable consumption:** Consumption of 5 or more servings of fruits and vegetables per day.

**Inadequate fruit and vegetable consumption:** Consumption of less than 5 servings of fruits and vegetables per day

**One serving of vegetables:** 1 cup of green leafy vegetables,  $\frac{1}{2}$  cup of other vegetables (cooked or chopped raw) or  $\frac{1}{2}$  cup of fruit juice, not artificially flavored.

#### **Nut consumption**

Adequate nut consumption <sup>20</sup>: 3-5 serving of nuts per week

**One serving of nuts <sup>20</sup>:** One handful or one-third cup of nuts

**Inadequate nut consumption:** Never/almost never/sometimes in winter only or  $\leq 2$  servings of nuts per week

#### **Physical activity**

**Regular physical activity <sup>21</sup>:** A pattern of physical activity is regular if activities are performed most days of the week-5 or more days of the week if moderate-intensity activities (at least 30 min per day); 3 or more days of the week if vigorous intensity activities (for at least 20 min per session)

**Inactivity <sup>21</sup>:** Inactivity is not engaging in any regular pattern of physical activity beyond daily functioning.

#### **Dyslipidemia <sup>14</sup>**

**Hypercholesterolemia:** Total serum cholesterol level  $\geq 200$  mg/dl

**Hypertriglyceridemia:** Fasting serum triglycerides levels  $\geq 150$  mg/dl

**Decreased high-density lipoprotein cholesterol (HDL):** Fasting serum HDL-cholesterol  $< 40$ mg/dl for males and  $< 50$  mg/dl for females

**Increased low-density lipoprotein (VLDL):** Fasting serum VLDL cholesterol  $\geq 30$ mg/dl

Increased LDL/HDL ratio: LDL/HDL ratio  $> 3$

**Present consumer:** A person who consumes alcohol on a regular basis (every day) or occasionally (some days)

**Heavy drinker:** for men – consuming an average of more than 2 standard drinks per day. For women- consuming an average of more than 1 standard drink per day

**Former consumer:** A person who used to consume alcohol on regular basis or occasionally, but who has quit drinking at the time of interview. One standard drink is equivalent to consuming one standard bottle or 285 ml of regular beer; one medium size glass or 120ml of wine; one single measure or 30ml of spirits (rum/vodka/gin/whiskey) <sup>19</sup>

**High –risk individuals:** Those with one or more cardiovascular risk factors

### **3. STATISTICAL ANALYSIS**

Data analysis was done using SPSS version 16. Mean and standard deviation was used for continuous variables. Chi-square test was used to find association between various cardiovascular risk factors and selected demographic variables. Statistical significance was established at a level of  $P < 0.05$

### **4. RESULTS**

A total of 503 individuals were enrolled in the study and demographic characteristics of the study group are as outlined in table 1. The mean age of the study group was 48.30 years. Out of total, 63.4% were males and the remaining 36.6 % were females. Among subjects 40.9% were from the age group of 50-69 years followed by 33.3% from 40-49 years, 11.7% from 30-39 years age groups, 9.9% from  $> 60$  years and only 3.9% were found from the age group of  $< 30$  years. 14.3% subjects

were illiterates and 4.7% of them were in professional courses. Most of the subjects had their education up to high school (37.5%) and middle school (26.8%) and 16.5% subjects were graduated. More than 40.0 % of them had income level <5000 per month and 12.3 % subjects had their income levels above >20000 per month. The range and mean of various bio physiologic parameters were as elaborated in table 2. The mean body mass index of both males and females were greater than 25. Females had higher BMI (26.34) than males (25.51) and the difference were statistically significant ( $p < 0.001$ ). The mean waist circumference in males were slightly higher (94.68) than females (93.84) and mean waist-hip ratio in both males and females were 0.96 and was statistically not significant ( $p > 0.001$ ). The female subjects showed more mean hip circumference (97.79) than males (95.24) and was found statistically significant ( $< 0.001$ ). Males and females both had waist-hip ratio more than one, but the difference was not significant. The systolic and diastolic blood pressure was observed with in the normal reference range both in male and female subjects.

In the dietary pattern (table 3), only 18.1% of the study subjects were vegetarian (total/lacto-vegetarian/lacto-ovo-vegetarian), and the rest 81.9% were non-vegetarian. Nuts were consumed in adequate quantity by 41% of the study subjects and inadequate by 59.0%. The most common type of nuts consumed were ground nuts followed by mixed variety of nuts. Various cardiovascular risk factors- smoking, alcohol consumption and physical inactivity (table 4) were associated male gender. Table 5 is showing association of age with various cardiovascular risk factors and was not significant between the age groups.

## 5. DISCUSSION

The present study has revealed a substantially high prevalence of cardiovascular risk factors especially hypertension (21.23), over weight (41.12) and obesity-  $BMI \geq 23$  (39.02), hypertriglyceridemia (51.23), central obesity (44.14) physical inactivity (46.23) and inadequate

fruit and vegetable consumption (36.13) and diabetes (9.01). The substantially high prevalence of overweight, obesity and central obesity as per Indian-specific guidelines may be owing to the sedentary lifestyle. The overall high prevalence of obesity and central obesity among highly educated study population of a tertiary care hospital suggests serious lack of awareness regarding physical activity and diet. This indicates a need to initiate health promotion and disease prevention programmes. The present study documented lower prevalence of current smoking (11.9%) which was considered lower than the studies in the past. This may be reason that hospital employees are more aware of hazards of smoking and the disease condition caused by it.

Table 1 – Demographic characteristics of the study subjects

Demographic characteristics	n (%)
<b>Age(years)</b>	<b>503</b>
Mean age	48.30±2.09
<30	20(03.9)
30-39	59(11.7)
40-49	168(33.3)
50-59	206(40.9)
≥60	50(09.9)
<b>Gender</b>	
Male	309(63.4)
Female	194(36.6)
<b>Educational Qualification</b>	
Illiterate	72(14.3)
Middle school	135(26.8)
High school	189(37.5)
Graduation	83(16.5)
Prof.course	24(4.7)
<b>Income (per month in Rs)</b>	
<5000	212(42.1)
5000-10000	170(33.7)
10000-20000	59(11.7)
>20000	62(12.3)

Table 2 – Range and mean of bio physiological parameters

physiological parameters	Mean	SD(99% C L )	P value
<b>Weight (kg)</b>			
Male(319)	67.96	11.462	<0.001
Female(194)	63.88	12.452	significant
<b>Height(cm)</b>			
Male	166.7	7.078	<0.001
Female	155.4	7.648	significant
<b>BMI (wt./m2)</b>			
Male	25.51	3.964	<0.001
Female	26.34	5.054	significant
<b>Waist circumference(cm)</b>			
Male	94.68	11.346	>0.001
Female	93.84	9.878	Not significant
<b>Hip circumference(cm)</b>			
Male	95.24	10.200	<0.001
Female	97.79	9.659	significant
<b>Waist hip ratio</b>			
Male	1.01	0.079	>0.001
Female	1.00	0.000	Not significant
<b>Systolic blood pressure</b>			
Male	127.78	13.024	>0.001
Female	128.95	13.401	Not significant
<b>Diastolic blood pressure</b>			
Male	80.80	10.223	>0.001
Female	82.17	10.804	Not significant

**Table 3** – Distribution according to dietary pattern

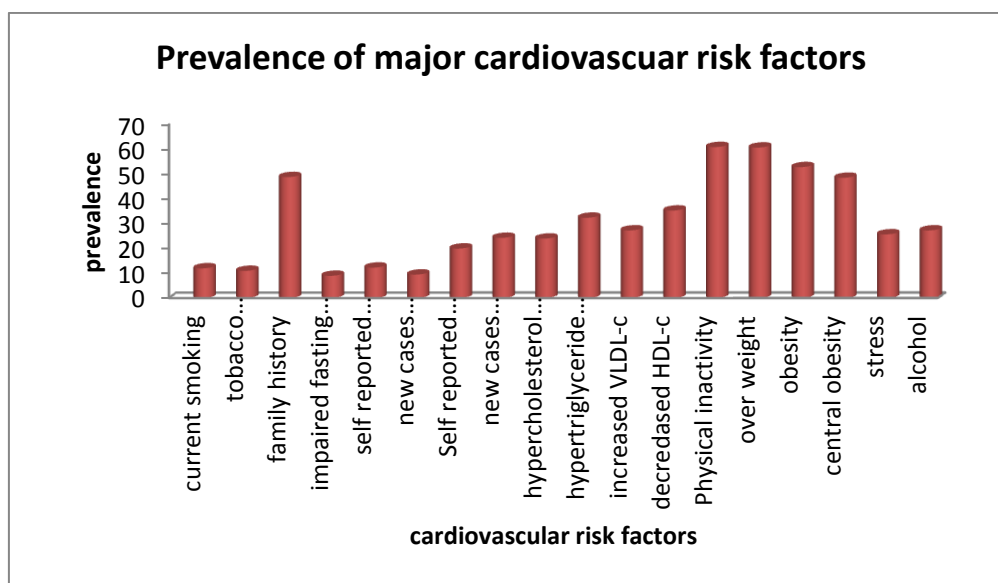
Dietary pattern	n (%)
<b>Vegetarian</b>	91(18.1)
Total vegetarian	63(12.5)
Lacto-vegetarian	10(1.9)
Lacto- ovo vegetarian	18(3.5)
<b>Non-vegetarian</b>	412(81.9)
<b>Nut consumption</b>	
Never	39(7.7)
≤ 2 servings/week	258(51.3)
Adequate	206(41)

**Table 4** – Association of gender with various cardiovascular risk factors

Cardiovascular risk factors	Male n (%)	Female n (%)	P value
<b>Smoking</b>			
Current	48(15.64)	2(1.03)	P= <0.0000001 X <sup>2</sup> =32.4 significant
Farmer and non-smoker	261(84.46)	192(98.96)	
<b>Tobacco consumption</b>			
Consumer	22(7.11)	21(10.82)	P= 0.6269 X <sup>2</sup> =0.263 Not significant
Non-consumer	287(92.88)	173(89.17)	
<b>Diabetes mellitus</b>			
Present	36(11.65)	21(10.82)	P= <0.000001 X <sup>2</sup> =30.4 significant
Absent	273(88.34)	173(89.17)	
<b>Physical exercise</b>			
Regular	23(7.44)	9(4.63)	P= <0.0000001 X <sup>2</sup> =32.69 significant
Inactive and sporadic	286(92.55)	185(95.36)	
<b>Overweight and obesity</b>			
Present	198(64.09)	99(51.03)	P= <0.0000001 X <sup>2</sup> =31.07 significant
Absent	111(35.92)	95(48.96)	
<b>Fruit and vegetable consumption</b>			
Adequate	185(59.87)	115(59.27)	P= 0.76 X <sup>2</sup> =0.092 Not significant
Inadequate	124(40.12)	79(40.72)	
<b>Alcohol</b>			
Current	115(37.21)	2(1.03)	P= <0.0000001 X <sup>2</sup> =34.18 significant
Farmer and non-alcoholic	194(62.78)	192(98.96)	
<b>Family history</b>			
yes	155(50.16)	91(46.90)	P= 0.6241 X <sup>2</sup> =0.2401 Not significant
no	154(49.83)	103(53.09)	

**Table 5-** Association of age with various cardiovascular risk factors

Cardiovascular risk factors	<30 years n(%)	30-39 years n (%)	40-49 years n(%)	50-59 years n (%)	≥60 years n (%)	P value
<b>Smoking</b>						
Current	1	6	21	25	7	0.005 significant
Former and non-smoker	19	53	147	181	43	
<b>Tobacco consumption</b>						
Consumer	2	4	15	26	6	0.001 Significant
Non-consumer	18	55	153	180	44	
<b>Diabetes mellitus</b>						
>126	3	9	7	36	2	0.002 Significant
<126	17	50	161	170	48	
<b>Physical exercise</b>						
Regular	0	3	06	22	1	0.001 Significant
Inactive	20	56	162	184	49	
<b>Overweight and obesity</b>						
<25	3	9	18	166	10	0.001 Significant
>25	17	50	150	40	40	
<b>Fruit and vegetable consumption</b>						
Adequate	14	35	101	120	30	0.005 Significant
Inadequate	6	24	67	86	20	



**Figure1.** Prevalence of major cardiovascular risk factors in tertiary care hospital employees

**6. CONCLUSION**

Prevalence of cardiovascular risk factors was very high. This shows the burden of the health conditions and most of them are the modifiable risk factors which we observed in the study. So Routine health check-up for employees including cardiovascular screening should be incorporated

as a part of the hospital policy. Promotion of healthy food in canteens of the hospital and preventive health checkup measures, camps and awareness programmes should be conducted periodically for all working employees.



**Limitation of the study**

Convenient sampling was used. A large- scale study with large sample size can be conducted. The study can also be down separately for each employment group- like doctors, nurses, technical staff and other health professionals separately. Further a study can plan impact of an intervention on health risk individuals.

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**References**

1. Non-communicable Diseases. Scaling Up Prevention and Control of Noncommunicable Diseases. The SEANET\_NCD meeting 22-26, October 2007, Phuket, Thailand: World Health Organization.
2. Reddy KS. Prevention and control of Non-Communicable Diseases: Status and Strategies. ICRIER; 2003July.
3. Statistical fact Sheet-populations 2008 update. American Heart Association.
4. National Health Profile 2007- Health Status Indicators. Central Bureau of Health Intelligence. Ministry of Health and Intelligence. Ministry of Health and family Welfare. Government of India, New Delhi:101
5. Murry CJL, Lopez AD. Global Health Statistics: Global Burden of Disease and Injury Series I and II. Boston: Harvard School of public Health;1992
6. Burden of Disease in India-Estimations and Causal Analysis. Background papers. National Commission on Macroeconomics and health. Govt of India, New Delhi.2005.sep3
7. Chronic diseases to cost India\$237b in the next decade. The time of India.2007 Nov 26.
8. Prabhakaran D, Shah P, Chaturvedi V, Ramakrishnan I, Manhara A, Reddy KS. Cardiovascular risk factors prevalence among men in a large industry of northern India. Nati Med J India.2005 march-April, 18(2):59-65
9. Plowden KO, Miller JL. Motivators of health seeking behavior in urban African-American men: an exploration of triggers and barriers. J Natl Black Nurses Assoc. 2000 Jan;11(1):15-20
10. Jain M, Nandan D, Misra SK. Qualitative assessment of health seeking behavior and perceptions regarding quality of health care services among rural community of district Agra. Indian J Common Med. 2006 Sep;31:140-144
11. National Health Interview Survey- Glossary Terms. National Center for Health Statistics.
12. Global database on Body Mass Index. The International Classification of Adult Underweight, Overweight and Obesity According to BMI. World health Organization
13. Obesity guidelines released for India. The Times of India. 2008 Nov 26
14. Executive summary of the third report of the National Cholesterol Education Program (NCEP) Expert panel on detection, evaluation and treatment of high blood cholesterol in adults. JAMA
15. Definition, Diagnosis and classification of diabetes mellitus and its Complications: Report of a WHO Consultation. Part 1: Diagnosis and classification of Diabetes Mellitus. Geneva, Switzerland: World Health Organization.33
16. JNC. Express. The seventh Report of Joint National Committee on Prevention, detection, Evaluation, and Treatment of High Blood Pressure. NIH publication;2003 Dec.03-5233:3
17. American Diabetes Association. Position Statement-diagnosis and

- classification of diabetes mellitus.  
Diabetes Care.2006 Jan;29(1):547
18. Vegetarian diets. American Heart Association. Available at:  
<http://www.americanheart.org/presenter.jhtml?Identifier=4777>;2009 Jan. Accessed 23.01.09
  19. The WHO STEP wise Approach to Surveillance of Non-Communicable Disease-WHO/NMS/CCS/03.05.2003. World Health Organization. Available at:  
<http://www.who.int/ncd-surveillance/en/>;Accessed 25.01.09
  20. Numbers that count for a Healthy Heart. American Heart Association. Available at:  
<http://www.americanherat.org/presenter.jhtml?identiier=3038638>;2008 May. Accessed 22.01.09
  21. Physical Activity and Health: A report of the Surgeon General. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention National Center for Chronic Disease Prevention and Health Promotion; 1996.1