THE MODIFIABLE NONCOMMUNICABLE RISK FACTORS AMONG AN IRANIAN POPULATION

Shahin Shirani[1], Kamal Heidari[2], Ali Mohammad Sabzghabaee[3], Parisa Mirmoghtadaee[4], Leila Hoseini[5], Hoseinali Aalifar[5], Hosein Fadaei[5], Hosein Esnaashari[6] and Rasool Soltani[4]

[1]Department of Cardiology, [2]Isfahan Provincial Health Promotion Center, [3]Isfahan Clinical Toxicology Research Center, [4]Department of Clinical Pharmacy and Pharmacy Practice, [5]Department of Disease Prevention and Control, Isfahan Provincial Health Center, [6]Department of Research and Development, Isfahan University of Medical Sciences, Isfahan, Iran

Abstract. Noncommunicable diseases (NCDs) are a major cause of morbidity and mortality in developing countries. Risk factors, such as hypertension, dyslipidemia, obesity and smoking play an important role in the high prevalence of NCDs. In this study we assessed the type and prevalence of NCD risk factors among an Iranian adult population. We conducted a cross sectional study of 500 men and 500 women, aged 15-65 years, selected by multi-stage random cluster sampling from urban areas of Isfahan, the second largest city in Iran. The prevalences of 8 risk factors were determined in this study: sedentary lifestyle (47.2%), overweight and obestity (body mass index $\geq 25\,kg/m^2$) (60.8%), hypertension (elevated systolic and/or diastolic blood pressure) (22%), low high density lipoprotein level (27.6%), high total cholesterol level (16.9%), high triglyceride level (22.1%) and high fasting blood sugar (7.6%). Sedentary life and overweight/obesity were common at all ages, especially among women. Given the high prevalence of NCD risk factors in the studied population, there is an urgent need for age-appropriate interventions to result in lifestyle changes to decrease the prevalence of NCD risk factors.

Keywords: noncommunicable disease, risk factors, prevalence, adult

INTRODUCTION

Noncommunicable diseases (NCD), especially cardiovascular disease, diabetes and cancer, are major health problems worldwide (Yach *et al*, 2005; Anhad *et al*, 2007; WHO, 2011). By 2020, 7 out of every 10 deaths in low-income countries will be due to chronic NCD (Ahmed *et al*, 2009). These diseases have common risk factors, including hypertension, dyslipidemia, impaired glucose, a sedentary lifestyle, and smoking; all are reversible (Bonita *et al*, 2002; Stevens *et al*, 2007; Ahmed *et al*, 2009).

In recent years, many countries have reduced mortality due to NCD by early detection of these risk factors. The World Health Organization (WHO) recommends where resources are available, data regarding NCD should be obtained by surveillance processes (Bonita *et al*, 2002).

Iran has a high prevalence of NCD

Correspondence: Rasool Soltani, Department of Clinical Pharmacy and Pharmacy Practice, School Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Science, Isfahan, Iran.
E-mail: soltani@pharm.mui.ac.ir

and their risk factors; preventive programs implemented by Iranian health care centers may reduce their prevalence. In a study from Isfahan, Iran (Mohamadifard *et al,* 2003) 34.8% and 19.3% of people had one or two risk factors for NCD. Since 2004, the WHO stepwise approach to surveillance has been performed in Iran. Identifying major risk factors for different age groups and genders helps health policy makers design interventions specific for those groups. We used the data from that surveillance to determine the extent of reversible and common risk factors for subjects who had at least one risk factor.

MATERIALS AND METHODS

This cross sectional study was carried out in 2007 in Isfahan (the second largest city in Iran) as part of the national Iranian audit of non-infective disease risk factors. It was approved by the scientific committee of the vice-chancellery for research at Isfahan University of Medical Sciences.

One thousand Iranian (500 male and 500 female) subjects age 15-64 years living in Isfahan Province were included in the study. We divided the subjects into five age groups aged 15-24, 25-34, 35-44, 45-54 and 55-64 years of at least 20 people in each cluster. The sex ratio of 1:1 for males:females was maintained for each group. Postal addresses and 10 digit postal codes were used for subject cluster selections.

Instruments and measurements

We prepared questionnaires in Farsi based on the WHO Stepwise approach to NCD (Bonita *et al,* 2002). Under health care professional supervision the participants filled out self-administered questionnaires. The validity of the content was based on observations by a panel of experts. Its reliability measures were assessed based on a pilot study.

All instruments were standardized before the examination, and the weight scales and sphygmomanometers were zero-calibrated. Heights and weights were measured twice $\pm$ 0.2 cm and to $\pm$ 0.2 kg, respectively, with subjects barefoot and lightly dressed, and recorded as averages. Body mass index (BMI) (weight in kilograms divided by height in meters squared) was calculated for each subject. A BMI >25 kg/m^2 was considered abnormal. The nurses measured blood pressure (BP) using a mercury sphygmomanometer according to standard protocols. An elevated BP was defined as a systolic blood pressure $\geq$ 140 mmHg and a diastolic blood pressure $\geq$ 90 mmHg, according to JNC-VII (the Seventh Joint National Committee) criteria (The Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, 2003).

The participants self-reported physical activity patterns were assessed using the Global Physical Activity Questionnaire (GPAQ) prepared by the WHO. The GPAQ collects information regarding physical activity in three domains, as well as information about sedentary behavior and is comprised of 16 questions. The domains are: activity at work, travel and recreational activity. High, moderate and low levels of physical activity are the results of the GPAQ (WHO, 2002).

The subjects fasted for 12 hours prior to blood screening; compliance with the fast was determined by interview on the morning of examination. Blood samples were taken from the antecubital vein between 08:00 and 09:30 hours. The blood samples were centrifuged for 10 minutes at 3,000 rpm within 30 minutes of venepuncture. The biochemical analysis

Table 1
Mean variables in the studied population.

Mean variable	Male	Female
Height (cm)	177.1	156.9
Weight (kg)	73.4	66
BMI (kg/m^2)	26	28
Systolic blood pressure (mmHg)	126.5	118.7
Diastolic blood pressure (mmHg)	79.7	80.6
Cholesterol (mg/dl)	192.2	202.5
High density lipoprotein (mg/dl)	38.2	42.5
Triglyceride (mg/dl)	157.4	141.9
Fasting blood glucose (mg/dl)	96.4	97.8

was performed at the central Esfahan laboratory, which met the standards of the National Reference Laboratory, a WHO collaborating center in Tehran. Fasting blood sugar (FBS), high density lipoprotein cholesterol (HDL-C) and triglycerides (TG) were measured enzymatically by auto-analysers. HDL-C was determined after dextran sulphate magnesium chloride precipitation of non-HDL-C. Low-density lipoprotein-cholesterol (LDL-C) was calculated from serum samples with a TG level ≤ 400 mg/dl according to the Friedewald equation (Friedewald *et al*, 1972). The undesirable levels for TC, TG and HDL-C was defined as >200, >200 and <35 mg/dl, respectively (Mclean *et al*, 1996). The biochemical tests were performed in subjects >25 years old.

Statistical analysis

Descriptive analysis was conducted to determine the prevalence of each risk factor in the different age groups and by sex. Then each risk factor was determined by sex.

RESULTS

The mean height, weight, BMI, systolic and diastolic blood pressures are shown in Table 1.

Fifty-six point two percent of men and 65.4% of women had a BMI > 25 kg/m². Twenty-one point eight percent of men and 0.2% of women were current smokers. Thirty-two point eight percent, 18.8% and 48.4% of men had low, moderate and severe physical activity levels, respectively. Sixty-one point six percent, 25.2% and 15.2% of women had low, moderate and severe physical activity. Six point eight percent of men and 8.5% of wemen had a FBS >126 mg/dl. Fourteen point eight percent of men and 18.8% of women had a cholesterol ≥ 240 mg/dl. Thirty-five point eight percent of men and 20.2% of women had an HDL-C <35 ng/dl. Twenty-two point one percent of men and women combined had a TG level >200 ng/dl. The risk factors by age group are shown in Fig 1.

DISCUSSION

In our study there were several differences in NCD risk factors by sex with overweight and obesity and sedentary life being much more common among women. With increasing age, the percent of women with overweight and obesity
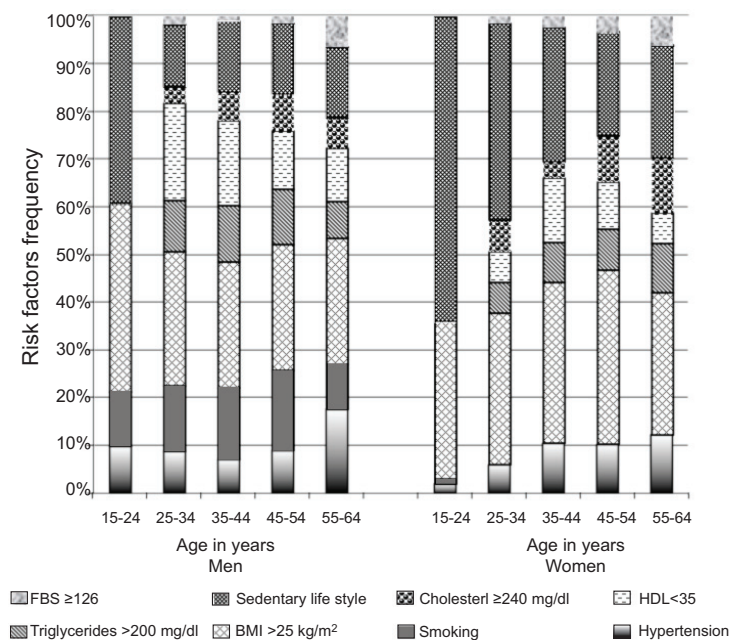
Fig 1–Risk factors according to gender and age in subjects who had at least one risk factor. FBS, fasting blood glucose; HDL, high density lipoprotein; BMI, body mass index

increased. This is consistent with findings from other studies in Iran and other countries (Azizi *et al*, 2002; Ng *et al*, 2006; Ahmed *et al*, 2009). It may be attributable to socio-cultural factors, including work activities, and sedentary life style. Having a TG level > 200 mg/dl and an HDL-C < 35 mg/dl was more prevalent among men aged 25-44 years. Our results are similar to a survey in Tehran, the capital city of Iran, to determine the risk factors for atherosclerosis (Azizi *et al*, 2002). However, in a study from Tanzania, having a low HDL-C and a high TG level was more common among women (Njelekela *et al*, 2009). Some studies have shown a positive association between measures of adiposity and TC, TG and LDL-C levels (Njelekela *et al*, 2009) but a study from Nigeria did not demonstrate such a re-

lationship (Akpa *et al*, 2006). In our population, although the prevalence of overweight was higher among women, low HDL-C levels were higher among men (Fig 1). A low HDL-C is a risk factor for cardiovascular disease in some populations of industrialized countries and is usually associated with high saturated fat intake (Hayes, 1885; Hegsted *et al*, 2003). In Iran there has been a change in nutrition toward a higher fat, fast food diet (Ghassemi *et al*, 2002; Rashidi *et al*, 2005).

In this study 27.8% of men and 0.2% of women were smokers. The high prevalence of smoking among men should raise concerns about environmental tobacco exposure and the potential influence of parental smoking on youth. Although the smoking rate in our study population was lower in comparison to the Tehran study (Azizi *et al*, 2002), smoking is an important risk factor for NCD and better prevention and cessation programs are needed.

The prevalence rate of hypertension among adults in our study was 22%. It was more common in older age groups in both genders. This prevalence is similar to that in Tehran (Azizi *et al*, 2002). The lower rate of smoking and protective effect of estrogen may have been causes of the lower rate of hypertension among women in our study despite higher rates of obesity (Mendelson and Karas, 1999).

In 2005, the national prevalence of diabetes was reported as 7.7% (8.3% among females and 7.1% among males) (Esteghamati *et al*, 2008). The Asia-Pacific

Cohort Studies Collaboration (APCSC) study reported diabetes prevalence rates between 2.6% and 15.1% in four countries in the Asia Pacific region (Welborn *et al*, 2007). In our study, the prevalence of diabetes mellitus is similar to the national prevalence, but higher than those reported from the UK and China (Gu *et al*, 2003; Forouhi *et al*, 2006). With the high prevalence of risk factors, such as sedentary lifestyle and obesity, the prevalence of diabetes may increase in the near future.

Our study has some limitations. First, the cross sectional design does not allow us to determine causal relationship. Second, the study was only representative of adults residing in Esfahan, Iran, and findings may not generalizable to other cities in our country.

In conclusion, NCD risk factors were common in our study due to changes in diet and lifestyle may be expected to become more prevalent in the near future. These findings may be used to develop public health policies, education programs and designs for early detection of people at high risk of NCD.

REFERENCES

Ahmed SM, Hadi A, Razzaque A, *et al*. Clustering of chronic non-communicable disease risk factors among selected Asian populations: levels and determinants. *Glob Health Action* 2009; (suppl 1): 68-74.

Anhad K, Shah B, Yadav K, Singh R, Mathur P, Paul E. Are the urban poor vulnerable to noncommunicable diseases? A survey of risk factors for noncommunicable diseases in urban slums of Faridabad. *Natl Med J India* 2007; 20: 115-20.

Akpa MR, Agomouh DI, Alasia DD. Lipid profile of healthy adult Nigerians in Port Harcourt, Nigeria. *Niger J Med* 2006; 15: 137-40.

Azizi F, Rahmani M, Emami H, *et al*. Cardiovascular risk factors in an Iranian urban population: Tehran Lipid and Glucose Study (Phase 1). *Prev Med* 2002; 47: 408-26.

Bonita R, de Courten M, Dwyer T, Jamrozik K, Winkelmann R. Surveillance of risk factors for non communicable diseases: the WHO STEPS wise approach. Geneva: World Health Organization, 2002.

Esteghamati A, Gouya MM, Abbasi M, *et al*. Prevalence of diabetes and impaired fasting glucose in the adult population of Iran: National Survey of Risk Factors for Non-Communicable Diseases of Iran. *Diabetes Care* 2008; 31: 96-8.

Forouhi NG, Merrick D, Goyder E, *et al*. Diabetes prevalence in England, 2001 – estimates from an epidemiological model. *Diabet Med* 2006; 23: 189-97.

Friedewald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. *Clin Chem* 1972; 16: 499-502.

Ghassemi H, Harrison G, Mohammad K. An accelerated nutrition transition in Iran. *Public Health Nutr* 2002; 5(1A): 149-55.

Gu D, Reynolds K, Duan X, *et al*. Prevalence of diabetes and impaired fasting glucose in the Chinese adult population: International Collaborative Study of Cardiovascular Disease in Asia (InterASIA). *Diabetologia* 2003; 46: 1190-8.

Hayes KC. Saturated fat and blood lipids: new slant on an old story. *Can J Cardiol* 1885; 11: 39-46.

Hegsted DM, Ausman L, Johson J, Dalllas G. Dietary fat and serum lipids: An evaluation of the experimental data. *Am J Clin Nutr* 2003; 57: 875-83.

Mclean DR, Petrasovitis A, Connely PW, Joffres M, O–Conner B, Little JA. Plasma lipids and lipoprotein reference values, and the prevalence of dyslipoproteinemia in Canadian adults. Canadian Heart Health Surveys Research group. *Can J Cardiol* 1996; 15: 434-44.

Mendelson ME, Karas RH: The protective effect of estrogen on the cardiovascular system. *N Engl J Med* 1999; 340: 1801-11.

Mohamadifard NS, Sarrafzadegan N, Baghaie AM, Shahrokhi Sh, Hoseini Sh. Ebrahimi GH. The prevalence of cardiovascular risk factors in rural and urban population of Isfahan & Markazi provinces. *J Qazvin Univ Med Sci* 2003; 26: 5-14.

Ng N, Stenlund H, Bonita R, Hakimi M, Wall S, Weinehall L. Preventable risk factors for noncommunicable disease in rural Indonesia: prevalence study using WHO STEPS approach. *Bull WHO* 2006; 84: 305-13.

Njelekela M, Mpembeni R, Muhihi A, *et al*. Gender-related differences in the prevalence of cardiovascular disease risk factors and their correlates in urban Tanzania. *BMC Cardiovasc Disord* 2009; 9: 30.

Rashidi A, Mohammadpour-Ahranjani B, Vafa MR, Karandish M. Prevalence of obesity in Iran. *Obes Rev* 2005; 6: 191-2.

Stevens D, Siegel K, Smith R . Global interest in addressing non-communicable disease. *Lancet* 2007; 370(9603): 1901-2.

Unwin N, Albert GMM. Chronic non-communicable diseases. *Ann Trop Med Parasitol* 2006; 100: 455-64.

Welborn T, Woodward M. Prevalence of diabetes mellitus and population attributable fractions for coronary heart disease and stroke mortality in the WHO South-East Asia and Western Pacific regions. *Asia Pac J Clin Nutr* 2007; 16: 187-92.

World Health Organization (WHO). Global Physical Activity Questionnaire (GPAQ): Analysis guide. Geneva: WHO, 2002.

World Health Organization (WHO). Golbal status report on noncommunicable diseases 2010. Geneva: WHO, 2011.

Yach D, Kellog M, Voute J. Chronic disease; an increasing challenge in developing countries. *Trans R Soc Trop Med Hyg* 2005; 99: 321-4.