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Socioeconomic Determinants of Health: An Adult Population Based Study in Shiraz, Southern Iran

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Background: Noncommunicable diseases (NCDs) are now the most important causes of mortality and morbidity in Iran.
Objectives: Therefore, knowing about NCDs status and its socioeconomic determinants are the cornerstone for the interventions that policymakers and health providers apply to improve the health of community. This research includes a full exploration of the relevant data.
Patients and Methods: This was a population-based cluster randomized sampling carried out in Shiraz, Iran. In this regard, demographic, socioeconomic status, and medical history of adult participants (at least 18 year old) were collected. In the next step, physical examination and anthropometric data were taken. Finally, fasting blood glucose (FBS), lipid profile, and complete blood count (CBC) measurement were done.
Results: Overall, 777 participants, mean age of 42.6 ± 13.8 (ranging from 18 to 88) year, were included in this study while female (451; 58%), middle-aged (203; 26.1%), married (653; 84%), and those with up to 12 years of education (470; 60.5%) were the majorities. Among the participants, 453 (58.3%) were among overweight to severely obese groups, 441 (56.7%) did not have physical activity, 148 (19.3%) were smokers, 280 (36%) had hypercholesterolemia, 239 (30.8%) had hypertriglyceridemia, 54 (6.9%) had high LDL, 93 (11.9%) had low HDL, and 49 (6.3%) were anemic. Women had significantly lower height ($P < 0.001$), weight ($P < 0.001$), and waist circumference ($P < 0.001$), but higher BMI ($P < 0.001$) compared to those parameters in men. Of total participants, 240 (30.9%) had prehypertension, 62 (8.0%) had stage I hypertension, and 16 (2.1%) had stage II hypertension. Overall, 76 (9.8%) subjects had hypertension, while most of them (57; 75%) were aware of their disease and consumed antihypertensive drugs. Of 777 participants, 148 (19.1%) had impaired glucose tolerance test and 51 (6.5%) were diabetic. However, 46 (5.9%) were aware of their disease and only 35 (4.5%) consumed glucose lowering agents to control plasma glucose. Those with fewer years of education had significantly higher prevalence of obesity ($P = 0.001$), hypertension ($P < 0.001$), and DM ($P = 0.02$).
Conclusions: At least 1 out of 2 adult people in Shiraz does not have physical activity and has high BMI, while 1 out of 3 has at least one abnormal components in their lipid profile. Prediabetes, hypertensive, and diabetic groups comprised a significant portion of population. Among different groups, women and less educated people belonged to the high risk groups. Therefore a multidisciplinary approach is needed to control this event, especially in high risk population.

Keywords: Socioeconomic Factors; Health; Life Style; Population

1. Background

Data on the health status of any community is the basis of health system planning. With the current pandemic status of noncommunicable diseases (NCDs), frequent monitoring of the major risk factors in the general population is a mandate for the health authorities to get a better overview of the future occurrence of these diseases and to plan for more effective preventive measures. These monitoring should be strengthened further with data on socioeconomic aspects of health, especially considering the inequalities in health status among communities. Inadequate consideration of the socioeconomic determinants of health is a major shortcoming in health planning worldwide. Both regional population based studies (1-3) and nationwide surveys (4-10) have been conducted in recent years in Shiraz (southern Iran) and Iran, respectively to screen the people for some kinds of diseases or risk factors.

2. Objectives

This study aimed to present an updated view, with special emphasis on socioeconomic correlates of important NCDs, to policy makers for their better understanding of the life style of people, their health status, and what should be more considered in interventional programs.

3. Patients and Methods

This was a cross-sectional study performed in Shiraz, southern Iran during a 10-month period from November 2010 to September 2011. Shiraz is the capital city of Fars Province with an estimated population of 1.5 million, according to the recent national census. A proportion weight based, randomized cluster sampling was used in this study based on the addresses from 7 postal zip code areas in Shiraz. All inhabitants older than 18 years were invited to participate in the study. Those who agreed to be part of the study had to call back and make an appointment with the study team for taking detailed history, performing physical examination, and measuring some laboratory tests. We excluded pregnant women or those who had delivered within past 6 months. Non-Iranian nationalities were also excluded. The study protocol was approved by Institutional Review Board (IRB) and the Research Ethics Committee of Health Policy Research Center affiliated to Shiraz University of Medical Sciences. All the participants gave their informed written consents.

3.1. Study Protocol

All the participants were asked to attend the clinic after an overnight fasting. After administration, 1000 participants were introduced to the health survey clinic. A team of 2 nurses and 2 physicians performed interview and medical history and physical examinations, respectively. Physicians were gender identical for all participants. The anthropometric measurements were also performed by two nurses. Intravenous blood samples were drowned from fasting subjects to measure Fasting Blood Sugar (FBS), Triglyceride (TG), cholesterol, Low-Density Lipoprotein (LDL), High-Density Lipoprotein (HDL). A complete blood count (CBC) was also done for each individual. Diabetes mellitus was defined according to the American Diabetes Association criteria based on FBS > 126 mg/dL (11). Hypertension was defined according to seventh report of Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7 report) (12).

3.2. Statistical Analysis

Statistical analyses were performed using the SPSS software, version 16.0 (SPSS Inc., Chicago, Ill., USA). The results are expressed as mean ± SD and proportions as appropriated. P value less than 0.05 was considered significant.

4. Results

4.1. Demographics and Socioeconomic Status

Of 999 invitations, 777 eligible subjects agreed to participate in the study, showing a participation rate of 78%. They comprised 326 (42%) men and 451 (58%) women with the mean age of 42.64 ± 13.89 (ranging from 18 to 88) years. Most of the participants (26.1%) were categorized as middle-aged (40-49 years of age) people. The demographic and socioeconomic status of the participants are summarized in Table 1. Most of the participants (45.6%) were categorized as middle income and 339 (43.7%) had educated for ≤ 12 years. Overall, 653 (84%) subjects were married and 124 (16%) were single. The mean number of family members was found to be 4.1 and was not significantly different between different educational levels (P = 0.7) or income levels (P = 0.9).

Table 1. Demographic and Socioeconomic Status of 777 Subjects Participated in the Health Survey of Shiraz, Southern Iran [a]

Variable	Value
Age, y	
18 - 29	163 (21.0)
30 - 39	157 (20.2)
40 - 49	203 (26.1)
50 - 59	163 (21.0)
≥ 60	91 (11.7)
Gender	
Male	326 (42)
Female	451 (58)
Income	
Very low, < 400 USD/mon	274 (35.2)
Low, 400 - 800 USD/mon	354 (45.6)
Moderate, 800 - 1000 USD/mon	103 (13.3)
High, ≥ 1000 USD/mon	46 (5.9)
Years of education	
Illiterate	51 (6.5)
≤ 12	470 (60.5)
13 - 16	173 (22.3)
17 - 19	42 (5.4)
≥ 20	41 (5.3)
Marital status	
Married	653 (84)
Single	124 (16)
Family size	
1	25 (3.2)
2	86 (11.1)
3 - 4	332 (42.7)
≥ 5	334 (43.0)

[a] Data are presented as No. (%).

4.2. Medical History

Table 2 summarizes the medical history of the subjects participating in this health survey. Medical history of the subjects revealed operation experience and snoring as the most common problems of the population and coronary artery bypass graft as the least frequent one. Overall, the prevalence of history of hypertension, diabetes mellitus (DM), ischemic heart diseases (IHD) was found to be 9.8% (9781 per 100000 inhabitants), 5.9% (5920 per 100000 inhabitants), 5.6% (5534 per 100000 inhabitants), respectively. However, 49 (6.3%) patients with hypertension and 35 (4.5%) with DM regularly consumed antihypertensive and glucose lowering agents. We found that history of dyslipidemia (P = 0.004) and asthma (P < 0.001) were significantly more prevalent among women. The crude prevalence of cancer in our region was found to be 1287 per 100000 inhabitants. Likewise, the crude prevalence of cerebrovascular accident (CVA) was found to be 1158 per 100000 inhabitants.

4.3. Anthropometric Measurements

Table 3 demonstrates the anthropometric characteristics of 777 subjects participating in the health survey. The mean BMI was found to be 26.1 ± 4.3 kg/m^2. Most of the participants (39.6%) were overweight and 15.7% were obese while 38.7% of them were normal. Women had significantly lower height (P < 0.001), weight (P < 0.001), and waist circumference (P < 0.001), but higher BMI (P < 0.001) when compared to these parameters in men. Age was positively correlated with BMI in both men (r = 0.1, P = 0.002) and women (r = 0.3, P < 0.001). Subjects with higher educational levels had significantly lower BMI (P < 0.001), and waist circumference (P < 0.001). In the same way, the prevalence of obesity (P < 0.001) and overweight (P < 0.001) were significantly higher among those with higher educational levels (Table 4), but did not differ among different groups of income (Table 5).

Table 2. Medical History of 777 Subjects Participated in the Health Survey of Shiraz, Southern Iran [a]

	Total (n = 777)	Female (n = 451)	Male (n = 326)
Surgery history	336 (43.8)	220 (48.7)	116 (35.5)
Snoring	159 (20.7)	92 (20.3)	67 (20.5)
Dyslipidemia	147 (19.1)	107 (23.7)	40 (12.2)
Gastrointestinal diseases	118 (15.4)	76 (17)	42 (12.8)
Asthma	101 (13.2)	74 (16.6)	27 (8.1)
Hypertension	76 (9.8)	35 (7.7)	41 (12.5)
Liver diseases	69 (9)	34 (7.6)	35 (10.6)
Renal diseases	69 (9)	34 (7.6)	35 (10.6)
Diabetes mellitus	46 (5.9)	29 (6.4)	17 (5.2)
Weight loss	52 (6.8)	43 (9.6)	9 (2.5)
Previous hospital admissions	38 (4.9)	18 (4)	20 (5.9)
Contraceptive use	36 (4.7)	36 (7.9)	0 (0)
Jaundice	35 (4.6)	16 (3.6)	19 (5.6)
Angiography	30 (3.9)	17 (3.8)	13 (3.9)
Angioplasty	12 (1.6)	8 (1.8)	4 (1.2)
CABG history	2 (0.3)	1 (0.2)	1 (0.3)
Cancer history	10 (1.3)	6 (1.3)	4 (1.2)
Chemotherapy	3 (0.4)	2 (0.4)	1 (0.3)
Cerebrovascular accident (CVA)	9 (1.2)	5 (1.1)	4 (1.2)
Hormone replacement therapy (ERT)	8 (1)	8 (1.8)	0 (0)
High energy supplements consumption	8 (1)	3 (0.6)	5 (1.5)

[a] Data are presented as No. (%).

Table 3. Anthropometric Findings in 777 Participated in the Health Survey of Shiraz, Southern Iran[a]

	Male (n = 326)	Female (n = 451)	Total (n = 777)
Height, cm	172.6 ± 8.02	157.7 ± 6.9	163.9 ± 13.8
Weight, kg	74.5 ± 12.1	66.7 ± 11.4	70.1 ± 12.3
Waist circumference, cm	92.4 ± 9.6	86.6 ± 11.3	89.1 ± 11.3
Hip circumference, cm	102 ± 6.7	102.5 ± 10.3	102.3 ± 9.1
Body mass index, kg/m^2	25 ± 3.7	26.8 ± 4.6	26.1 ± 4.3
Underweight	14 (4.3)	9 (2.0)	23 (3.0)
Normal	152 (46.6)	149 (33.0)	301 (38.7)
Overweight	126 (38.7)	182 (40.4)	308 (39.6)
Obese	31 (9.5)	91 (20.2)	122 (15.7)
Severely Obese	3 (0.9)	20 (4.4)	23 (3.0)

[a] Data are presented as No. (%) or Mean ± SD.

Table 4. Correlation of Medical History and Anthropometric Measures With Education Level of 777 Subjects Participated in the Health Survey of Shiraz, Southern Iran [a]

	Illiterate (n = 51)	≤ 12 years (n = 470)	13 - 16 years (n = 173)	17 - 19 years (n = 42)	≥ 20 years (n = 41)	P Value
Age, y	59.3 ± 13.2	43.8 ± 13.1	36.4 ± 11.8	39.4 ± 11.8	38.3 ± 14.6	< 0.001
Height, cm	156.3 ± 8.5	162.2 ± 9.3	169.6 ± 10.9	170.5 ± 9.8	166.3 ± 10.6	< 0.001
Weight, kg	65.8 ± 9.5	69.8 ± 11.7	72.3 ± 14.2	73.2 ± 14.3	66.9 ± 10.4	0.003
Waist circumference, cm	92.6 ± 8.2	89.7 ± 10.7	87.4 ± 11.3	90.2 ± 13.1	85.1 ± 11.4	0.003
Hip circumference, cm	103.5 ± 8.6	103.2 ± 8.6	100.6 ± 9.2	102.2 ± 10.9	99.7 ± 10.1	0.007
Body mass index, kg/m^2	27.2 ± 4.4	26.6 ± 4.3	25.1 ± 3.9	25.3 ± 5.2	24.3 ± 3.7	< 0.001
Underweight	2 (0.3)	12 (1.6)	6 (0.8)	2 (0.3)	1 (0.2)	
Normal	13 (1.7)	156 (20.1)	85 (10.9)	24 (3.1)	23 (2.9)	
Overweight	23 (2.9)	192 (24.7)	66 (8.5)	11 (1.4)	16 (2.1)	
Obese	12 (1.5)	85 (10.9)	13 (1.7)	7 (0.9)	5 (0.6)	
Severely Obese	3 (0.4)	15 (1.9)	3 (0.4)	2 (0.3)	0 (0.0)	0.001
Smoking	8 (1.1)	72 (9.3)	46 (5.9)	9 (1.2)	13 (1.7)	0.4
Hypertension	11 (1.4)	54 (6.9)	4 (0.5)	3 (0.4)	4 (0.5)	< 0.001
Diabetes Mellitus	6 (7.8)	34 (4.4)	5 (0.6)	0 (0)	1 (0.2)	0.02

[a] Data are presented as No. (%) or Mean ± SD.

Table 5. Correlation of Medical History and Anthropometric Measures With the Income of 777 Subjects Participated in the Health Survey of Shiraz, Southern Iran [a]

	Very Low (n = 274)	Low (n = 354)	Moderate (n = 103)	High (n = 46)	P Value
Age, y	41.6 ± 15.2	45.1 ± 13.2	41.9 ± 12.1	43.8 ± 12.7	0.02
Height, cm	162.3 ± 9.6	164.8 ± 10.6	166.9 ± 10.9	169.3 ± 10.7	< 0.001
Weight, kg	68.4 ± 12.1	70.8 ± 11.8	72.6 ± 13.4	75.6 ± 13.6	0.001
Waist circumference, cm	88.2 ± 11.3	90.3 ± 10.3	90.6 ± 11.4	92.1 ± 11.7	0.06
Hip circumference, cm	101.7 ± 9.2	103.1 ± 10.1	103.2 ± 10.5	103.7 ± 8.3	0.2
Body mass index, kg/m^2	25.9 ± 4.3	26.2 ± 4.2	26.3 ± 5.3	26.4 ± 4.3	0.9
Underweight	10 (1.3)	9 (1.2)	4 (0.5)	0 (0.0)	
Normal	109 (14.1)	123 (15.8)	45 (5.8)	24 (3.1)	
Overweight	98 (12.6)	151 (19.4)	38 (4.9)	21 (2.7)	
Obese	47 (6.1)	51 (6.5)	17 (2.2)	7 (0.9)	
Severely Obese	4 (0.5)	9 (1.2)	7 (0.9)	3 (0.4)	0.2
Smoking	29 (3.7)	74 (9.5)	26 (3.4)	19 (2.4)	0.04
Hypertension	24 (3.1)	38 (4.9)	8 (1.1)	6 (0.7)	0.5
Diabetes Mellitus	20 (2.6)	18 (2.3)	7 (0.9)	1 (0.2)	0.5

[a] Data are presented as No. (%) or Mean ± SD.

4.4. Physical Activity

Most of the participants (56.7%) lacked any physical activity, while 34.2% of them walked for at least 30 minutes per day and 14.1% had daily jogging. Professional sport was reported by 9.2% of the participants and swimming by 4.8% of the participants. The details of physical activity in our series are summarized in Table 6.

4.5. Smoking Habits

Of the population studied, 148 (19.3%) were smokers, and among them, 89 (11.5%) were cigarette smokers and 59 (7.8%) were water-pipe smokers, while 36 (4.6%) smoked both. Among the participants, 30 (3.9%) had quit smoking for at least 1 year. The mean pack/year was found to be 12.3 ± 3.6 in our series with 52 (6.7%) heavy smokers (> 20 pack/year). Routine alcoholic beverage consumption was reported by 29 (3.8%) individuals, while 58 (7.4%) consumed these beverages intermittently, among whom there were 81 (93.1%) men and 6 (6.9%) women with the mean age of 41.9 ± 16.3 (range 21 - 79) years. Opium and its products were used by 26 (3.3%) through ingestion or inhalation. None of the participants were intravenous drug abuser. Smoking was significantly higher among those with low income (P = 0.048) while it was comparable between participants with different educational levels (P = 0.4) (Tables 4 and 5).

4.6. Nutritional Status

Fruit, bread, and chicken were the mostly nutrients used by the subjects (almost 4 times a day). Fast foods (mainly pizza) were mentioned as the most infrequent foods consumed by the subjects. The mean age of those subjects consuming fast foods more than 2 times a week was significantly lower than those who did not consume these food types (42.3 ± 14.1 vs. 46.8 ± 11.7 y; P = 0.01). Fast foods consumption was positively correlated with income (r = 0.1, P = 0.03). Fast foods consumption was also significantly higher in those with higher years of education (>16 years) compared to others (33.9% vs. 18.2%; P = 0.03).

4.7. Diabetes Mellitus and Hypertension

The mean systolic and diastolic blood pressures were 115.1 ± 16.2 and 75.2 ± 9.8 mmHg, respectively. On the whole, 459 (59.1%) individuals were normotensive, while 240 (30.9%) had prehypertension, 62 (8.0%) had stage I hypertension and 16 (2.1%) had stage II hypertension. Overall, 76 (9.8%) subjects had hypertension, while most of them (57; 75%) were aware of their disease and consumed antihypertensive drugs. The prevalence of hypertension was significantly higher among men (11.9% vs. 8.7%; P = 0.03). The mean FBS was found to be 92.9 ± 29.1 mg/dL. Out of 777 participants, 578 (74.4%) were normal, 148 (19.1%) had impaired glucose tolerance and 51 (6.5%) were diabetic. However, 46 (5.9%) subjects were aware of their disease and only 35 (4.5%) consumed glucose lowering agents for plasma glucose control. The prevalence of DM was significantly higher among those with lower educational levels (P = 0.02), while it was comparable between different incomes of participants (P = 0.5) (Tables 4 and 5). Likewise, the prevalence of hypertension was significantly higher among those with lower educational levels (P < 0.001), while it was not associated with participants' income (P = 0.5) (Tables 4 and 5). Correlation of smoking and anthropometrics with income and education of the participants were shown in Tables 6 and 7.

4.8. Laboratory Findings

Laboratory findings of 777 subjects participating in this survey are summarized in Table 7. The mean level of hemoglobin was significantly lower in women (P < 0.001) and the prevalence of anemia was significantly higher in women (P < 0.001). The mean serum level of cholesterol (P < 0.001) was significantly higher in women and a serum level of HDL (P < 0.001) was significantly higher in women (P < 0.001). The prevalence of hypercholesterolemia was also higher among women (P = 0.008), while they had lower prevalence of low HDL (P = 0.001). There was no correlation between laboratory findings and the educational or income status.

Table 6. Type of Physical Activity of 777 Participated in the Health Survey of Shiraz, Southern Iran [a]

	Male (n = 326)	Female (n = 451)	Total (n = 777)
Nothing	159 (48.7)	282 (62.5)	441 (56.7)
Walking	122 (37.4)	144 (31.9)	266 (34.2)
Jogging	61 (18.7)	48 (10.6)	109 (14.1)
Limbering	52 (15.9)	25 (5.5)	77 (9.9)
Professional sport	40 (12.2)	31 (6.8)	71 (9.2)
Body building	22 (6.7)	27 (5.9)	49 (6.3)
Swimming	15 (4.6)	23 (5.1)	38 (4.8)
Treadmill	6 (1.8)	10 (2.2)	16 (2.1)

[a] Data are presented as No. (%).

Table 7. Laboratory findings of 777 Subjects Participated in the Health Survey of Shiraz, Southern Iran [a,b]

	Male (n = 326)	Female (n = 451)	Total (n = 777)
Hemoglobin, mg/dL	15.4 ± 1.5	13.5 ± 1.3	14.3 ± 1.7
Normal	319 (97.8)	409 (90.7)	728 (93.7)
Anemic	7 (2.2)	42 (9.3)	49 (6.3)
Platelet, 10^6/μL	234000 ± 67384	358000 ± 71346	248000 ± 70665
Normal	318 (97.5)	440 (97.5)	758 (97.5)
Thrombocytopenic	8 (2.5)	11 (2.2)	19 (2.2)
Cholesterol, mg/dL	187.3 ± 42.6	137.8 ± 72.1	191.1 ± 42.6
Normal	225 (69.1)	272 (60.3)	497 (63.9)
High	101 (30.9)	179 (39.7)	280 (36.1)
Triglyceride, mg/dL	145.2 ± 84.3	137.8 ± 72.1	140.8 ± 77.4
Normal	224 (68.8)	314 (75.6)	538 (69.2)
High	102 (31.2)	137 (24.4)	239 (30.8)
LDL, mg/dL	105.9 ± 33.3	107.4 ± 35.2	106.8 ± 34.4
Normal	306 (93.8)	417 (92.4)	723 (93.1)
High	20 (6.2)	34 (7.6)	54 (6.9)
HDL, mg/dL	47.7 ± 9.2	52.7 ± 11.4	50.6 ± 10.8
Normal	272 (83.4)	412 (91.4)	684 (88.3)
Low	54 (16.6)	39 (8.6)	93 (11.9)

[a] Abbreviations: LDL, low-density lipoprotein; HDL, high-density lipoprotein.
[b] Data are presented as No. (%) or Mean ± SD.

5. Discussion

Iran is one the most populous countries in the Middle East with an estimated population of 77 million facing the problems of an aging population and increasing demands for healthcare services, which is comparable to other countries in the region. Health issue concerns changed and moved from communicable, maternal, neonatal, and nutritional conditions to NCDs between 1990 and 2010. Among 20 countries, including neighboring countries and 6 countries in the Middle East and North Africa (MENA) region that share important geopolitical and cultural characteristics, Iran ranked 13th with regard to health-adjusted life expectancy (HALE) and 12th in age-standardized death rate (ASD) (13). Moreover, It is estimated that the healthcare spending increased dramatically from 24.3 billion USD in 2008 (equivalent to 4.2% of GDP) to 50 billion USD by 2013 demonstrating the rise of demand on medical services, also the healthcare coverage is estimated to be 73% in Iran, which is increasing gradually (14). As a result, Iran shows a significant improvement in many health indices such as life expectancy at birth and life expectancy at 60 years compared to two decades ago (15).

However, data regarding the health status of different districts of Iran is scarce. Therefore, this study was performed in order to determine the health status of Iranian people living in Shiraz while focusing on the socioeconomic determinants of health. One of the findings of this survey was the high frequency of the overweight people in our region. Obesity was also reported in 15.7% of the population, which is more or less differs from previous studies in Iran. Massarrat and Tahaghoghi-Mehrizi (16) found obesity in 11% and 6.2% of males residing in urban and rural areas, respectively and in 27.6% and 15.6% of females residing in urban and rural areas, respectively. However, as we found, the prevalence of obesity in Shiraz is 9.5% among men and 20.2% among women. Overall, BMI is significantly higher in women compared to men probably because of lower height in Iranian women descendant. This finding becomes more important by taking into consideration the high prevalence of dyslipidemia and hypertension indicating the high prevalence of metabolic syndrome in our region (17). Overall, 36.1%, 30.8%, and 6.9% had high levels of cholesterol, TG, and LDL and 11.7% had low levels of HDL which is higher than previous reports (1-3). This study showed that those with lower level of education had significantly higher BMI as well as higher prevalence of overweight and obesity, which is probably due to lack of appropriate knowledge regarding nutrition and health. However, consumption of fast foods (or unhealthy diet) increased by increasing income and years of education, which is in contrast to our previous findings. By taking into consideration the fact that there was not any correlation between dyslipidemia and socioeconomic status, it can be concluded that

high carbohydrate diet among those with fewer years of education is one the most reasons of overweight and obesity. Our results are consistent with previous studies (18, 19) and demonstrate the impact of education on BMI of the populations. It was also shown by Mielck et al. (20) that low socioeconomic groups are faced with a double burden: first, increased levels of health impairments; and second, lower levels of health related quality of life (HRQL) once health is impaired.

The prevalence of smoking, which is an important risk factor for cardiovascular diseases was also increased from 11.8% (3) to 19.3% in this survey indicating the increased risk of cardiovascular diseases in our region. In addition the frequency of opium consumption was quite high in our population (3.3), while alcoholic beverages consumption was low (3.8). Smoking rate was also negatively associated with the income level, demonstrating the increased risk of cardiovascular diseases among lower economic groups.

We found that the prevalence of prehypertension and hypertension were 30.9% and 9.8%, respectively. Out of hypertensive patients, 25% were unaware of their disease. Previous reports from Iran had shown that the prevalence of hypertension and prehypertension are approximately 25% and 46%, respectively (10). According to this report, only 34% of hypertensive patients were aware of their disease and just 25% were taking medications (10, 21). We determined that the prevalence of hypertension is significantly higher among those participants with fewer years of education indicating the role of education in early detection and prevention of hypertension.

The frequency of IGT and DM were found to be 19.1% and 6.5%, respectively, while 5.9% of them were aware of their disease and 4.5% consumed glucose lowering agents to control plasma glucose. The worldwide prevalence of DM is estimated to be 8.3% ranging from 2.3% to 30.9% in different regions (22). DM is considered an important risk factor for nonalcoholic fatty liver disease and its proper screening, early detection and control is of important value for the health system of a country and region (22). The prevalence of DM is significantly low in Shiraz and its awareness and control is quite high compared to other reports (3). We also found that those with fewer years of education had significantly higher prevalence of DM compared to others. Previously it has been shown by Lee et al. (23) that advanced education and increasing income were both inversely associated with incident diabetes. This relationship is largely explained by behavioral factors, particularly body mass index.

We faced some limitations in this study. First the study population was slightly low, so future health surveys with more participants are recommended. However, the precise cluster randomized sampling used in this study resulted in a study population, which is representative of the whole community in our region. Second, the measurements and clinical examination were performed by several physicians and nurses, which may result in inevitable inter-observer variation. In conclusion, changing of life style and increasing trend of NCDs expose a great proportion of population to life threatening events. At least 1 out of 2 adult people in Shiraz lacks physical activity and has high BMI, while 1 out of 3 has at least one abnormal component in his/her lipid profile. Prediabetic, hypertensive, and diabetic groups composed a significant portion of population. Among different groups, women and less educated people belonged to high risk groups. Therefore a multidisciplinary approach is needed to control NCDs and their risk factors, especially in high risk population as it is true for detection of other diseases in at risk populations (24, 25).

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