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The Association of Age and Gender with Risk Factors of Noncommunicable Diseases among Employees in West of Iran

Nahid Khademi, Mehran Babanejad, Atefeh Asadmobini, Hossein Karim

Department of Cardiology, Cardiovascular Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran

Correspondence to:
Dr. Hossein Karim, Department of Cardiology, Cardiovascular Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran.
E-mail: dr_karim@kums.ac.ir

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ABSTRACT

Background: The relationships that age and gender share with risk factors (RFs) of noncommunicable diseases (NCDs) were assessed among a large-scale employ in Western Iran.

Methods: In this epidemiologic cross-sectional study, 7129 employees from Kermanshah Province were assessed using a census method in 2012. Data on RFs of NCD were collected using a standard questionnaire. Demographic information, diet, physical activity, tobacco use, and history of hypertension, history of diabetes, cardiovascular diseases, osteoporosis, and cancer were studied.

Results: The proportion of ≥5 servings of fruits and vegetables consumption per day was lower in higher ages ($P = 0.001$), and this proportion was greater in females than males (72.1% vs. 47.8%; $P < 0.0001$). Tobacco use was more in higher ages and was higher among males than females (13.3% vs. 0.6%; $P < 0.0001$). Overweight and obesity prevalence increased in higher ages and was more prominent among males than females (67.8% vs. 55.3%; $P < 0.0001$). Overall, the prevalence of having 3–5 RFs was greater among those with ≥55 years and among males than females (20.4% vs. 6.6%; $P < 0.0001$).

Conclusions: The prevalence of major RFs of NCDs was greater among older persons and male participants. More preventive programs such as health education on employees of Kermanshah are recommended.

Keywords: Age, employees, gender, risk factors of noncommunicable diseases

INTRODUCTION

Noncommunicable diseases (NCDs), such as cardiovascular disease (CVD), are primary health concerns and major causes of morbidity and mortality worldwide.[1,2] The prevention and management of NCDs are mainly conducted by managing associated risk factors (RFs) including cigarette smoking, hypertension (HTN), hyperglycemia, dyslipidemia, obesity, physical inactivity, and poor dietary habits.[3,4] These conditions commonly affect individuals' work and socioeconomic performance and often contribute to early death.[5-8]

The World Health Organization (WHO) reported that approximately 38 million (68%) of all deaths worldwide in 2012 were due to NCDs.[9] The WHO estimated that, by 2020, NCDs will account for 80% of the global burden of disease, causing seven out of every 10 deaths

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in developing countries with roughly half of those deaths occurring prematurely to persons younger than 70 years of age.[2,10-12] It is reported that 76% of Iranian deaths were due to NCDs.[13]

To decrease the burden of NCDs in developing countries, more data on their RFs should be collected. Recent reviews have revealed that, among developing countries, the Middle East publishes the fewest articles on NCDs.[14] Iran, as one of the countries in this region, is no exception, and the prevalence of NCDs has increased in Iran over the past few years.[15]

Differences in biological and social factors contribute to NCD RF exposure that varies by age and gender. Shirani *et al.* reported that the prevalence of HTN is higher in males than females in Iran, and this difference may be due to higher awareness among women about this disease or their sex-related hormones.[16] This result is consistent with the findings of Sandberg and Ji (2012) that male individuals have a higher mean blood pressure than females.[17] Diabetes is another disease whose pattern varies by region. In a study by Azimi-Nezhad *et al*., there were no significant gender differences in the prevalence of diabetes in the northeast of Iran.[18] However, Yang *et al*.'s study on the prevalence of diabetes by gender in China showed that men had a higher prevalence and that prevalence increased with age.[19]

Usually, employers have worse sedentary lifestyle and probably low-quality diet regime. The age of retirement in Iran is between 60 and 65 years and it means a significant part of employee is near or in old age. Understanding how gender- and age-related prevalence of RFs of NCDs vary in different societies helps to design future intervention programs targeted to age and gender in this population. Since there was not any comprehensive and large-scale study on Iranian employees with regard to the WHO guidelines and protocols; therefore, the current study aimed to assess age and gender differences in the prevalence of RFs of NCDs in a large-scale population of employees from Kermanshah Province in Western Iran.

METHODS

Study design and participants

This cross-sectional study was conducted in 2012 with 7129 employee ages 22–83 years employed in eight cities in Kermanshah Province using the convenient method. The employee defined as a person who worked for governmental or nongovernmental organizations and those who worked in workplaces with low population were excluded from the study. The WHO's standardized stepwise protocol for NCD RF surveillance was used for the standardization and accurate collection of data.[20] All employees in governmental and nongovernmental organizations including hospitals, insurance organization, telecommunication company, universities, health centers, registry offices, and judiciary were included in the study. First, we sent an invitation to all organizations to participate voluntarily in this study.

Study instruments

The standardized stepwise questionnaire for NCDs RF surveillance of the WHO included the demographic information, diet, physical activity, tobacco use, and history of HTN, history of diabetes, CVDs, osteoporosis, and cancer. The demographic items were age, gender, marital status (single or married), and educational level (with or without university education). For most age-related comparisons, employees were categorized into four groups according to age: 15–34 years, 35–44 years, 45–54 years, and ≥55 years. The health personnel collected the responses through face-to-face interviews. The second part of the questionnaire included data on common RFs of NCD as follows:

Diet

The diet items included servings of fruit and vegetable (F&V) consumption on an average day and dairy, fish, and fast foods consumption per week.

Physical activity

The Global Physical Activity Questionnaire (GPAQ), which was introduced by the WHO for physical activity monitoring, was applied in this study. It gathers data on physical activity participation in three domains comprising 16 questions (P1–P16) on activity at work (P1–P6), travel (P7–P9), and recreational activities (P10–P15) as well as sedentary behavior (P16). An approximation of the mean physical activity was calculated as metabolic equivalents (METs), in minutes per week. METs are usually used to evaluate physical activity intensity and are also used for the analysis of GPAQ data. MET is the ratio of a person's active metabolic rate relative to their resting metabolic rate. One MET is defined as 1 kcal/kg/h and is roughly equivalent to the energy cost of sitting quietly and is equivalent to a caloric consumption of 1 kcal/kg/h. For the analysis of GPAQ data, existing guidelines have been adopted. It is estimated that compared to sitting quietly, a person's caloric consumption is four times as high when moderately active, and eight times as high when vigorously active. Therefore, when calculating a person's overall energy expenditure using GPAQ data, 4 METs get assigned to the time spent in moderate activities, and 8 METs to the time spent in vigorous activities. To calculate minutes per week for activity at work, P2 and P3 (days and time of vigorous-intensity activity, respectively); P5 and P6 (days and time of moderate-intensity activities, respectively) were used. For traveling, P8 and P9 (days and time of walking or bicycling for at least 10 min continuously, respectively) were used. For recreational activities, P11 and P12 (days and time of vigorous-intensity sports and of fitness or recreational

activities, respectively), along with P14 and P15 (days and time of moderate-intensity sports, fitness, or recreational activities, respectively) were considered. P1, P4, P7, P10, and P13 were questions on the presence or absence of related activities, and P16 pertained to sleeping, which was not included elsewhere in the GPAQ analysis. Total PA MET-min/week was calculated as follows: ([P2 × P3 × 8] + [P5 × P6 × 4] + [P8 × P9 × 4] + [P11 × P12 × 8] + [P14 × P15 × 4]). Low, moderate, and high levels of PA were, respectively, defined as <600, 600–2999, and ≥3000 MET-min/week.[21]

Tobacco use

In this section, some questions were asked to know about the current status of daily cigarette smoking (factory-rolled cigarettes, hand-rolled cigarettes, or cigars) and water pipe smoking with yes/no responses. Tobacco use was defined as the use of cigarettes and water pipes.

Hypertension

For all participants, physicians measured blood pressure at rest, three times, at an interval of 5 min on the right arm using a mercury sphygmomanometer to determine HTN. People were categorized as hypertensive if they had a mean systolic blood pressure of ≥140 mmHg, or diastolic blood pressure of ≥90 mmHg, and/or reported the use of antihypertensive treatment during the previous 2 weeks.[22]

Diabetes

Diabetes was defined through diagnosis by a physician or health personnel during the last year with yes/no responses and/or reporting the use of antidiabetic medications during the previous 2 weeks.

Cardiovascular disease, osteoporosis, and cancer

Participant history of CVDs, osteoporosis, and cancer was determined by response to the question, "Have you ever been told by a doctor or other health worker that you have any of the following: CVD, such as heart attack, chest pain from heart disease (angina), or stroke (cerebrovascular accident or incident); osteoporosis; or cancer?"

Body mass index

Height was measured to the nearest 0.5 cm without shoes, while the participant had their back square against a taped section of the wall, while looking directly ahead with a right-angle triangle resting on the scalp and against the wall. Weight was measured to the nearest 100 g without shoes. Body mass index (BMI) was calculated as weight (kg) divided by height (m) squared. Based on the WHO definition, individuals with BMI <25 were considered to have normal weight while those with BMI ≥25 were categorized as overweight and/or obese.

There were 5 familiar RFs used in this study: current daily smoking, overweight and/or obesity, high blood pressure, fewer than 5 F&V servings per day, and low physical activity levels. This variable was categorized as having no RFs, 1–2 RFs, or 3–5 RFs.

Ethics

The present study observed the principles of research ethics for questioning and data collection. After the research proposal was approved by the Ethics Committee of Kermanshah University of Medical Sciences, female or male researchers visited the study subjects' workplace depending on the respondent's gender and delivered the questionnaires to fill out after obtaining participant consent for the study, fully explaining the study objectives, and ensuring participants of the confidentiality of their data. To increase the accuracy of responses, questionnaire delivery was coordinated with each relevant departments to provide the respondents with questionnaires during hours when administrative visitors were scarce. Study project number and ethical approval code of study were 91255 and KUMS.ARBC.1394.245, respectively.

Statistical analysis

Collected data were entered into SPSS version 20 (International Business Machines Corp. Armonk, New York, 10504, USA) and Chi-square tests for categorical variables; independent two samples *t*-test was used to evaluate the relationship between age and gender and ANOVA was applied to assess the relationships between dietary habits and age group. $P < 0.05$ was considered statistically significant.

RESULTS

In total, 7129 participants were investigated. The mean ± standard deviation (SD) age of the participants was 41.5 ± 8.5 years; 5215 individuals (73.2%) were male; 5995 individuals (84.1%) were married; and 4498 individuals (63.1%) had a university education. Mean ± SD ages for male and female participants were 42.66 ± 8.45 years and 38.45 ± 8.11 years, which was significantly different ($P < 0.0001$).

Dietary habits

The mean days and serving of fruits consumption in a typical week were decreased by increasing age significantly, and the mentioned means was higher in women in compared with men ($P < 0.001$). There was not a significant relationship between mean days and serving of vegetables and dairy consumption with age and gender ($P < 0.05$). The times of fish consumption were decreased by increasing age, significantly ($P < 0.001$). The times of fish consumption in a typical week was higher in women in compared with men ($P = 0.01$). In addition, the mean days of fast food consumption in a typical week were decreased by increasing age, significantly ($P < 0.001$). Men employees were more likely to consume fast foods in compared with women ($P = 0.04$), [Table 1]. There was a significant

Table 1: Age and gender difference in terms of dietary habits in employees of Kermanshah province

Variables (Mean±SD)	Age group (year)				Gender	
	15-34	35-44	45-54	≥ 55	Male	Female
Days of fruits consumption in a typical week	5.58±1.83	5.41±1.93	5.23±2.08	4.46±2.24	5.1±2.04	5.96±1.72
P	<0.001				<0.001	
Servings of fruits consumption on one of those days	2.28±0.98	2.2±0.97	2.16±0.99	2.04±0.96	2.13±0.94	2.38±1.06
P		<0.001			<0.001	
Days of Vegetables consumption in a typical week	4.62±2.23	4.57±2.23	4.57±2.26	4.34±2.29	4.23±2.24	5.48±1.99
P		0.11			<0.001	
Servings of Vegetables consumption on one of those days	2.65±1.31	2.65±1.31	2.63±1.32	2.52±1.28	2.44±1.24	3.17±1.34
P		0.28			<0.001	
Days of dairy consumption in a typical week	5.27±2.08	5.3±2.13	5.22±2.19	5.02±2.28	5.1±2.19	5.66±1.98
P		0.06			<0.001	
Servings of dairy consumption on one of those days	2.7±7.02	2.49±5.21	2.39±4.61	2.59±6.53	2.41±5.16	2.8±6.74
P		0.37			0.01	
Times of fish consumption in a typical week	0.63±0.83	0.56±0.77	0.5±0.73	0.49±0.79	0.54±0.77	0.59±0.8
P		<0.001			0.01	
Days of fast food consumption in a typical week	0.46±1.04	0.24±0.68	0.17±0.55	0.16±0.53	0.28±0.77	0.24±0.69
P		<0.001			0.04	

relationship of age and gender with the number of F&V servings consumed per day; in higher ages, the proportion of people consuming ≥5 servings of F&V per day decreased ($P = 0.001$). In addition, consumption of >5 F&V servings per day was significantly higher among females (72.1%) than among males [47.8%; $P < 0.0001$; Table 2].

Physical activity

The proportions of low, moderate, and high physical activity were observed in 1487 (28.5%), 2456 (47.1%), and 1276 individuals (24.4%), respectively. Although there was no significant relationship between age and physical activity levels, physical activity levels differed by gender ($P < 0.0001$). Among male participants, the proportion of participants with high physical activity levels (27.4%) was higher compared to females [15.1%; Table 2].

Tobacco use

The prevalence of current cigarette smoking, current water pipe smoking, and current tobacco use was 8.9%, 1.2%, and 9.9% among the employees. The rate of current tobacco use increased with age and was higher among males; both relationships were significant. There were 86 employees (18.7%) ≥55 years that used tobacco, compared to 82 individuals (4.7%) who were 15–34 years of age. In addition, male employees had more frequent tobacco use compared to females [13.3% vs. 0.6%; $P < 0.0001$; Table 2].

Body mass index

In total, 4570 individuals (64.4%) were overweight and/or obese, which had significant relationships with age and gender. In the 45–54 years age group, overweight and/or obesity was observed for 1641 out of 2343 individuals, which was higher than in other age groups (70%; $P < 0.0001$). Furthermore, 3517 males (67.8%) and 1053 females (55.3%) were overweight and/or obese showing a significantly higher prevalence among males [$P < 0.0001$; Table 2].

Noncommunicable diseases risk factors

In total, 892 (12.5%), 5045 (70.8%), and 1192 employees (16.7%) had no RFs, 1–2 RFs, and 3–5 RFs, respectively. The percentage of employees with 3–5 RFs increased with age and was significantly higher among male employees. There were 160 individuals (34.5%) in the age group of ≥55 years with 3–5 RFs compared to 141 individuals (8%) in age group of 15–34 years ($P < 0.0001$). In addition, 1065 males (20.4%) had 3–5 RFs, which was significantly higher than the 127 female employees (6.6%) who had 3–5 RFs, [$P < 0.0001$; Table 2].

Other risk factors

The prevalence of HTN, diabetes, CVD, osteoporosis, and cancer was observed in 1407/7092 (19.8%), 224/7116 (3.1%), 338/7119 (4.7%), 129/7042 (1.8%), and 24/7042 (0.3%) employees, respectively. HTN, diabetes, CVD, osteoporosis, and cancer prevalence significantly increased with age, with a significance level of $P < 0.0001$, except for osteoporosis and cancer. In addition, HTN, diabetes, and CVD were significantly more prevalent in male employees at a level of $P < 0.0001$, except for CVD morbidity, which was significant at $P > 0.05$. Female participants had a significantly higher prevalence of osteoporosis and cancer compared to males [$P < 0.0001$; Table 3].

Table 2: Age and gender difference in terms of NCDs RFs in employees of Kermanshah province

Variables	Age group (year)				Gender	
	15-34	35-44	45-54	≥55	Male	Female
F&V (servings)						
1-2	164 (9.3)	242 (9.5)	236 (10.1)	66 (14.4)	631 (12.2)	77 (4.0)
3-4	588 (33.5)	902 (35.6)	867 (37.0)	174 (38.0)	2077 (40.0)	454 (23.8)
≥5	1004 (57.2)	1393 (54.9)	1239 (52.9)	218 (47.6)	2480 (47.8)	1374 (72.1)
P	0.001				<0.001	
P A						
Low	373 (29.0)	537 (29.5)	473 (27.2)	104 (27.7)	974 (24.6)	513 (41.0)
Moderate	593 (46.1)	860 (47.3)	846 (48.6)	157 (41.9)	1906 (48.0)	550 (43.9)
High	319 (24.8)	422 (23.2)	421 (24.2)	114 (30.4)	1087 (27.4)	189 (15.1)
P	0.06				<0.001	
Tobacco use						
Prevalence/*N* (%)	82/1727 (4.7)	180/2514 (7.2)	352/2344 (15.0)	86/460 (18.7)	689/5172 (13.3)	11/1873 (0.6)
P	<0.001				<0.001	
BMI ≥25						
Prevalence/*N* (%)	902/1756 (51.4)	1709/2532 (67.5)	1641/2343 (70.0)	318/460 (69.1)	3517/5186 (67.8)	1053/1905 (55.3)
P	<0.001				<0.001	
NCDs RFs *N* (%)						
Without RFs	353 (20.0)	312 (12.3)	202 (8.6)	25 (5.4)	483 (9.3)	409 (21.4)
1-2	1271 (72.0)	1876 (73.7)	1619 (68.7)	279 (60.1)	3667 (70.3)	1378 (72.0)
3-5	141 (8.0)	356 (14.0)	535 (22.7)	160 (34.5)	1065 (20.4)	127 (6.6)
P	<0.001				<0.001	

F&V=Fruits & vegetables, PA=Physical activity, NCDs=Non communicable diseases; RFs=Risk factors BMI=Body mass index

Table 3: Age and gender difference in terms of NCDs in employees of Kermanshah province

Variables	Age group (year)				Gender	
	15-34	35-44	45-54	≥ 55	Male	Female
Hypertension Prevalence/*N* (%)	138/1756 (7.9)	360/2531 (14.2)	672/2343 (28.7)	237/462 (51.3)	1214/5186 (23.4)	193/1906 (10.1)
OR (CI, 95%)	1	1.94 (1.5-2.4)	4.7 (3.8-5.7)	12.35 (9.6-15.8)	2.7 (2.3-3.1)	1
P	<0.001				<0.001	
Diabetes Prevalence/*N* (%)	9/1761 (0.5)	50/2539 (2.0)	120/2353 (5.1)	45/463 (9.7)	183/5203 (3.5)	41/1913 (2.1)
OR (CI, 95%)	1	3.9 (1.9-7.9)	10.4 (5.2-20.6)	20.9 (10.1-34.2)	1.6 (1.1-2.3)	1
P	<0.001				0.003	
CVD Prevalence/*N* (%)	50/1765 (2.8)	78/2539 (3.1)	156/2353 (6.6)	54/462 (11.7)	261/5210 (5.0)	77/1909 (4.0)
OR (CI, 95%)	1	1.0 (0.7-1.5)	2.4 (1.7-3.3)	4.5 (3.0-6.7)	1.2 (0.9-1.6)	1
P	<0.001				0.09	
Osteoporosis Prevalence/*N* (%)	22/1729 (1.3)	43/2512 (1.7)	53/2342 (2.3)	11/459 (2.4)	64/5170 (1.2)	65/1872 (3.5)
OR (CI, 95%)	1	1.3 (0.8-2.2)	1.7 (1.0-2.9)	1.9 (0.9-3.9)	1	2.8 (2.0-4.0)
P	0.09				<0.001	
Cancer Prevalence/*N* (%)	4/1727 (0.2)	7/2513 (0.3)	11/2343 (0.5)	2/459 (0.4)	15/5172 (0.3)	9/1870 (0.5)
OR (CI, 95%)	1	1.2 (0.3-4.1)	2.0 (0.6-6.3)	1.8 (0.3-10.3)	1	1.6 (0.7-3.8)
P	0.5				0.24	

CVD=Cardiovascular disease

DISCUSSION

The present cross-sectional study showed that males had a higher prevalence than females for having 3–5 RFs (20.4% vs. 6.6%), using tobacco (13.3% vs. 0.6%), engaging in high PA (27.4% vs. 15.1%), and having diabetes (3.5% vs. 2.1%) while having ≥5 servings of F&V per day was higher in female than male employees (47.8% vs. 72.1%).

Male and females have different levels of exposure and vulnerability to NCD RFs. In the current study, a significantly higher proportion of female respondents (41%) fell into the category of having low levels of physical activity than their male

counterparts (24.6%). The WHO reported in 2010 that 20% of males and 27% of females were insufficiently active and older adults were less active than younger adults.[23] In addition, the WHO has reported that insufficient physical activity has its highest prevalence in the Eastern Mediterranean Region (31%) and the US (32%), whereas the prevalence in Southeast Asia (15%) and Africa (21%) is the lowest.[23] Across all regions, females are less active than males, with gender differences in prevalence varying by 10% or more in the Eastern Mediterranean region and the US.[23]

In the present study, the prevalence of tobacco use was higher among older persons compared to the younger individuals. Studies conducted by Fasoro *et al*.[24] and Veeranki *et al*.[25] also showed a higher tendency for smoking cigarettes in employees over 40 years of age, which is in line with the present findings. Cigarette smoking is the most common form of tobacco use among the Iranian population and is more prevalent among males (24.6%) than females (3.3%).[26] In the current study, 12% of males and 0.3% of females smoked. Based on these figures, the tobacco use pattern observed in the majority of the Iranian society is similar to the employees in Kermanshah Province, where the tendency to smoke is higher among males. As previously mentioned, due to the differences in education levels among employees and the general public, and also given the former's greater knowledge about health issues, the lower levels of tobacco use among the male and female employees surveyed here, compared to the entire population of the country, seem reasonable. Cigarette smoking is stigmatized among Iranian women, making under-reporting among women very likely. A study conducted in one region of Iran supported this idea as it compared tobacco use among women through both self-reports and biochemical measurements and found a significant difference between the prevalence of tobacco use in self-reporting (1.3%) versus biochemical measurements (6.7%).[27] In a study conducted on Malaysian workers, the prevalence of cigarette smoking was 26.5% in men and 0.5% in women. Given that both Iran and Malaysia are Muslim countries and also that tobacco use is not common among the women in these countries, it can be inferred that the prevalence of tobacco use is similar among Iranian and Malaysian women.[24]

In the current study, more than 50% of participants consumed ≥5 F&V servings per day, but this proportion significantly decreased with age. In a study on the Iranian general population conducted by Esteghamati *et al*. (2007), the researchers found that the prevalence of consuming ≥5 servings of F&V per day was only 13% for all participants and also tended to be less common among older persons.[28] It seems that the higher knowledge of the benefits of F&V among employees compared to the general population resulted in higher F&V consumption. In addition, our findings on the gender differences with F&V consumption is similar to the findings in Ramezankhani *et al* (2013), which reported that the frequency of F&V consumption was higher among females compared with males, respectively.[29] In another study by Baker and Wardle, it was found that men have lower consumption of F&V than women.[30]

In our study, the prevalence of diabetes was higher among older persons and males compared to younger female participants. Several studies showed that the prevalence of hyperglycemia increases among older Iranians, which is consistent with our study's findings.[18,31] In addition, in a study conducted by the DECODA study group in four Asian countries showed that diabetes prevalence increased with age in both genders. However, diabetes was more common among men in China and Japan, however, in India, females had higher diabetes rates.[32]

One of the strengths of this study is its large sample size and its use of the census method, which can be said to have sampled from all classes of employees in Kermanshah. Using the WHO standardized stepwise protocol for NCD RFs surveillance as the study's method of data collection is another strength that supports the validity and reliability of the results.

A limitation of the present study was the possibility of the employees, especially the female employees for underreporting and answering according to a social desirability bias for fear of losing their job. In addition, because the blood samples were not obtained to calculate the prevalence of diabetes, diabetes was only assessed through self-report. These limitations should be addressed in future studies.

CONCLUSIONS

The findings of the current study suggest that more than 80% of employees in Western Iran had at least one NCD RF, and higher numbers of RFs were observed among older persons and male employees. F&V consumption, tobacco use, excess weight, diabetes, HTN, and CVD rates also significantly increased with age. In addition, high levels of tobacco use, high physical activity, low F&V consumption, excess weight, diabetes, and HTN were more common among male respondents, whereas osteoporosis was higher among females. These findings emphasize the need for focused national strategies targeting this modern epidemic of NCDs by incorporating primordial prevention activities for employees as an important part of the general population and placing considerable emphasis on younger male participants to prevent future NCD occurrence. More preventive programs such as health education on employees of Kermanshah are recommended.

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Conflicts of interest
There are no conflicts of interest.

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