Association between type of physical activity and risk factors for cardiovascular disease, Islamic Republic of Iran

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Abstract

Background: Little is known about the role of occupational-related physical activity and risk factors for cardiovascular disease.

Aims: This study aimed to assess the association between different types of physical activity (work-related, transport-related, home-time and leisure-time) and risk factors for cardiovascular disease in a sample of Iranian workers.

Methods: This cross-sectional study was conducted from February to November 2018 among 415 workers of a rubber factory in Tehran province. Physical activity levels of the participants were measured using the International Physical Activity Questionnaire. Blood sample were analysed for cardiovascular disease risk factors (fasting blood sugar ≥ 100 mg/dL, triglycerides ≥ 150 mg/dL, total cholesterol ≥ 200 mg/dL, systolic blood pressure ≥ 130 mmHg, diastolic blood pressure ≥ 85 mmHg and waist circumference ≥ 102 cm). Alanine aminotransferase and aspartate aminotransferase were also measured, as was body mass index (BMI).

Results: Risk factors for cardiovascular disease differed significantly according to type of physical activity. Fasting blood sugar ≥ 100 mg/dL and BMI ≥ 25 kg/m^2 had a significant negative association with overall physical activity level ($P < 0.001$). In a logistic regression analysis, leisure-time physical activity had a significant negative correlation with all risk factors for cardiovascular disease after adjusting for age and smoking.

Conclusion: Leisure-time physical activity has a more important role in reducing cardiovascular disease risk factors than other types of activity, including work-related physical activity.

Key words: cardiovascular disease, risk factors, exercise, leisure activities, Iran

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Introduction

Cardiovascular disease (CVD) is one of the most important causes of mortality and morbidity in the general population worldwide *(1–3)*. CVD has increased in developing countries *(4–6)*. Many risk factors for CVD are modifiable with specific prevention measures. A global study in 52 countries, found that nine modifiable risk factors – smoking, dyslipidaemia, hypertension, diabetes, abdominal obesity, psychosocial factors, fruit and vegetable consumption, alcohol use, and daily physical activity accounted for over 90% of the population-attributable risk of a first myocardial infarction *(7,8)*. Many studies have estimated that more than half of mortality due to CVD is associated with five leading modifiable risk factors – hypercholesterolaemia, diabetes, hypertension, obesity and smoking *(9)*. Moreover, the absence of these major risk factors predicts much lower CVD risk factors *(10)*. According to the American Heart Association, seven ideal cardiovascular health metrics have been included in its CVD screening programme to improve risk factors in the general population *(11)*, namely: not smoking, being physically active, having normal blood pressure, having normal blood glucose, having normal total cholesterol level, being normal weight, and eating a healthy diet. Even moderate physical activity gives some protection against coronary heart disease, one of the four main CVD categories *(7,12–16)*. Some studies maintain that individuals with mild to moderate physical activity levels, even as a part of their occupation, appear to have a lower risk of myocardial infarction compared with sedentary workers *(17,18)*. Some studies mentioned that patients with NAFLD have an increased risk of CVD that is independent of traditional CVD risk factors and components of metabolic syndrome *(19,20)*. Also, we have much evidence of the association between physical inactivity and fatty liver disease *(21)*.

Globalization and computerization of workplace, technological changes, highly automated work processes have resulted in an increasing prevalence of sedentary work. Studies on the association between physical work activities and cardiovascular risks give inconsistent results. A systematic review found limited evidence to support a positive relationship between sedentary work and poor health *(22)*. A prospective cohort study among 4819 male industrial workers concluded that moderately hard occupational physical activity may adversely affect

health and should not be a substitute for leisure-time physical activity which is known to protect against coronary heart disease mortality *(23)*. On the other hand, a study showed a significant risk reduction in CVD mortality with moderate work and household physical activity, moderate to vigorous leisure time and total physical activity compared to light physical activity *(24)*. Similarly, a meta-analysis of 21 prospective cohort studies found a strong protective effect of moderate levels of occupational physical activity in both men and women *(25)*.

While the relationship between physical inactivity and CVD is established, clear evidence is lacking that occupational physical activity decreases the prevalence of CVD risk factors. Therefore, we need to research physical activity categories separately to determine which ones have a significant effect on CVD risk factors.

Methods

The survey was conducted from February to November 2018 in a rubber factory in Tehran province which had 583 workers. We collected data on demographic variables, physical activity and cardiovascular disease risk factors. We excluded from the analysis, men who did not participate in measurement of physical activity or in blood testing or who submitted incomplete questionnaires. Thus, 415 male workers aged 21–57 years were included in the study (response rate: 71%): 326 blue collar and 89 white collar workers. Blue collar workers worked in different stations of rubber processing, including mastication, when the elastomer is sheared, and the molecules are broken down to give easier flow, mixing with a Banbury mixer when additives are incorporated, shaping of the viscous mass by extrusion, calendaring and vulcanizing (curing) when the polymer molecules become interlinked and the shape is fixed. White collar workers had clerical, administrative, marketing or managerial duties.

Height was assessed using a digital scale (InBody stadiometer, USA), and for weight, we used an electronic scale (Fitbit Aria 2, USA). Waist circumference was measured with measuring tape from the midpoint of the subcostal region and the upper iliac crest on both sides to the nearest 0.1 cm in the standing position. Blood pressure was measured after sitting for 10 minutes using an electronic haematomanometer (Rossmax X9 blood pressure monitor, Taiwan). Blood was collected after the participant had fasted for more than 10 hours and fasting blood glucose, total cholesterol, triglycerides, alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were measured.

Physical activity of rubber industry workers was measured using an interviewer-administered version of the International Physical Activity Questionnaire (IPAQ) modified and validated for use with the Iranian population *(26)*. The grade of physical activity was based on the IPAQ score conversion system.

IPAQ assesses physical activity undertaken across a comprehensive set of areas, including work-related activity (physical activity as part of paid or unpaid work), transport-related activity (physical activity for travelling from place to place including to work, shops and the cinema). Home-time activity included housework, gardening, yard work, general maintenance work and caring for family and leisure time activity included physical activity solely for recreation, sport, exercise or leisure. The questionnaire asks the time spent being physically active in the past 7 days. Frequency (measured in days per week) and duration (length of time per day) of physical activity are collected separately for each specific type of activity. To calculate the total physical activity score duration (in minutes) and frequency (days) of physical activity are summed.

Physical activity status was divided into three groups according to the IPAQ scoring system as follows *(27–29)*:

1. Low physical activity: not enough activity reported to meet categories 2 or 3.
2. Moderate physical activity: any of the following three criteria:
   i. 3 or more days of vigorous-intensity activity of at least 20 minutes a day.
   ii. 5 or more days of moderate-intensity activity and/or walking for at least 30 minutes a day.
   iii. 5 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities, achieving a minimum of at least 600 metabolic equivalent task (MET) minutes/week.
3. High physical activity. Either of the following two criteria:
   i. Vigorous-intensity activity of at least 3 days a week achieving at least 1500 MET minutes/week.
   ii. 7 or more days of any combination of walking or moderate- or vigorous-intensity activity achieving at least 3000 MET minutes/week.

Statistical analysis

We used *SPSS*, version 24 for statistical analyses. We assessed differences in CVD risk factors among individuals with varying physical activity levels (low, moderate and high) using the Kruskal–Wallis test (one-way ANOVA). To confirm the association of cardiovascular risk factors and type of physical activity, we calculated the Pearson correlation coefficient using bivariate correlation analysis. *P*-value of ≤ 0.05 was considered statistically significant. We also used logistic regression analysis to examine the association between type of physical activity (continuous variables) and CVD risk factors (fasting blood sugar ≥ 100 mg/dl, triglycerides ≥ 150 mg/dl, total cholesterol ≥ 200 mg/dl, systolic blood pressure ≥ 130 mmHg, diastolic blood pressure ≥ 85 mmHg, and waist circumference ≥ 102 cm) adjusting for age and smoking.

Ethical considerations

The study was approved by the ethics and research committee of Tehran University of Medical Sciences (regis-

tration number: 42719). All participants gave written informed consent before participating in the study.

Results

IPAQ and demographic questionnaires were distributed to 583 workers of the rubber factory; 140 participants who did not participate in blood sampling or who submitted incomplete questionnaires were excluded from the analysis. In addition, 28 participants were excluded because they were using medicines for hypertension, dyslipidaemia or hypoglycaemia. Thus 415 individuals remained for data analysis.

Of the 415 men included, 79.5% were married, 77.3% had worked for more than 2 years in their current job and 9.2% smoked. With regard to work type, 78.6% were blue collar workers and 74.2% were shift workers. With regard to CVD risk factors, 14.9% had fasting blood sugar ≥ 100 mg/dL, 43.4% had triglycerides ≥ 150 mg/dL and 23.1% had total cholesterol ≥ 200 mg/dL. In addition, 24.1% had systolic blood pressure ≥ 130 mmHg, 17.8% had diastolic blood pressure ≥ 85 mmHg and 25.8% had a waist circumference ≥ 102 cm (Table 1).

The means values of CVD risk factors are shown in Table 2 for the total study population and physical activity group (low, moderate and high). The mean (standard deviation (SD) age of the participants was 32.99 (6.60) years and mean body mass index (BMI) was 26.49 (3.78) kg/m^2. There was no significant difference in age between the three groups ($P = 0.29$). With regard to fasting blood sugar, triglycerides, total cholesterol, systolic and diastolic blood pressure, ALT, AST, waist circumference and BMI, all the variables were significantly lower in the high physical activity group than in the moderate and low activity groups ($P < 0.05$ for BMI and $P < 0.005$ for other variables).

Fasting blood sugar, triglycerides, systolic blood pressure, diastolic blood pressure and BMI had a statistically significant negative correlation with total physical activity (Table 3). Waist circumference, ALT, AST and total cholesterol were also negatively correlated with total physical activity but this association was not statistically significant. In addition, there was a statistically significant negative correlation between fasting blood sugar and BMI and all types of physical activity, while there is no statistically significant relationship between waist circumference and any kind of physical activity. Triglycerides, total cholesterol, systolic blood pressure, AST and ALT were negatively correlated with leisure activity, transport activity and home activity but not with work activity. Diastolic blood pressure showed a statistically significant negative correlation with leisure and transport physical activity.

Logistic regression analysis showed that leisure-time physical activity has a strong negative relationship with all CVD risk factors after adjustment for age and smoking (Table 4). On the other hand, work-related physical activity had a significant effect only on fasting blood sugar and waist circumference. Similarly, transport-related physical activity had a significant relationship only with waist circumference and home-time physical activity only with systolic blood pressure.

Table 1 Demographic and work characteristics of the study participants

Characteristic	No. (%) (n = 415)
Education level	
≤ High-school diploma	293 (70.6)
> High-school diploma	122 (29.4)
Marital status	
Married	330 (79.5)
Single	85 (20.5)
Duration of job at workplace (years)	
< 2	94 (22.7)
≥ 2	321 (77.3)
Work type	
Blue collar	326 (78.6)
White collar	89 (21.4)
Shift work	
Yes	308 (74.2)
No	107 (25.8)
Income per month (US$)	
< 1000	157 (37.8)
1000–1500	211 (50.8)
> 1500	47 (11.4)
Smoking	
Yes	38 (9.2)
No	377(90.8)
Fasting blood sugar (mg/dL)	
≥ 100	62 (14.9)
< 100	353 (85.1)
Triglycerides (mg/dL)	
≥ 150	180 (43.4)
< 150	235 (56.6)
Total cholesterol (mg/dL)	
≥ 200	96 (23.1)
< 200	319 (76.9)
Systolic blood pressure (mmHg)	
≥ 130	100 (24.1)
< 130	315 (75.9)
Diastolic blood pressure (mmHg)	
≥ 85	74 (17.8)
< 85	341 (82.2)
Waist circumference (cm)	
≥ 102	107 (25.8)
< 102	308 (74.2)

Table 2 Mean (standard deviation) of cardiovascular risk factors according physical activity level

Variable	Total (*n* = 415)	Physical activity level			*P*
		Low (*n* = 66)	Moderate (*n* = 133)	High (*n* = 216)	
Age (years)	32.99 (6.60)	33.23 (6.17)	33.47 (6.26)	32.62 (6.76)	0.29
FBS (mg/dL)	88.87 (12.31)	99.95 (14.36)	89.68 (11.45)	84.99 (9.70)	< 0.001
TG (mg/dL)	165.75 (82.15)	200.69 (67.58)	157.18 (103.11)	125.75 (60.71)	< 0.001
TC (mg/dL)	170.10 (44.85)	197.12 (56.65)	171.23 (45.25)	161.15 (36.60)	< 0.001
AST (U/L)	21.92 (7.01)	25.59 (9.95)	21.74 (6.53)	20.91 (5.76)	< 0.001
ALT (U/L)	26.10 (16.54)	33.32 (28.11)	25.63 (14.06)	24.18 (12.10)	< 0.001
SBP (mmHg)	119.80 (9.85)	125.83 (11.48)	118.76 (8.55)	118.59 (9.42)	0.002
DBP (mmHg)	75.42 (9.24)	81.36 (10.09)	74.62 (8.15)	74.10 (8.93)	< 0.001
WC (cm)	94.97 (11.52)	103.11 (15.25)	92.90 (10.52)	97.52 (1.62)	< 0.001
BMI (kg/m²)	26.49 (3.78)	28.35 (5.38)	26.15 (3.48)	26.12 (3.16)	0.025

FBS = fasting blood sugar; TG = triglycerides; TC = total cholesterol; AST = aspartate aminotransferase; ALT = alanine aminotransferase; SBP = systolic blood pressure; DBP = diastolic blood pressure; WC = waist circumference; BMI = body mass index.

Discussion

We compared CVD risk factors in rubber industry workers according to physical activity level. The results showed that fasting blood sugar, triglycerides, total cholesterol, systolic blood pressure, diastolic blood pressure and BMI were significantly higher in workers with lower physical activity than in more highly active groups.

These findings are supported by reports from similar studies about the effect of physical activity on CVD and its risk factors. For example, a meta-analysis of physical activity or fitness and CVD (representing 1 325 004 person-years of follow-up) showed that the risk of CVD decreased linearly by increasing centile of physical activity *(30)*. Another study provided the first objective evidence that light-intensity physical activity is beneficially associated with blood glucose and that sedentary time is unfavourably associated with blood glucose, which is similar to our report about the relationship of physical activity and fasting blood sugar *(31)*. Yet another study reported that self-reported physical activity level and directly measured fitness are moderately correlated, and the latter is more strongly associated with a protective cardiovascular risk profile as our results also suggest *(32)*.

In past studies, the association between waist circumference and physical activity was mentioned. A study in the USA showed that increases of 25 MET hours/week in vigorous physical activity and of ≥ 0.5 hours/week in weight training were associated with 0.38 cm and 0.91 cm decreases in waist circumference, respectively *33))*. However, we did not find significant differences in waist circumference between groups according to type of physical activity, which might be due to genetic and racial differences in the worldwide population and Iranian workers.

Our study indicated that the most effective physical activity to decrease CVD risk factors was leisure-time exercise, and work-related physical activity cannot be substituted for that. This finding matches results of a systematic review which did not find strong evidence of a causal link between sedentary work and poor health *(23)* and an updated meta-analysis that focused on leisure-time physical activity and primary prevention of CVD

Table 3 Association between cardiovascular risk factors and type of physical activity

Physical activity	Statistics	FBS	TG	TC	SBP	DBP	AST	ALT	WC	BMI
Work-related	PC	−0.212	−0.077	0.010	−0.043	−0.086	−0.002	−0.017	−0.059	−0.217
	P	< 0.001	0.118	0.883	0.384	0.079	0.978	0.725	0.233	< 0.001
Transport-related	PC	−0.135	−0.145	−0.121	−0.186	−0.134	−0.120	−0.129	−0.070	−0.230
	P	0.006	0.003	0.014	< 0.001	0.006	0.014	0.008	0.154	< 0.001
Home-time	PC	−0.132	−0.145	−0.161	−0.179	−0.094	−0.145	−0.115	−0.098	−0.202
	P	0.007	0.003	0.001	< 0.001	0.055	0.003	0.019	0.051	< 0.001
Leisure-time	PC	−0.202	−0.239	−0.240	−0.250	−0.187	−0.140	−0.133	−0.037	−0.319
	P	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.004	0.007	0.456	< 0.001
Total	PC	−0.258	−0.146	−0.060	−0.120	−0.131	−0.055	−0.067	−0.081	−0.301
	P	< 0.001	0.003	0.22	0.015	0.007	0.267	0.171	0.98	< 0.001

FBS = fasting blood sugar; TG = triglycerides; TC = total cholesterol; AST = aspartate aminotransferase; ALT = alanine aminotransferase; SBP = systolic blood pressure; DBP = diastolic blood pressure; WC = waist circumference; BMI = body mass index; PC = Pearson correlation coefficient.
Note. Cardiovascular risk factors: FBS ≥ 100 mg/dL, TG ≥ 150 mg/dL, TC ≥ 200 mg/dL, SBP ≥ 130 mmHg, DBP ≥ 85 mmHg and WC ≥ 102 cm.

Table 4: Effect of physical activity type on cardiovascular risk factors: logistic regression analysis

Physical activity	FBS	TG	TC	SBP	DBP	WC
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Work-related	0.98* (0.97–0.99)	1.00 (0.99–1.01)	1.00 (0.99–1.01)	1.00 (0.99–1.01)	1.00 (0.99–1.01)	0.97** (0.95–0.99)
Transport-related	0.999 (0.99–1.01)	0.998 (0.99–1.01)	1.00 (0.99–1.01)	1.00 (0.99–1.01)	0.999 (0.99–1.01)	0.98* (0.97–0.99)
Home-time	0.999 (0.99–1.01)	1.00 (0.99–1.01)	0.998 (0.99–1.01)	0.98** (0.96–0.99)	0.998 (0.99–1.01)	1.00 (0.99–1.01)
Leisure-time	0.97** (0.96–0.98)	0.97** (0.96–0.99)	0.98** (0.97–0.99)	0.98* (0.97–0.99)	0.98* (0.97–0.99)	0.97** (0.96–0.98)

FBS = fasting blood sugar; TG = triglycerides; TC = total cholesterol; SBP = systolic blood pressure; DBP = diastolic blood pressure; WC = waist circumference; OR = odds ratio; CI = confidence interval.
**P < 0.05; **P < 0.005.*
Note. Cardiovascular risk factors were: FBS ≥ 100 mg/dL, TG ≥ 150 mg/dL, TC ≥ 200 mg/dL, SBP ≥ 130 mmHg, DBP ≥ 85 mmHg and WC ≥ 102 cm. Adjusted for age and smoking.

and in which the role of occupational physical activity in CVD prevention was uncertain based on 23 prospective studies of a total of more than 790 000 adults *(34)*. This finding may be due to the fact that occupational physical activity includes prolonged manual material handling tasks that require lifting, pushing, pulling, holding, and carrying loads, or repeated or sustained exertions of the body while often in biomechanically awkward positions carried out for 8 hours a day or more with only short breaks. In contrast, leisure-time physical activity has a short duration (30–45 minutes) and can significantly increase metabolic rate and overall calorie burn from fat cells. In addition, exercise decreases insulin resistance and improves lipid levels and endothelial function.

Regarding the prevalence of risk factors, despite the high level of physical activity among rubber factory workers, we suggest that the relation between chemical hazards in the rubber industry and CVD risk factors be surveyed in subsequent studies. Furthermore, the levels of AST and ALT may be associated with the solvents used in this factory.

Our study had some limitations. First, our sample was drawn from a single organization in one city and was of a moderate size. Furthermore, this was cross-sectional study, so we cannot infer and causal relationship. In the measurement of physical activity, we relied on self-reports from the participants which may introduce bias. Besides, we did not have detailed lipid profiles such as high-density lipoprotein, low-density lipoprotein and very-low-density lipoprotein, which may reduce the accuracy of the research. Moreover, we could not compare CVD risk factors between sex-specific groups because no women worked in this industry.

Given the considerable impact of leisure-time physical activity on CVD risk factors, industry employers should dedicate some time and space for workers which they could use for exercise and leisure-time physical activities. Furthermore, due to the importance of CVD and the prevalence of its risk factors, detailed lipid profile screening for rubber industry workers should be carried out.

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Lien entre le type d'activité physique et les facteurs de risque des maladies cardiovasculaires, République islamique d'Iran

Résumé

Contexte : Peu d'informations sont disponibles sur le rôle de l'activité physique liée au travail par rapport aux facteurs de risque des maladies cardiovasculaires.

Objectifs : La présente étude visait à évaluer, dans un échantillon de travailleurs iraniens, le lien entre différents types d'activité physique (liée au travail, au transport, au temps libre à domicile ou aux loisirs) et facteurs de risque de maladies cardiovasculaires.

Méthodes : Cette étude transversale a été menée de février à novembre 2018 auprès de 415 travailleurs d'une usine de caoutchouc de la province de Téhéran. Les niveaux d'activité physique des participants ont été mesurés à l'aide du questionnaire international sur l'activité physique (International Physical Activity Questionnaire, IPAQ). Les facteurs de risque de maladies cardiovasculaires ont été recherchés au moyen d'une analyse des échantillons sanguins (glycémie à jeun ≥ 100 mg/dl, triglycérides ≥ 150 mg/dl, cholestérol total ≥ 200 mg/ dl,

tension artérielle systolique ≥ 130 mm Hg, tension artérielle diastolique ≥ 85 mm Hg et tour de taille ≥ 102 cm). L'alanine aminotransférase et l'aspartate aminotransférase ont également été mesurées, ainsi que l'indice de masse corporelle (IMC).

Résultats : Les facteurs de risque des maladies cardiovasculaires différaient considérablement selon le type d'activité physique. Une glycémie à jeun supérieure ou égale à 100 mg/dl et un IMC supérieur ou égal à 25 kg/m^2 étaient liés de façon négative et significative au niveau global d'activité physique (p < 0,001). Dans une analyse de régression logistique, l'activité physique de loisir était corrélée de façon négative et significative avec tous les facteurs de risque des maladies cardiovasculaires après ajustement en fonction de l'âge et du tabagisme.

Conclusion : L'activité physique de loisir joue un rôle plus important dans la réduction des facteurs de risque des maladies cardiovasculaires que les autres types d'activité, y compris l'activité physique liée au travail.

الارتباط بين نوع النشاط البدني وعوامل خطر أمراض القلب والأوعية الدموية، جمهورية إيران الإسلامية

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الخلاصة

الخلفية: لا يُعرف سوى القليل عن دور النشاط البدني المرتبط بممارسة المهنة وعوامل خطر الإصابة بأمراض القلب والأوعية الدموية.

الأهداف: هدفت هذه الدراسة إلى تقييم الارتباط بين مختلف أنواع النشاط البدني (المتصل بالعمل، والمتصل بالنقل، وفي المنزل، وفي وقت الفراغ) وبين عوامل خطر الإصابة بأمراض القلب والأوعية الدموية لدى عينة من العاملين الإيرانيين.

طُرق البحث: أُجريت هذه الدراسة المقطعية في الفترة من فبراير / شباط وحتى نوفمبر / تشرين الثاني 2018 على 415 عاملاً في مصنع للمطاط في محافظة طهران. وقيست مستويات النشاط البدني للمشاركين باستخدام الاستبيان الدولي للنشاط البدني. وحُلِّلت عينة من الدم لمعرفة عوامل خطر الإصابة بأمراض القلب والأوعية الدموية (سكر الدم أثناء الصيام يساوي أو يزيد عن 100 مجم/ دل (ميليجرام بالديسي لتر)، والدهون الثلاثية تساوي أو تزيد عن 150 مجم/ دل، والكولسترول الإجمالي يساوي أو يزيد عن 200 مجم/ دل، وضغط الدم الانقباضي يساوي أو يزيد عن 130 مليمتر زئبق، وضغط الدم الانبساطي يساوي أو يزيد عن 85 مليمتر زئبق، ومحيط الخصر يساوي أو يزيد عن 102 سم. كما قيس إنزيم ناقلة أمينو ألانين وإنزيم ناقلة أمينو أسبارتيت، وكذلك مَنْسَب كتلة الجسم.

النتائج: تتفاوت عوامل خطر الإصابة بأمراض القلب والأوعية الدموية بشكل كبير حسب نوع النشاط البدني. وتبيَّن وجود ارتباط سلبي ملحوظ بين سكر الدم أثناء الصيام الذي يساوي أو يزيد عن 100 مجم/ دل ومنسب كتلة الجسم الذي يساوي أو يزيد عن 25 كجم/ م^2 ومستوى النشاط البدني الإجمالي (قيمة احتمالية < 0.001). وفي تحليل الانحدار اللوجستي، ارتبط النشاط البدني أثناء وقت الفراغ ارتباطًا سلبيًّا ملحوظًا بجميع عوامل خطر أمراض القلب والأوعية الدموية بعد التصحيح مع العمر والتدخين.

الاستنتاجات: يؤدي النشاط البدني في وقت الفراغ دورًا أكثر أهمية في الحد من عوامل خطر الإصابة بأمراض القلب والأوعية الدموية من سائر أنواع النشاط الأخرى، لا سيّما النشاط البدني المتصل بالعمل.

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