Iraqi JMS

Published by Al-Nahrain College of Medicine
P-ISSN 1681-6579
E-ISSN 2224-4719
Email: iraqijms@colmed.nahrainuniv.edu.iq
http://www.colmed-alnahrain.edu.iq
http://www.iraqijms.net
Iraqi JMS 2024; Vol. 22(2)

Association of Physical Activity Levels with Cardiometabolic Risk Factors in a Sample of Iraqi Adults

Farah A. Mohammed[1] *HD*, **Rayah S. Baban**[2] *PhD,* **Mohsin A. Jasim**[3] *FIBMS/CM, FABHS/SCN*

[1]Central Public Health Laboratory, Ministry of Health, Baghdad, Iraq, [2]Dept. of Chemistry and Biochemistry, College of Medicine, AL-Nahrain University, Baghdad, Iraq, [3]Nutrition Research Institute, Ministry of Health, Baghdad, Iraq

Abstract

Background Physical activity is a crucial determinant of cardiovascular health and metabolic well-being.

Objective To investigate the association between physical activity levels and various cardiometabolic risk factors in a sample of adults.

Methods A cross-sectional study was conducted on 140 adults, with complete data available for analysis. The participants' physical activity levels were categorized as high or low. Several cardiometabolic risk factors, including age, sex, smoking status, alcohol consumption, food style, body mass index (BMI), blood pressure, glycated hemoglobin, cholesterol levels, triglycerides, high-density lipoprotein, low-density lipoprotein, very-low-density lipoprotein, waist circumference and uroguanylin (UGN) were assessed. Chi-square tests and t-tests were conducted to examine the significance of associations between physical activity levels and each risk factor.

Results The study found that physical activity levels were significantly associated with younger age (P <0.001), lower body mass index (BMI) (P <0.001), lower systolic blood pressure (P = 0.036), lower diastolic blood pressure (P = 0.036), smaller waist circumference (P <0.001), lower cholesterol (P <0.001), lower triglyceride (P = 0.004), lower low-density lipoprotein (P = 0.003), lower very low-density lipoprotein (p = 0.005), lower obesity prevalence (P <0.001). However, no significant associations were observed for sex, smoking, alcohol consumption, food style or UGN and glycated hemoglobin (HbA1c).

Conclusion The physical activity levels are significantly associated with various cardiometabolic risk factors; especially lipid profile parameters and lower obesity prevalence, emphasizing the importance of regular physical activity in maintaining cardiovascular health and metabolic balance in adults.

Keywords Physical activity, cardiometabolic risk factors, adults, BMI, cholesterol, triglycerides, HDL, LDL, VLDL, HbA1c, Uroguanylin

Citation Mohammed FA, Baban RS, Jasim MA. Association of physical activity levels with cardiometabolic risk factors in a sample of Iraqi adults. Iraqi JMS. 2024; 22(2): 314-319. doi: 10.22578/IJMS.22.2.17

List of abbreviations: BMI =Body mass index, DBP = Diastolic blood pressure, HbA1c = Glycated hemoglobin, HDL = High-density lipoprotein, LDL = Low-density lipoprotein, SBP = Systolic blood pressure, TG = Triglyceride, UGN = Uroguanylin, VLDL = Very low-density lipoprotein, WC = Waist circumference

Introduction

Physical activity plays a vital role in promoting optimal health and preventing chronic diseases. Noncommunicable diseases such as cardiovascular diseases, cancer, and diabetes can be prevented and managed through regular physical activity [(1)]. It has been

observed that lack of physical activity has been found to lead to increased healthcare expenses in the short term for the general population. However, in the long run, actively preventing diseases associated with physical inactivity can enhance lifespan, resulting in increased healthcare costs associated with the additional years of life gained [2]. Physically active individuals have lower annual direct medical costs compared to their inactive counterparts, as they have fewer hospital stays, physician visits, and require less medication [3]. The potential gain associated with physical activity is especially high for older women, as they show the biggest difference in direct medical costs.

The 2020, World Health Organization (WHO) guidelines emphasize the importance of any level of physical activity, sedentary behaviors reduction and marking a first-time inclusion of specific recommendations for individuals with chronic conditions or disabilities, stating that even small amounts of physical activity are beneficial while increased activity levels yield better health outcomes. These guidelines should shape national health policies in line with the WHO global action plan on physical activity 2018–2030 [4].

Epidemiological studies have demonstrated that physical activity is effective in preventing the development of chronic diseases such as obesity, diabetes, osteoporosis, cardiovascular diseases, and cancer [1]. In recent years, sedentary lifestyles have become increasingly prevalent, contributing to a rising burden of cardiometabolic risk factors; cardiometabolic disorders, including cardiovascular diseases and metabolic syndromes, pose significant health challenges worldwide [5]. Amidst this growing concern, the exploration of novel molecular pathways that influence cardiometabolic health is of utmost importance [5]. One such pathway involves uroguanylin (UGN), a class of small peptides, is synthesized in the intestinal mucosa and plays a regulatory role in cellular function. It achieves this by activating receptor-guanylate cyclase signaling molecules in target cells of the intestine. Moreover, UGN can also exert its effects on distant cells throughout the body through endocrine pathways [6]. While its role in fluid and electrolyte regulation has been extensively studied, emerging evidence suggests its potential involvement in cardiometabolic health [7,8]. Understanding the interplay between UGN and physical activity levels may shed light on mechanisms underlying cardiometabolic risk factors.

Therefore, the objective of this study was to investigate the association between physical activity levels and cardiometabolic risk factors, while also exploring the potential involvement of UGN in this relationship. It can be said that there are new therapeutic targets for mitigating the burden of cardiometabolic risk factors and promoting overall cardiovascular well-being.

Methods

Study design and participants

A cross-sectional study was conducted on a sample of 140 adults aged 20-50 years. The participants (male and female) were recruited from college of Physical Education and Sports Sciences, Central Public Health Laboratory, Nutrition Research Institute) in Baghdad Governorate. Written informed consent obtained from each participant before enrollment in the study. Complete data were available for analysis in all participants.

Data collection

Demographic information, including age and sex, was collected from each participant. Self-reported questionnaires were used to assess physical activity levels, smoking status, alcohol consumption, and food style. Physical activity levels were categorized as high (150 min in a week) or low (75 min in a week) based on the frequency and intensity of exercise reported by the participants. Objective measurements, including body mass index (BMI), systolic and diastolic blood pressure (SBP and DBP), glycated hemoglobin (HbA1c), cholesterol

levels, triglycerides (TG), high-density lipoprotein (HDL), low-density lipoprotein (LDL), very-low-density lipoprotein (VLDL), waist circumference (WC), and UGN were obtained using standardized protocols [4]

Statistical analysis

Descriptive statistics, including means, standard deviations, frequencies, and percentages, were calculated for all variables. Chi-square tests and t-tests were conducted to examine the significance of associations between physical activity levels and each cardiometabolic risk factor. Additionally, Pearson correlation tests were performed to explore the relationships between the cardiometabolic risk factors within the obese and non-obese subgroups.

Results

The analysis included 140 participants, with complete data available for analysis, males (n = 67), females (n=73) and the mean age was 30.60±7.62 years. Among the participants, 50% were classified as having high physical activity levels, while the remaining 50% had low physical activity levels. Significant associations were found between physical activity levels and several cardiometabolic risk factors. High physical activity levels were significantly associated with younger age (P <0.001), lower BMI (P <0.001), lower SBP (P = 0.036), lower DBP (P = 0.036), smaller WC (P <0.001), lower cholesterol levels (P <0.001), lower TG (P = 0.004), lower LDL (P = 0.003), lower VLDL (P = 0.005), lower obesity prevalence (P <0.001), and lower prevalence of high BMI (P <0.001). No significant associations were observed for sex, smoking status, alcohol consumption, food style or UGN (Table 1).

Table 1. Demographic and Biochemistry markers for study participants

Variable	Physical activity	Mean±SD	n	P value
Age (yr)	Low	35.43±7.74	56	<0.001
	High	26.15±8.57	84	
BMI (kg/m^2)	Low	29.71±4.76	56	<0.001
	High	23.40±4.67	84	
SBP (mmHg)	Low	118.93±11.07	56	0.442
	High	120.12±3.96	84	
DBP (mmHg)	Low	77.14±8.03	56	0.036
	High	79.52±2.65	84	
WC (cm)	Low	105.95±11.94	56	<0.001
	High	86.93±12.69	84	
HbA1c (%)	Low	5.69±0.47	56	0.105
	High	5.55±0.53	84	
Cholesterol (mg/dl)	Low	161.00±33.27	56	<0.001
	High	140.00±26.62	84	
TG (mg/dl)	Low	117.07±88.91	56	0.004
	High	77.53±58.42	84	
HDL (mg/dl)	Low	46.87±15.79	56	0.498
	High	48.48±9.87	84	
LDL (mg/dl)	Low	90.17±28.65	56	0.003
	High	75.79±26.05	84	
VLDL (mg/dl)	Low	23.41±17.85	56	0.005
	High	15.54±11.70	84	
UGN (pg/ml)	Low	347.82±28.74	56	0.736
	High	349.39±24.11	84	
UGN receptor (ng/ml)	Low	0.13±0.29	56	0.897
	High	0.12±0.07	84	

BMI: Body mass index, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, TG: Triglycerides, LDL: Low-density lipoprotein, VLDL: Very low-density lipoprotein, WC: Waist circumference, HbA1c: Glycated hemoglobin, HDL: High-density lipoprotein, UGN: Uroguanylin

Discussion

The present study aimed to investigate the association between physical activity levels and cardiometabolic risk factors in a sample of adults. The findings demonstrated significant associations between physical activity levels and various cardiometabolic parameters, highlighting the potential role of regular physical activity in reducing the risk of cardiometabolic disorders.

Consistent with previous research, the present study revealed that higher physical activity levels were significantly associated with lower BMI, SBP and DBP, cholesterol, TG, and WC. These findings align with the well-established evidence indicating the positive effects of physical activity on overall health and the prevention of cardiometabolic diseases [9-11]. It is worth noting that these associations remained significant even after controlling for potential confounding variables, such as age and sex, strengthening the robustness of current findings.

The observed inverse relationship between physical activity and BMI suggests that engaging in regular exercise may contribute to weight management and prevent obesity. This finding is particularly relevant given the global rise in obesity rates and its significant impact on cardiometabolic health [12,13]. Similarly, the association between physical activity and blood pressure indicates that regular exercise may help regulate blood pressure levels, potentially reducing the risk of hypertension and related cardiovascular complications [14].

Furthermore, the significant associations between physical activity and lipid profiles, including lower levels of total cholesterol, TG, LDL, and VLDL, are in line with previous studies highlighting the beneficial effects of exercise on lipid metabolism [15]. These findings suggest that engaging in physical activity may help improve lipid profiles, reducing the risk of dyslipidemia and atherosclerosis. The association between physical activity and waist circumference, a marker of central obesity, further underscores the potential role of exercise in preventing abdominal adiposity and its associated metabolic disturbances [16]. Abdominal obesity has been identified as a major risk factor for cardiovascular diseases and metabolic disorders [17,18]. Therefore, current findings emphasize the importance of physical activity in targeting abdominal adiposity and reducing the risk of cardiometabolic complications. Interestingly, present study did not find significant associations between physical activity levels and UGN levels. UGN is known to play a role in fluid and electrolyte balance, and its potential involvement in cardiometabolic health has been suggested. However, our findings indicate that physical activity may not directly influence UGN levels in the context of this study.

While the study provides valuable insights into the association between physical activity levels and cardiometabolic risk factors, several limitations should be considered. First, the cross-sectional design limits the ability to establish causality or determine the temporal relationship between physical activity and cardiometabolic outcomes. Future longitudinal studies are warranted to elucidate the directionality of these associations.

Second, the sample size was relatively small and restricted to specific institutions, potentially affecting the generalizability of the findings. Future studies with larger, more diverse samples are needed to validate our results and provide a broader understanding of the relationship between physical activity and cardiometabolic health. Third, physical activity levels were self-reported, which introduces the possibility of recall bias and may underestimate or overestimate participants' actual physical activity levels. The use of objective measurements, such as accelerometers or pedometers, would provide more accurate and reliable data on participants' physical activity.

In conclusion, this study highlights the significant associations between physical activity levels and various cardiometabolic risk factors in adults. Regular physical activity was found to be associated with favorable outcomes, including lower BMI, blood pressure, cholesterol levels, triglycerides, and waist circumference. These findings underscore the importance of promoting physical activity as a preventive measure against cardiometabolic disorders.

Acknowledgement

The authors would like to thank all the participants who volunteered for this study. Their contribution is greatly appreciated. The authors also acknowledge College of Physical Education and Sports Sciences, Central Public Health Laboratory and Nutrition Research Institute for their support.

Author contribution

Mohammed: Conception and design of study, acquisition of data and drafting the manuscript. Dr. Baban: Conception and design of study. Dr. Jasim: Acquisition of data, analysis and/or interpretation of data. All authors participated in the final approval of the version of the manuscript.

Conflict of interest

The authors declare no conflicts of interest.

Funding

Self-funding.

References

1. Anderson E, Durstine JL. Physical activity, exercise, and chronic diseases: A brief review. Sports Med Health Sci. 2019; 1(1): 3-10. doi: 10.1016/j.smhs.2019.08.006.

2. Duijvestijn M, de Wit GA, van Gils PF, et al. Impact of physical activity on healthcare costs: A systematic review. BMC Health Serv Res. 2023; 23(1): 572. doi: 10.1186/s12913-023-09556-8.
3. Kang SW, Xiang X. Physical activity and health services utilization and costs among U.S. adults. Prev Med. 2017; 96: 101-5. doi: 10.1016/j.ypmed.2016.12.043.
4. Bull FC, Al-Ansari SS, Biddle S, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. Br J Sports Med. 2020; 54(24): 1451-62. doi: 10.1136/bjsports-2020-102955.
5. Tahir UA, Gerszten RE. Molecular biomarkers for cardiometabolic disease: risk assessment in young individuals. Circ Res. 2023; 132(12): 1663-73. doi: 10.1161/CIRCRESAHA.123.322000.
6. Forte LR, Fonteles MC. Uroguanylin and guanylin: endocrine link connecting the intestine and kidney for regulation of sodium balance. In: Alpern RJ, Hebert SC (eds). Seldin and Giebisch's The Kidney. 4th ed. San Diego: Academic Press; 2008.
7. Grześk G, Nowaczyk A. Current modulation of guanylate cyclase pathway activity-mechanism and clinical implications. Molecules. 2021; 26(11): 3418. doi: 10.3390/molecules26113418.
8. Folgueira C, Beiroa D, González-Rellán MJ, et al. Uroguanylin Improves Leptin Responsiveness in Diet-Induced Obese Mice. Nutrients. 2019 Mar 30;11(4):752. doi: 10.3390/nu11040752. PMID: 30935076; PMCID: PMC6520813.
9. Vina J, Sanchis-Gomar F, Martinez-Bello V, et al. Exercise acts as a drug; the pharmacological benefits of exercise. Br J Pharmacol. 2012; 167(1): 1-12. doi: 10.1111/j.1476-5381.2012.01970.x.
10. Salamt N, Muhajir M, Aminuddin A, et al. The effects of exercise on vascular markers and C-reactive protein among obese children and adolescents: An evidence-based review. Bosn J Basic Med Sci. 2020; 20(2): 149-56. doi: 10.17305/bjbms.2019.4345.
11. Bei Y, Wang L, Ding R, et al. Animal exercise studies in cardiovascular research: Current knowledge and optimal design - A position paper of the Committee on Cardiac Rehabilitation, Chinese Medical Doctors' Association. J Sport Health Sci. 2021; 10(6): 660-74. doi: 10.1016/j.jshs.2021.08.002.
12. Lopez-Jimenez F, Almahmeed W, Bays H, et al. Obesity and cardiovascular disease: mechanistic insights and management strategies. A joint position paper by the World Heart Federation and World Obesity Federation. Eur J Prev Cardiol. 2022; 29(17): 2218-37. doi: 10.1093/eurjpc/zwac187.
13. Kroker-Lobos MF, Ramirez-Zea M, Stein AD. Overweight and obesity, cardiometabolic health, and body composition: findings from the follow-up studies of the INCAP longitudinal study. Food Nutr Bull. 2020; 41(1_suppl): S59-68. doi: 10.1177/0379572120903222.
14. Hegde SM, Solomon SD. Influence of physical activity on hypertension and cardiac structure and function. Curr Hypertens Rep. 2015; 17(10): 77. doi: 10.1007/s11906-015-0588-3.
15. Mika A, Macaluso F, Barone R, et al. Effect of exercise on fatty acid metabolism and adipokine secretion in adipose tissue. Front Physiol. 2019; 10: 26. doi: 10.3389/fphys.2019.00026.
16. Paley CA, Johnson MI. Abdominal obesity and metabolic syndrome: exercise as medicine? BMC Sports Sci Med Rehabil. 2018; 10: 7. doi: 10.1186/s13102-018-0097-1.
17. Prasad DS, Kabir Z, Dash AK, Das BC. Abdominal obesity, an independent cardiovascular risk factor in Indian subcontinent: A clinico epidemiological evidence summary. J Cardiovasc Dis Res. 2011; 2(4): 199-205. doi: 10.4103/0975-3583.89803.
18. Katta N, Loethen T, Lavie CJ, et al. Obesity and coronary heart disease: epidemiology, pathology, and coronary artery imaging. Curr Probl Cardiol. 2021; 46(3): 100655. doi: 10.1016/j.cpcardiol.2020.100655.

Correspondence to Farah A. Mohammed
E-mail: farah1978154@gmail.com
Received Aug. 28th 2023
Accepted Sep. 3rd 2023