

Physical Activity and Obesity in Iraqi Adults: A Cross-Sectional Study of Social and Demographic Correlates and BMI Associations

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Abstract

Objective: Given the important role physical activity (PA) plays in determining body weight, health, and overall body composition, and its relationship with body weight in adults, it is an important area of study for promoting health and fitness among adults. This study aimed to assess PA among adults, investigate the correlation between body mass index and PA, and explore variations in PA based on Social/Demographic factors.

Methods: A cross-sectional study of 195 randomly selected and gender -stratified individuals out of 390 adults attending nutrition clinics in Al-Hilla Teaching Hospitals was conducted between December 22, 2024, to February 20, 2025. Data was collected using a structured questionnaire that included the short form of the International PA Questionnaire. Pearson's correlation coefficients and Kruskal-Wallis tests were used to examine the associations.

Results: Most of the participants were aged 20–29 years (41.5%), female (79.5%), married (60.5%), employed (48.2%), and residing in urban areas (75.9%). The overall evaluation of the PA level among the participants was moderate. A statistically significant negative correlation was found between BMI and (PA) ($r = -0.392$; $p < 0.001$). Nearly half of the sample fell under the "Obesity" category (47.7%), with BMI values ≥ 30 . Variations in PA were observed based on gender and occupation, but not for age or marital status.

Conclusion: Physical activity was negatively correlated with body mass index. Gender and occupation significantly influence Physical activity levels, indicating the need for targeted interventions among females and unemployed adults to achieve an ideal weight and reduce obesity.

Keywords: Physical activity, BMI, Obesity, Body weight, Cross-sectional study

Plain English Summary

The association between body weight and PA in adults is an important study area for promoting health and fitness among adults. This study aimed to assess physical activity among adults, investigate the correlation between body mass index and physical activity. The study also explored variations in PA based on Social/Demographic factors. A quantitative cross-sectional descriptive study was conducted on 195 samples of clients selected out of 390 adults attending nutrition clinics in Al-Hilla teaching hospitals from December 22, 2024, to February 20, 2025. Data were collected using a structured questionnaire that included Social/Demographic details, BMI measurements, and PA measures. The overall evaluation of the physical activity level among the participants was moderate. A statistically significant negative correlation was found between BMI and PA. Health promotion should focus on encouraging PA to reduce obesity and raising awareness of the importance of PA to prevent the progression of obesity and its health risks

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Background

Obesity is “a medical condition in which excess body fat has accumulated to the extent that it may hurt health, leading to reduced life expectancy and/or increased health problems” (1). Obesity is a major health crisis and a real and present threat to global health progress (2). Body weight is a fundamental anthropometric measure to assess physical health and nutritional status (3). Body Mass Index (BMI) is a simple scale used to detect an increase or decrease in body weight (4). Obesity risk factors are numerous. They include heredity, environment, food, psychological aspects, and lack of physical activity (PA) (5).

Only 21% of adults and 13% of older people worldwide reach the recommended levels of aerobic and muscle-strengthening PA. The percentage of physical inactivity is even higher in obese people or those of lower socioeconomic status, populations who may benefit even more from PA, assuming their advanced charges of long-lasting illness (6). One in three people is not highly active, and physical inactivity is the fourth biggest cause of death globally. In 2013, WHO member states promised to reduce physical inactivity by 10% by 2025 (7). The movement of the body brought on by skeletal muscle activity that requires the use of energy is referred to as PA. Physical activities include jogging, walking, gardening, climbing stairs, and playing soccer (8). A previous study referred to PA as a habit that involves motions of the body that cause energy expenditure; increasing PA is known to have positive effects on a variety of health outcomes (9). Physical exercise is one of the best methods to support the development of both physical and mental health, according to a wealth of data and research (10).

This study investigated PA behaviour among Iraqi adults while exploring BMI association with PA, along with analysing the PA differences caused by Social/Demographic conditions, which included age groups, marital status, occupational type, educational attainment, and salary level.

Materials and Methods

Study Design

This cross-sectional descriptive study was conducted to investigate the correlation between body mass index and PA among nutrition clinic attendees at Hillah Teaching Hospitals between December 2024 to February 2025. The descriptive design was chosen for its ability to classify patterns and associations without affecting the study environment or variables.

Study Population

The study population encompassed adult clients attending nutrition clinics at Al-Hilla Teaching Hospital throughout the study period. The inclusion criteria were any adults aged ≥ 18 who suffered from weight disorders and obesity.

Sampling Method

A non-probability convenience sampling method was used to recruit participants from nutrition clinics in Al-Hilla Teaching Hospitals. We acknowledge that convenience sampling may limit generalizability; however, this population was chosen because nutrition clinic attendees represent individuals actively seeking weight management services, making them a relevant group to explore associations between BMI and PA.

Data Collection Tools

Data were collected using a structured questionnaire divided into three parts:

1. Social/Demographic Data: Seven items capturing age, gender, marital status, occupation, education level, income level, and residence type, occupation, education level, income level, and residence type.

2. BMI Assessment: Participants' height and weight were measured using standardised equipment, and BMI was calculated using the formula: $\text{weight (kg)}/\text{height}^2 (\text{m}^2)$. BMI classifications followed WHO criteria: underweight ($<18.5 \text{ kg/m}^2$), normal weight (18.5–24.9), overweight (25.0–29.9), obesity class I (30.0–34.9), class II (35.0–39.9), and class III (≥ 40.0) (11).

3. International PA Questionnaire (IPAQ): This was used to calculate the amount of time spent engaging in moderate-to-intense physical exercise in several facets of life per week. The activities included walking, moderate activities, vigorous PA, sitting time, household activities, recreational activities, flexibility exercises, social PA, and active transportation. IPAQ data were processed by assigning MET values to activity categories (walking = 3.3 METs, moderate = 4.0 METs, vigorous = 8.0 METs) and calculating total MET-min/week per participant. According to WHO guidelines, moderate PA was defined as achieving at least 600 MET-min/week, and vigorous PA as at least 1500 MET-min/week (12).

Pilot Study

The pilot study was conducted among 15 participants from December 8 to 19, 2024, to test questionnaire reliability using Cronbach's alpha; the results indicated acceptable internal consistency ($\alpha = 0.785$).

Statistical Analysis

Statistical analysis included descriptive statistics (means ± SD) for Social/Demographic characteristics; Pearson’s correlation coefficients assessed the association between BMI and PA; Kruskal-Wallis tests examined differences in PA across demographic groups at significance levels of ≤0.05.

Results

Table 1 describes the Social/Demographic characteristics of the participants. Most of the participants were within the 20-29 years age group (41.5%), and most of the subjects were female (79.5%) and resided in urban areas (75.9%). A significant proportion (60.5%) were married, and nearly half (48.2%) were employed. The largest educational category consisted of bachelor’s degree holders (29.7%), and more than half (54.4%) of the participants had a monthly income of ≤ 600,000 Iraqi Dinar.

Table 1. Demographic Characteristics of the Study Population

SDVs	Classification	No.	%
Age/ years	<20	11	5.6
	20-29	81	41.5
	30-39	53	27.2
	40-49	33	16.9
	50-59	13	6.7
	≥60	4	2.1
	Total	195	100
	M± SD.	32.72±10.380	
Sex	Men	40	20.5
	Women	155	79.5
	Total	195	100
Residents	Urban	148	75.9
	Rural	47	24.1
	Total	195	100
Marital status	Single	70	35.9
	Married	118	60.5
	Divorced	5	2.6
	Widowed	2	1.0
Occupation	Total	195	100
	Unemployed	55	28.2
	Students	14	7.2
	Self-employed	27	13.8
	Employed	94	48.2
	Retired	5	2.6
	Total	195	100
Education levels	Illiterate	18	9.2
	Read and write	24	12.3
	Primary school graduate	22	11.3
	Intermediate school graduate	16	8.2
	High school graduate	17	8.7
	Diploma graduate	34	17.4
	Bachelor's degree graduate	58	29.7
Higher degree graduate	6	3.1	
Family monthly income/ months	Total	195	100
	≤ 600,000	106	54.4
	601,000-900,000 ID	47	24.1
	901,000-1,200,000	21	10.8
	1,201,000-1,500,000	12	6.2
	≥ 1,501,000	9	4.6
BMI Category	Total	195	100
	Normal (18.5 -24.9)	33	16.9
	Overweight (25.0-29.9)	69	35.4

PA level	Obesity (> = 30.0)	93	47.7
	Low	69	35.4
	Moderate	96	49.2
	High	30	15.4

No. Number; %= Percentage; M= Mean; SD= standard deviation; ID = Iraqi Dinar

Table 2 presents the distribution of PA levels among the adults based on their engagement in various physical activities over the previous seven days before the interview. Walking was the most practised activity (55.4%). The participants were also highly engaged in household activities. Nearly half (49.5%) of the subjects always participated in

moderate PA, social PA. Active transportation fell within the moderate category. Sitting time had a moderate score, with 48.7% of the participants spending more than four hours sitting daily. In contrast, participants rarely participated in vigorous PA, recreational activities, and flexibility exercises.

Table 2. Distribution of PA among the Studied Sample (Adults)

PA Items	Never		Sometime		Always		Total		M.s	Ass.
	No.	%	No.	%	No.	%	No.	%		
Walking: In the last 7 days, I walked for at least 10 minutes continuously at a moderate pace.	23	11.8	64	32.8	108	55.4	195	100	2.44	H
Moderate PA: In the last 7 days, I engaged in moderate physical activities (e.g., carrying light loads, cycling at a regular pace) for at least 30 minutes.	98	50.3	51	26.2	46	23.6	195	100	1.73	M
Vigorous PA: In the last 7 days, I performed vigorous physical activities (e.g., heavy lifting, aerobics) that made me breathe harder than normal for at least 20 minutes.	116	59.5	46	23.6	33	16.9	195	100	1.57	L
Sitting Time: In the last 7 days, I spent long periods sitting or reclining (e.g., at work, while driving, watching TV or mobile) for more than 4 hours a day.	32	16.4	68	34.9	95	48.7	195	100	2.32	M
Household Activities: In the last 7 days, I engaged in household tasks (e.g., cleaning, gardening) for at least 30 minutes.	30	15.5	68	35.1	96	49.5	195	100	2.34	H
Recreational Activities: In the last 7 days, I participated in recreational activities (e.g., sports, Hunting, recreation) for at least 30 minutes.	115	59.0	66	33.8	14	7.2	195	100	1.48	L
Flexibility Exercises: In the last 7 days, I participated in flexibility exercises (e.g., stretching, yoga) for at least 20 minutes.	133	68.2	31	15.9	31	15.9	195	100	1.48	L
Social PA: In the last 7 days, I engaged in physical activities with others (e.g., group walks, team sports).	77	39.5	83	42.6	35	17.9	195	100	1.78	M
Active Transportation: In the last 7 days, I used active transportation (e.g., walking or cycling instead of driving) for at least 30 minutes.	65	33.3	54	27.7	76	39.0	195	100	2.06	M

No. Number; %= Percentage; M= Mean; SD= standard deviation, Ass.= Assessment, M.s=mean of score Level of Responses (Low [L]=1-1.66; Moderate [M]=1.67-2.33; High [H]=2.34-3)

Figure 1 shows that the overall evaluation of PA among study participants indicated that the majority of them participated in moderate PA. Specifically, 49.2% of participants fell into the moderate category, while 35.4% had low PA levels,

and only 15.4% demonstrated high PA levels. The mean total score for PA was 17.2 ± 4.34 , which fell within the moderate range (15.1–21), suggesting that, on average, adults engaged in physical activities at a moderate level.

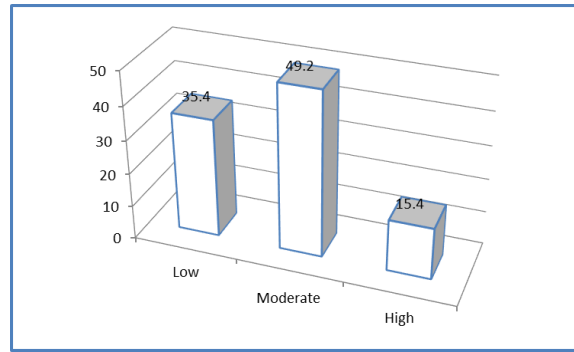


Figure 1: Overall Physical Activity Level

The statistical correlations between BMI and PA among adults is presented in Figure 2. Showing a significant negative correlation ($r = -0.392$; $p < 0.001$). This indicated that as PA increases, BMI

tends to decrease, suggesting that higher levels of PA are associated with lower BMI among adults ($R^2 = 0.154$), and this means 15.4 % of the variance in BMI is due to PA.

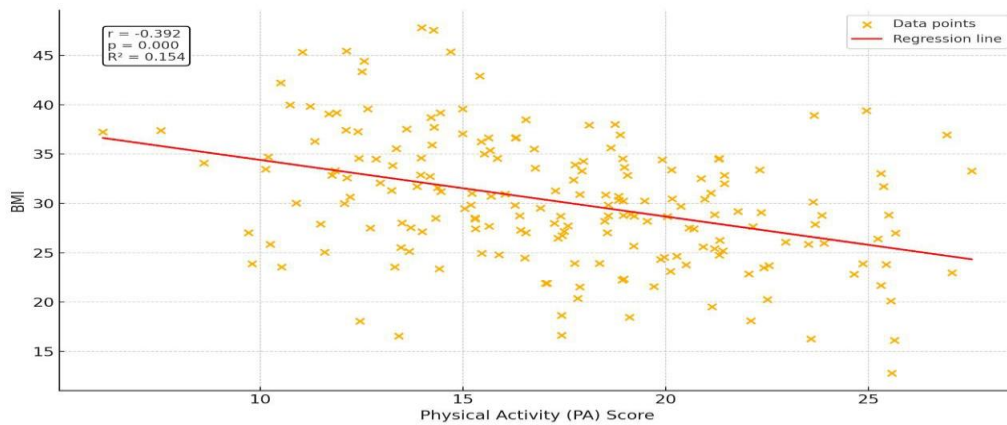


Figure 2: Association between body weight (BMI) and PA

The variations in PA based on Social/Demographic characteristics are shown in Table 3. A significant difference ($p = 0.028$) was found between the sexes, with males showing higher PA compared to females. Occupation showed a significant

difference ($p = 0.011$), where the self-employed group had higher PA levels. Age, residence, marital status, education, and income did not show significant differences in PA.

Table 3. Statistical Differences in PA between Groups of Socio-demographic Factors

Variables	Class	Category No.	Mean PA score	χ^2	p-value
Age (years)	<20	11	85.45	4.907	.427
	20-29	81	95.98		
	30-39	53	95.01		
	40-49	33	116.14		
	50-59	13	85.69		
Sex	Male	40	100.89	3.743	.028
	Female	155	84.46		
Residents	Urban	148	96.25	.594	.441
	Rural	47	103.50		
Marital status	Single	70	93.19	1.169	.760
	Married	118	100.75		

		Divorced	5	107.90		
		Widowed	2	79.50		
		Unemployed	55	101.90		
		Students	14	92.79		
Occupation		Self-employed	27	157.81	6.585	.011
		Employed	94	93.81		
		Retired	5	100.80		
		Illiterate	18	104.28		
		Read and write	24	105.54		
		Primary school	22	91.95		
Education level		Intermediate school	16	91.91	1.315	.971
		High school	17	95.12		
		Diploma graduate	34	93.88		
		Bachelor's degree	58	97.18		
		Post-graduate	6	126.83		
		≤ 600,000	106	101.17		
Family income/ monthly		601,000-900,000 ID	47	89.09		
		901,000-1,200,000	21	98.74	3.343	.488
		1,201,000-1,500,000	12	86.79		
		≥ 1,501,000	9	120.39		

^b= Kruskal Wallis Test; n= number; sig.= significant level at ≤0.05; ID = Iraqi Dinar

Discussion

The study findings provide important insights into the relationship between individuals' BMI and PA. The results showed a significant negative correlation, suggesting that higher levels of PA are associated with lower BMI. However, given the cross-sectional design, causation cannot be inferred; we cannot conclude that PA directly reduces BMI, only that they are linked. This association aligns with previous investigations (8, 13), which also observed statistically significant relationships between BMI and PA levels.

Regarding energy expenditure, a similar negative correlation with BMI was found. Participants with lower levels of PA tended to have higher BMI values. These findings are consistent with global evidence showing that sedentary behaviour is increasing in developing countries, contributing to the rising prevalence of obesity and chronic diseases such as diabetes and hypertension (14). In our sample, 47.7% were classified as obese (BMI ≥ 30.0), consistent with earlier regional findings (15). This reflects a pressing public health issue, as obesity significantly raises the risk of coronary heart disease, stroke, and several cancers (16). While 49.2% of participants engaged in moderate PA, this level was not necessarily sufficient to counteract weight gain, highlighting the need for improved interventions. Similar activity levels were observed in prior studies (7), where even individuals performing moderate exercise reported continued weight issues.

Compared to WHO estimates, Iraq's adult PA levels appear moderately lower than some

neighbouring countries and global averages, where insufficient PA prevalence ranges from 25% to 40% (17). This may be partly attributed to sociocultural constraints and limited awareness about daily PA guidelines.

Demographic analysis showed that most participants were young (20–29 years), married females living in urban areas. This aligns with regional studies (15, 18), which note that urban living is often linked to lower PA due to lifestyle and occupational patterns; however, our study found no significant association between residence and PA. This may reflect recent shifts in urban design in Iraq or the fact that both urban and rural populations face similar barriers, like safety concerns or lack of recreational space.

In terms of gender, males showed significantly higher PA levels than females, supporting earlier research (14). While family responsibilities may limit women's time, other sociocultural barriers, such as limited access to female-only gyms, safety concerns, and social norms discouraging public exercise, may further hinder Iraqi women's engagement in PA.

Our findings on occupation showed that self-employed individuals were the most active, consistent with prior literature (19, 20). Employment type plays a major role in incidental activity, and self-employed or manual workers may accumulate substantial PA through daily tasks.

Future Research
To build upon the findings of this study, future research should consider using longitudinal designs that can better assess causal relationships

between physical activity and BMI over time. Such designs would help clarify whether increased physical activity directly leads to reductions in BMI, beyond the associations observed in cross-sectional analyses. Additionally, incorporating qualitative approaches, such as interviews or focus groups, could provide deeper insights into specific barriers to physical activity, particularly among women. These may include cultural norms, safety concerns, lack of access to female-friendly exercise spaces, and competing family responsibilities, which are often overlooked in quantitative studies.

Conclusion

Although the study results showed a moderate association between PA and BMI, the highest percentage of participants (47.7%) were obese. Based on BMI results above 30.0, there was a negative association between BMI and PA. This showed that as PA increases, BMI tends to decrease, indicating that people who engage in more physical exercise have lower BMIs. Health promotion should focus on encouraging PA to reduce obesity and raising awareness of the importance of PA to prevent the progression of obesity and its dire consequences. Targeted awareness programs and plans should be implemented regarding the importance and benefits of PA and its positive effects on health and body composition.

List of Abbreviations

BMI:	Body mass index
PA:	Physical Activity
≥:	greater than or equal to
Kg:	Kilogram
m ² :	square meter
IPAQ:	International Physical Activity Questionnaire
A:	Alpha
SD:	standard deviation
ID:	Iraqi dinar
No:	Number;
%:	Percentage
M:	Mean
M.s:	mean of the score
Ass:	Assessment
L:	Low
M:	Moderate
H:	High
B:	Kruskal-Wallis Test
Sig:	significance level

Declarations

Ethical approval and consent to participate

Before data collection, ethical approval was obtained from the Babylon Health Department and the College of Nursing at the University of Babylon under code No. 28 on 90 27/11/2024. Written informed consent was obtained from all participants, and anonymity was ensured by assigning unique identification codes and storing data without any personally identifying information.

Consent for publication

All the authors gave consent for the publication of the work under the Creative Commons Attribution-Non-Commercial 4.0 license.

Availability of data and materials

The data and materials associated with this research will be made available by the corresponding author upon reasonable request.

Competing interests

Nil.

Funding

Nil.

Author contributions

ADSA was responsible for the conceptualisation, data collection, methodology, and original draft preparation of the manuscript. She contributed significantly to the research design and performed the primary data analysis. YAAA supervised the overall research project, provided critical revisions, and contributed to the validation and interpretation of the data. He also reviewed and edited the final version of the manuscript for important intellectual content.

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References

1. Al-Bayati HF, Albadri AM, Mohammed SJ. Obesity Among Adult Patients Aged 18 Years Old And Above Attending Main Primary Health Care Centers In Babil Governorate, Iraq 2015: Prevalence And Some Possible Risk Factors. *Kufa Medical Journal*. Epub ahead of print 15 December 2023. <https://doi.org/10.36330/kmj.v19i2.13473>
2. Hussain M, Bonilla-Rosso G, Chung CK, Bärswyl L, Rodriguez MP, Kim BS, Engel P, Noti M. High dietary fat intake induces a microbiota signature that promotes food allergy. *Journal of Allergy and Clinical Immunology*. 2019 Jul 1;144(1):157-70. <https://doi.org/10.1016/J.JACI.2019.01.043>

3. Al-Daami QJ, Bash HS, Naji GH, Al-Hindy HA. High-sensitivity C-Reactive protein assessment in bronchial asthma: Impact of exhaled Nitric Oxide and body mass index. *Age*. 2020;33(13.0):13-0. <https://doi.org/10.31838/SRP.2020.3.96>
4. Al-gharify ZY, Faraj RK. Quality of Life for Adult Clients with Obesity Who Attend Consultation Clinics at Teaching Hospitals in Al-Diwaniya City. *Annals of the Romanian Society for Cell Biology*. 2021;25(4):12519-30.
5. Al-Karawi SI, Mahmood AA, Hassan BK. The impact of obesity on periodontal health status in adolescent iraqi students. *Brazilian Dental Science*. 2021 Mar 31;24(2). <https://doi.org/10.14295/BDS.2021.V24I2.2095>
6. Yin M, Li H, Zhang B, Li Y. Comment on "exercise snacks and other forms of intermittent PA for improving health in adults and older adults: a scoping review of epidemiological, experimental and qualitative studies". *Sports Medicine*. 2024 Aug;54(8):2199-203. <https://doi.org/10.1007/s40279-024-02080-7>
7. Uthman-Akinhanmi YO, Ademiluyi DD, OA A, Olayiwola OI, AO A, Akinlose EO, JE O, Ilo JG. Consumption Pattern, PA Level and Anthropometric indices of Consumers of Franchised Fast Food in South Western States in Nigeria. *Nigerian Journal of Nutritional Sciences*. 2023 Jul 1;44(2). <https://doi.org/10.25220/WNJ.V08.i1.0010>
8. You HW, Tan PL, Mat Ludin AF. The relationship between PA, body mass index and body composition among students at a pre-university centre in Malaysia. *IIUM Medical Journal Malaysia*. 2020 Jul 1;19(2). <https://doi.org/10.31436/imjm.v19i2.1567>
9. Battista F, Bettini S, Verde L, Busetto L, Barrea L, Muscogiuri G. Diet and physical exercise in elderly people with obesity: The state of the art. *European Journal of Internal Medicine*. 2024 Aug 18. <https://doi.org/10.1016/j.ejim.2024.08.007>
10. Xu H. Healthy Lifestyle and Exercise: How to Promote Physical and Mental Health through Physical Exercise. *Frontiers in Sport Research*. 2023 Jul 20;5(6). <https://doi.org/10.25236/fsr.2023.050610>
11. Akadri O, Akadri A. Lifestyle modification adherence among patients attending diabetes clinics in selected hospitals in Remo zone Ogun State, Nigeria: Lifestyle modification adherence. *Babcock University Medical Journal*. 2021 Jun 30;4(1):23-32. <https://doi.org/10.38029/bumj.v4i1.63>
12. Bull, F., Al-Ansari, S. S., Biddle, S. J. H., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J.-P., Chastin, S. F. M., Chou, R., Dempsey, P. C., DiPietro, L., Ekelund, U., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L. M. T., Gichu, M., Jago, R., ... Willumsen, J. (2020). World Health Organization 2020 guidelines on PA and sedentary behaviour. *British Journal of Sports Medicine*, 54(24), 1451–1462. <https://doi.org/10.1136/BJSPORTS-2020-102955>
13. Ekanayake UL, Wijesinghe DG. Junk food consumption, PA and nutritional status of adolescent school children: a case study in Ratnapura District of Sri Lanka. *Tropical Agricultural Research*. 2021 Jan 1;32(1). <https://doi.org/10.4038/tar.v32i1.8446>
14. Nowara AS, Magdy H, El-Eshrawy MM. Eating behavior and PA in relation to obesity among medical students at Mansoura University, Egypt. *Porto Biomedical Journal*. 2025 Mar 1;10(2):e281. <https://doi.org/10.1097/j.pbj.0000000000000281>
15. Yassen ZM, Al-Dewachi AB. Prevalence of Overweight and Obesity Among Medical Students at the University of Mosul. *Medical Journal of Babylon*. 2024 Oct 1;21(4):799-803. https://doi.org/10.4103/MJBL.MJBL_940_23
16. Johnson W, Norris T, Pearson N, Petherick ES, King JA, Willis SA, Hardy R, Paudel S, Haycraft E, Baker JL, Hamer M. Are associations of adulthood overweight and obesity with all-cause mortality, cardiovascular disease, and obesity-related cancer modified by comparative body weight at age 10 years in the UK Biobank study?. *International Journal of Obesity*. 2025 Jan 23:1-3. <https://doi.org/10.1038/s41366-025-01718-4>
17. Alhashemi M, Mayo W, Alshaghel MM, Alsaman MZ, Kassem LH. Prevalence of obesity and its association with fast-food consumption and PA: A cross-sectional study and review of medical students' obesity rate. *Annals of medicine and surgery*. 2022 Jul 1;79:104007. <https://doi.org/10.1016/j.amsu.2022.104007>
18. Moniruzzaman M, Ahmed MM, Zaman MM. PA levels and associated socio-demographic factors in Bangladeshi adults: a cross-sectional study. *BMC Public Health*. 2017 Dec;17:1-8. <https://doi.org/10.1186/s12889-016-4003-z>
19. Gudnadottir U, Cadmus-Bertram L, Spicer A, Gorzelitz J, Malecki K. The relationship between occupational PA and self-reported vs

measured total PA. Preventive medicine reports. 2019 Sep 1;15:100908. <https://doi.org/10.1016/j.pmedr.2019.100908>.
20.Dvouletý O. Starting business out of unemployment: how do supported self-

employed individuals perform?
Entrepreneurship Research Journal. 2022 Jan 7;12(1):1-23. <https://doi.org/10.1515/erj-2019-0327>.