

Prevalence of physical activity using validated tools among adults during the COVID-19 pandemic in the Eastern Mediterranean region: A systematic review and meta-analysis

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Abstract

Many interventions have been taken around the world to limit the spread of COVID-19. These interventions have affected people's lifestyles such as physical activity. The aim of this systematic review and meta-analysis was to determine the prevalence of physical activity using validated tools among adults during the COVID-19 pandemic in the Eastern Mediterranean region. A systematic literature review and meta-analysis were conducted in October 2021. We searched three electronic databases (Web of Science, Scopus, and PubMed) for English-language original articles of observational studies (cross-sectional, case-control, and cohort studies) with original data reporting the prevalence of physical activity among adults in 22 countries from EMR during the COVID-19 pandemic. Hoy's risk of Bias tool was applied to assess the biases in individual studies. The result was reported as a percentage for prevalence. A meta-analysis was conducted using the random-effect model with a 95% confidence interval. A total of 363 articles were retrieved. Finally, 15 articles were selected and included in the statistical analysis. The selected studies included 16,585 participants. The result of the meta-analysis showed that the overall physical activity was 51.6% (95% confidence interval: 42.1, 61: $p=0.745$). The result of subgroup analysis based on different tools was 60.2%, 39.5%, 36.3%, 39.4%, and 55.2% for Global Physical Activity Questionnaire, The Godin-Shephard Leisure-Time Physical Activity Questionnaire, International Physical Activity Questionnaire, International Physical Activity Questionnaire-BREF, and International Physical Activity Questionnaire-short form, respectively. Our study highlights the urgent need for large-scale measurement and reporting of physical activity and the use of standard tools that can allow for the regular assessment and screening of the PA prevalence to support evidence-informed policy and programs development at both national and regional levels.

Keywords

Prevalence, physical activity, Eastern Mediterranean, COVID-19, coronavirus

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Introduction

The Eastern Mediterranean region comprises 19 Arab states, in addition to Iran, Afghanistan, and Pakistan, with total inhabitants of more than 679 million.^{1,2} According to the World Bank classification, there were six high-income states (Saudi Arabia, United Arab Emirates (UAE), Oman, Kuwait, Qatar, and Bahrain), five upper-middle-income states (Iraq, Libya, Lebanon, Jordan, and Iran), seven lower-middle-income states (Palestine, Sudan, Egypt, Tunisia, Morocco, Djibouti, and Pakistan), and four low-income states (Syria, Yemen, Somalia, and Afghanistan).³

Physical activity (PA) is any movement of a person that is generated by skeletal muscles that require energy

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expenditure including running household chores, playing, traveling, participating in recreational activities, and any activities performed in the workplace, attending PA regularly has clear health benefits for an individual's physical and mental well-being.⁴ Based on World Health Organization (WHO) recommendations, adults between 16 and 64 years of age should do at least 2½ h of moderate-intensity aerobic PA per week, or hour and a quarter of vigorous-intensity aerobic PA per week, or an equivalent combination of both.⁵

It is estimated that a quarter of the world's adults do not engage in PA based on global recommended levels, lack of PA is associated with more than five million deaths yearly, and physically inactive individuals have a 20% to 30% increased risk of death compared to physically active individuals.^{4,6}

In the Eastern Mediterranean region, the available data showed that physical inactive ranges from 30% to 70%, and there is an absence of regular assessment of PA in most countries of the region.^{7,8}

Coronavirus disease 2019 (COVID-19) is a respiratory infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).⁹ At the end of December 2019, the WHO was aware of more than 40 cases of pneumonia of unknown causes related to the city of Wuhan, China, around mid-March 2021, the WHO has declared COVID-19 disease as a pandemic, and during these days, COVID-19 is spreading among all the states of Eastern Mediterranean region.^{10–12}

In response to the pandemic, many interventions have been taken around the world to limit the spread of COVID-19, including wearing masks, social distancing, lockdowns, and quarantines.^{10,13} These interventions have affected people's lifestyles such as PA, diet patterns, shopping and work activities, and psycho-emotional well-being.^{14,15}

Several previous studies supposed that the lockdowns harmed practicing PA due to increased daily sitting hours, closures of sports clubs, and outdoor activities are completely excluded.^{16–18} Lack of PA harms individuals and public health, and PA is considered one of the main risk factors for non-communicable diseases and can lead to obesity.¹⁹ In addition, findings from studies conducted during the COVID-19 period have shown that obesity is related to an increased risk of adverse COVID-19 outcomes.^{20,21}

During the period of COVID-19, several studies have been published investigating the prevalence of PA in Eastern Mediterranean states and no review summarized the prevalence of PA during this period. Therefore, we aim to (1) provide a comprehensive perspective of the prevalence of PA in the Eastern Mediterranean states during the COVID-19 period, (2) the tools used to measure PA, and (3) statistical evaluation of the existing published studies to determine the prevalence of PA using a meta-analysis model. Our hypothesis in this study is as follows: For adults, what is the prevalence of PA during the COVID-19 pandemic, and was it significantly different from the previous period? Or has the onset of COVID-19 disease caused a change in PA in adults in the Eastern Mediterranean region?

Methods

Study design

In this systematic review and meta-analysis, we undertook an electronic search to identified studies assess the prevalence of PA according to the preferred method of reporting items for systematic reviews and meta-analyses (PRISMA-P 15) guidelines.²²

Data sources and search strategy

Three online databases, including Web of Science, Scopus, and PubMed, were searched from 31 December 2019 to October 2021. To increase the comprehensiveness of the current systematic review, references were checked for all selected research articles, and preliminary research was conducted to determine the common keywords with the help of a librarian. To combine terms, the Boolean operators (AND, OR, and NOT) were used. The current review reported articles written in English, and the full search strategy is available in Online Appendix 1.

Eligibility criteria

Study area. Research articles conducted across adults during the COVID-19 pandemic in 22 countries of the Eastern Mediterranean region (Saudi Arabia, UAE, Oman, Kuwait, Qatar, Bahrain, Iraq, Libya, Lebanon, Jordan, Iran, Palestine, Sudan, Egypt, Tunisia, Morocco, Djibouti, Pakistan, Syria, Yemen, Somalia, and Afghanistan) were considered as eligible.

Study design. Observational studies (cross-sectional, case-control, and cohort studies) with original data reporting the prevalence of PA among adults during the COVID-19 pandemic were considered.

Language. Literatures written in English language and published in peer-reviewed journals were included.

Population. Studies conducted among adults (age greater than or equal to 18 years) were included.

Time period. Studies published from 31 December 2019 to October 2021 were included.

Exclusion criteria

Studies were excluded if they were conducted among patients or pregnant or among age group less than 18 years, duplicate publications, non-observational studies, and letters not rendering principal data or had not studied the exposures or outcomes of interest. Also, studies that did not have reports of magnitude of PA were excluded. When full texts could not be found or data of interest for this meta-analysis was missing, authors could be contacted through email to request full text

or data. Also, if they failed to access the full text of the studies, they would be excluded from the analysis.

Study selection

After the search was completed, the retrieved records were imported to the EndNote (V. X8; Clarivate Analytics, Philadelphia, PA), and then, the duplicates were removed.

Two independent authors (E.K. and A.H.A.) screened the titles and abstracts, and retrieved full texts of the appropriate articles. Moreover, the entire text of the article has been re-evaluated based on the eligibility criteria. After initial screening, full text of studies was obtained and examined to ensure eligibility for the development of the data extraction table. Disagreements are resolved by either consensus or with a third author (M.Z.)

Data extraction

Two independent reviewers (E.K. and A.H.A.) extracted the data from included studies using a designed checklist developed by the research team. A standardized data table was used to extract data from all eligible studies. For each study, the following information was extracted: publication details (e.g. first author and publication date); research setting (community-based or institution-based); population and study design (e.g. country, study area, and sample size); and used tool, participants' characteristics, and major findings (e.g. age, method of measurements, and prevalence of PA).

Risk of bias and quality assessment

The risk of bias was assessed by the Hoy et al.²³ tool that was established to assess bias in prevalence studies and considered as suitable and easy to use. Two authors (A.H.A. and E.K.) individually reviewed each study; the disagreement was resolved by consensus and in consultation with co-authors (K.M.S.). The selected tool includes 10 items to judge four bias domains: (1) selection-related bias, (2) bias associated with non-response, (3) measurement-related bias, and (4) bias associated with analysis. After completing the judgment, there are two options: (1) high risk or (0) low risk. The high-risk option was chosen if the study lacked basic information to make the judgment. The overall assessment of risk of bias was rated as low, moderate, and high risk of bias. We adopted the categories as reported by Thomas et al.²⁴: low (three or less high-risk items), moderate (four to five high-risk items), and high (six or more high-risk items).

Statistical analysis

The proportion of all individuals in each study was combined to give a pooled prevalence of PA for all studies. Heterogeneity between studies was assessed by using the I²

statistic. Subgroup analyses were conducted according to different tools and research settings. Data were pooled by using a random-effects model with 95% confidence intervals (CIs). Comprehensive Meta-Analysis software version 2 (CMA) was used to generate forest plots of pooled prevalence. Evidence of publication bias was assessed by applying Egger's test and funnel plots. The meta-analysis was performed if at least three studies had measured the same outcome.

Results

Study selection

A total of 363 articles were retrieved articles from different databases by using the search strategy elaborated earlier. Out of the 363 documents, 289 were unique. At the preliminary stage of screening, the 289 articles were checked based on their title and abstract. Then, 210 articles were excluded, and the remaining 79 articles were full text assessed according to the eligibility criteria. Afterward, 15 articles were selected and included in the statistical analysis (Figure 1).

The characteristics of the selected studies

Table 1 displayed the characteristics of the 15 articles included in the statistical analysis.^{25–39} All included studies were cross-sectional; the most common study setting was at households (nine studies). Other settings involved universities (four studies) and public institutions (2). The included studies were conducted as the following: four in Saudi Arabia,^{26,27,30,35} two in Iran,^{29,36} two in Morocco,^{31,37} and one study for each country, Tunisia,³⁸ UAE,³² Lebanon,³⁴ Jordan,²⁵ and Pakistan.³⁹ Two studies collected data from more than one country, the first in four Arab countries²⁸ and the second in 18 Arab countries.³³ The 15 selected studies included 16,585 participants; around 36.3% are males, and 63.7% are females. The sample size ranged from 216 to 2970. Five studies involved more than 1000 participants.^{27,30,32–34,39} All studies included both genders except one study conducted on Saudi women.²⁶ In all studies, the proportion of female participants was higher than males except in a study conducted among medical doctors in Saudi Arabia.²⁷

PA assessment

Two studies used the International Physical Activity Questionnaire (IPAQ) to assess PA.^{27,31} Furthermore, eight studies used the International Physical Activity Questionnaire–short form (IPAQ-SF).^{25,28–30,32–34,39} One study used the International Physical Activity Questionnaire-BREF (IPAQ-BREF),³⁸ and another one used the Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ).³⁷ Three studies used the Global Physical Activity Questionnaire (GPAQ) to assess PA.^{26,35,36}

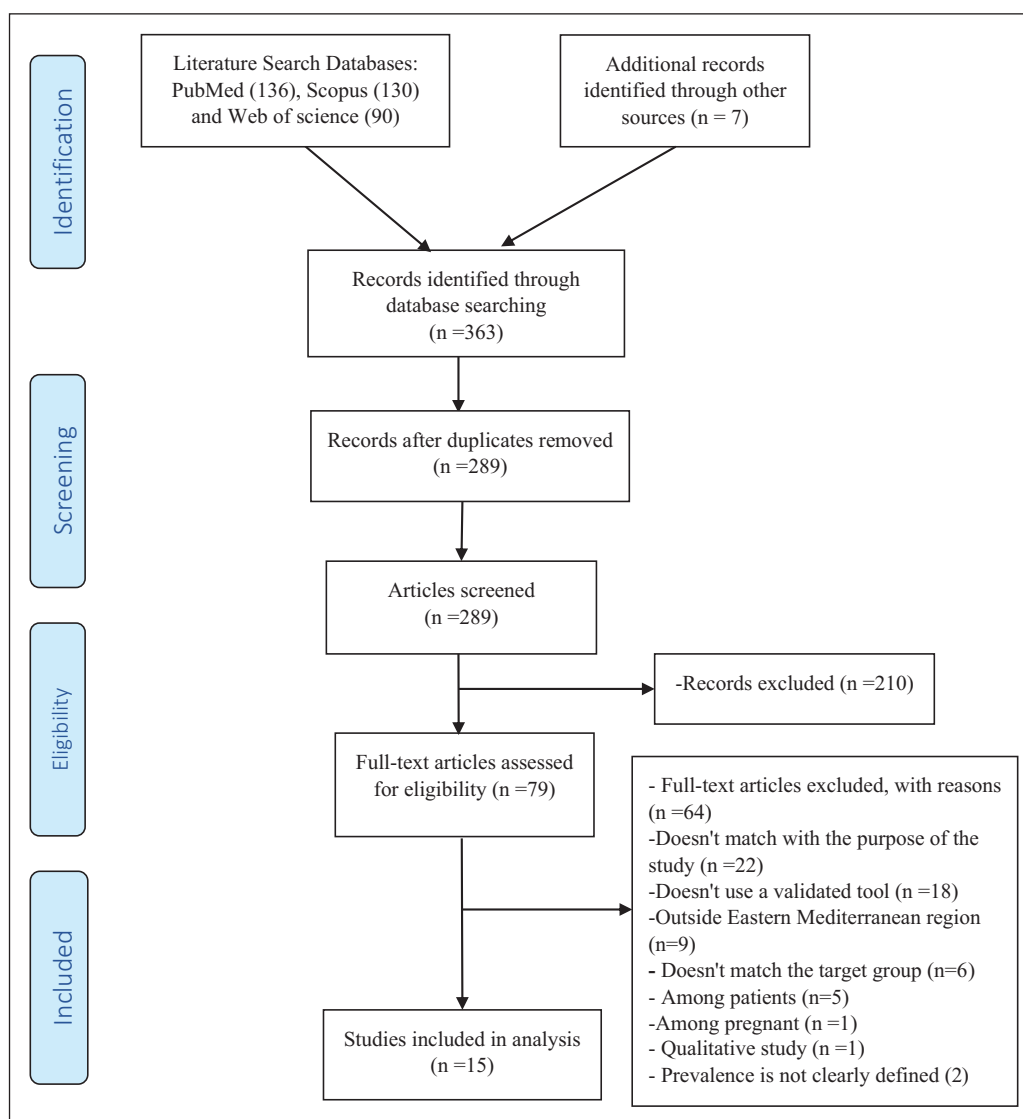


Figure 1. Flow chart explaining the selection of primary studies.

Meta-analysis

Fifteen studies encompassing 16,585 individuals were included in the meta-analysis. The overall pooled prevalence of PA in the included studies was 51.6% (95% CI: 42.1, 61: $p=0.745$). The pooled prevalence of PA among adults' study population during the COVID-19 pandemic in the Eastern Mediterranean region states was summarized in Figure 2.

Subgroup analyses based on the different tools

The most frequent questionnaire used in the included studies was IPAQ-SF (eight studies). The results of subgroup analysis based on the different tools were 60.2%, 39.5%, 36.3%, 39.4%, and 55.2% for GPAQ, GSLTPAQ, IPAQ, IPAQ-BREEF, and PAQ-SF, respectively (Table 2, Figure 3). There was no significant difference in the prevalence of PA between different tools used in the included studies.

The risk of bias included studies

Overall, the risk of bias across the studies was low (see Table 2). Of the 15 studies included in our review, six studies were found to have moderate risk of bias, and nine had lower risk of bias. No single study was rated at high risk of bias. The largest possible source of bias was related to response rates and random selection. Most studies (13 studies) failed to report response rates and did not report sufficient detail for the response rate to be calculated. Only two studies used some form of random selection (simple random technique and cluster sampling) to select the sample.^{35,36}

Subgroup analyses based on the different setting

Finally, the studies were classified into two categories (community-based setting and public-institution setting). Of the included studies, nine studies were conducted in a

Table 1. Characteristics of the studies.

Authors/Year	Country	Study setting	Population	Sampling methods	Sample size (n)	Mean or range of age	Methods of data collection	Tool	PA categories (%)	Prevalence (%)
Almhdawi et al. ²⁵	Jordan	Universities	Healthcare students	NA	485	20.6	Online self-administered questionnaire	IPAQ-SF	Low (61.6) Moderate (29.1) High (9.3)	38.4
Ismail et al. ³⁴	Lebanon	Households	Adults' population	Convenience, snowball	2507	> 18	Online self-administered questionnaire	IPAQ-SF	No exercise (44.1) 1–3 times/week (24.9) > 3 times/week (31.0)	55.9
Ismail et al. ³²	UAE	Households	Adults' population	Snowball	1012	> 18	Online self-administered questionnaire	IPAQ-SF	No exercise (38.5) 1–3 times/week (50.9) > 3 times/week (10.6)	61.5
Slimani et al. ³⁸	Tunisia	Households	Adults' population	A non-probabilistic sampling	216	27.9	Online self-administered questionnaire	IPAQ-BREF	IG (60.6) MAG (22.7) HEPAG (16.7)	39.4
Ullah et al. ³⁹	Pakistan	Universities	Medical students	NA	407	21.8	Online self-administered questionnaire	IPAQ-SF	Low activity (48.2) Moderate activity (42.8) High activity (9.1)	51.8
Sfendia et al. ³⁷	Morocco	Households	Adults' population	Convenience, snowball	256	33.0	Online self-administered questionnaire	GSLTPAQ	Insufficient active (57.0) Moderate Active (13.3)	39.5
Boukrim et al. ³¹	Morocco	Public institutions	Higher education students	NA	406	20.1	Online self-administered questionnaire	IPAQ	Active (26.2) Low (64.0) Moderate (36.0)	36.0
Amini et al. ²⁹	Iran	Households	Adults' population	NA	670	29.2	Online self-administered questionnaire	IPAQ-SF	Intense (00.0) Low activity (78.0) Moderate activity (13.4)	22
Najafpour et al. ³⁶	Iran	Households	Adults' population	Cluster sampling	911	> 15–80	Interview	GPAQ	High activity (8.6) Low (15.5) Moderate (29.4) Intense (55.1)	84.5
Al-Musharaf et al. ²⁶	Saudi Arabia	University/ KSU	Female students or graduate	NA	297	20.7	Phone interview	GPAQ	Recommended GPAQ \geq 600	40.7
AlOmar et al. ²⁷	Saudi Arabia	Public institution	Physicians	NA	3492	> 25–> 65	Online self-administered questionnaire	IPAQ	MET-min/week Low (63.5) Moderate (21.7) High (14.8)	36.5
Baattaiah et al. ³⁰	Saudi Arabia	Households	Adults' population	Convenience	1859	18–69	Electronic self-administered questionnaire	IPAQ-SF	Physical inactive (15) Moderate intensity (71) Vigorous (14)	85
Jalal et al. ³⁵	Saudi Arabia	University of Al-Ahsa	Adults students	Simple random technique	628	18–30	Interview	GPAQ	Recommended GPAQ \geq 600 MET-min/week	47.9
Alsahle et al. ²⁸	4 countries Eastern Mediterranean Region	Households	Adults' population	Convenience	459	33.02	Online self-administered questionnaire	IPAQ-SF	Low intensity (39.0) Middle intensity (30.7) High intensity (30.3)	61
Ismail et al. ³³	18 countries Eastern Mediterranean region	Households	Adults' population	Convenience and snowball	2970	> 18	Online self-administered questionnaire	IPAQ-SF	No exercise (39.1) 1–3 times/week (36.7) > 3 times/week (24.2)	60.9

IPAQ-SF: International Physical Activity Questionnaire–short form; IPAQ: International Physical Activity Questionnaire; UAE: United Arab Emirates; IPAQ-BREF: International Physical Activity Questionnaire–BREF; METs: metabolic equivalent of tasks; IG (inactive group) or low activity: less than 600METs; MAG (minimally active group) or moderate activity: from 600 to 2999 METs; HEPAG (health-enhancing PA group) or high activity: 3000 + METs; GSLTPAQ: The Godin-Shephard Leisure-Time Physical Activity Questionnaire; GPAQ: Global Physical Activity Questionnaire; KSU: King Khalid University.
The prevalence of PA measured according to the following formula (One hundred percent minus the percentage of low PA, no exercise or IG, insufficient active, physical inactive, low-intensity).

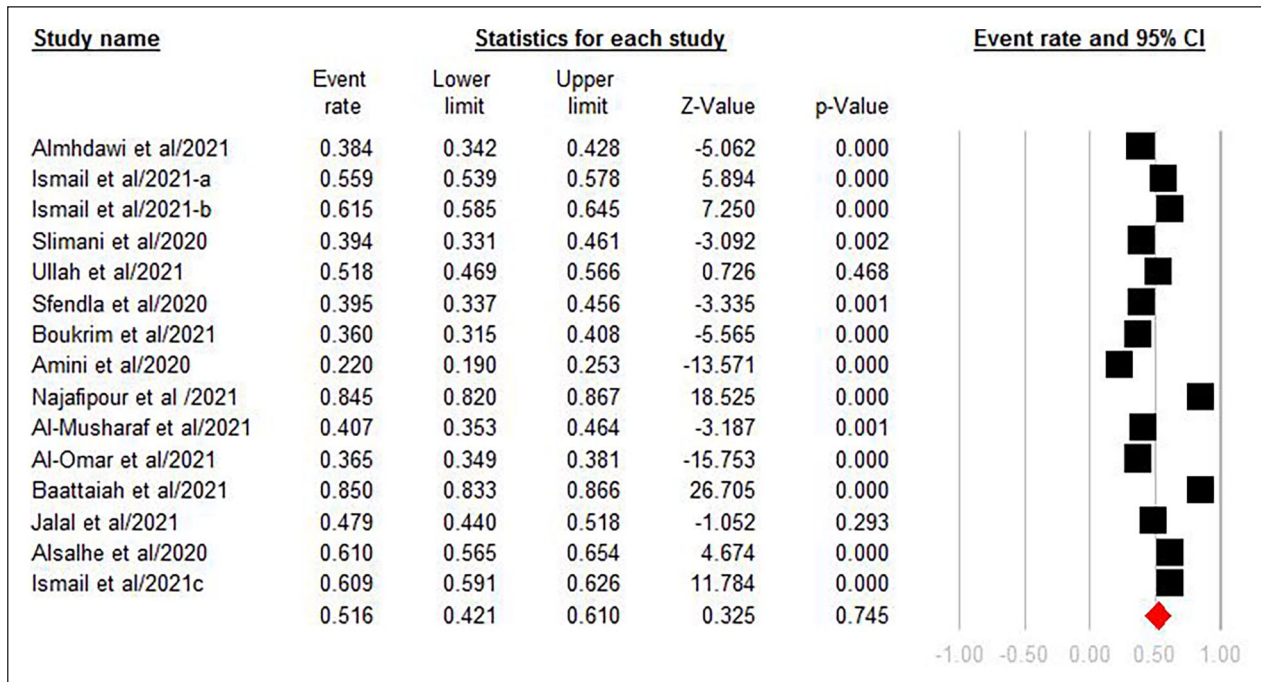


Figure 2. Forest plots for the pooled prevalence of PA among the adult study population during the COVID-19 pandemic in the Eastern Mediterranean region. The diamond position showed that the overall prevalence of FA among the study population was 51.6%. Legend: Red diamond, effect of meta-analysis with prevalence of FA indicating CIs; square, power of individual studies; line, CI of individual studies.

community-based setting and six studies were conducted in an institution-based setting. The results of subgroup analysis based on different settings were 58.1% and 41.8% for community-based and institution-based settings, respectively (Table 3, Figure 4). There was no significant difference in the prevalence of PA in those of community-based settings compared with those of institution-based settings.

Publication bias

Visual inspection of the funnel plot and the results of applied Egger's test did not show significant evidence of publication bias (0.94) (Figure 5).

Discussion

This systematic review and meta-analysis aimed to review and summarize, the prevalence of PA in the Eastern Mediterranean states, the tools used to measure PA, and statistical evaluation of the published studies. There is evidence demonstrated that exercise training and sufficient practice of PA may be an effective multisystemic therapy for the post-COVID-19 syndrome.^{40–42}

The absence of regular assessment and screening may lead to significant challenges in policy-making and planning programs at the national and regional levels. The use of standard tools can allow for measuring the prevalence of PA

at the country level, make comparisons between different countries at the regional level, and support the building of surveillance systems.⁴³

This review and meta-analysis of 15 studies (16,585 participants). Most included studies used the International Physical Activity Questionnaires (IPAQ, IPAQ-SF, and IPAQ-BREF). The rest of the other studies used the GSLTPAQ and the GPAQ to assess PA.

The result of the meta-analysis showed that the overall pooled prevalence of PA was 51.6% (95% CI: 42.1, 61: $p=0.745$). The result of subgroup analysis based on different tools was 60.2%, 39.5%, 36.3%, 39.4%, and 55.2% for GPAQ, GSLTPAQ, IPAQ, IPAQ-BREEF, and PAQ-SF, respectively. Also, the results of subgroup analysis based on different settings were 58.1% and 41.8% for community-based and institution-based settings, respectively.

Impact of the COVID-19 pandemic on the prevalence of PA

A previous systematic review conducted on 15 Arab countries located in the Eastern Mediterranean region and Comoros before the COVID-19 pandemic showed that the prevalence of PA ranged between 34.2% and 96.9%.⁴⁴

Seven of the 15 studies included in the current review measured the prevalence of PA before and during COVID-19, and there is consensus among these studies that the prevalence of PA decreased during a pandemic.^{26,29,31–34,36} For

Table 2. Quality assessment and risk of bias assessment of included studies.

Authors/Year	Study target population	Sampling frame	Random selection	Non-participation bias	Direct or proxy data collected	Case definition	Reliability and validity	Standard mode of data collection	NNumerator(s) and denominator(s)	Prevalence period	Overall	Type
Almhdawi et al. ²⁵	x	✓	x	x	✓	✓	✓	✓	✓	✓	3	L
Ismail et al. ³⁴	x	x	x	x	✓	✓	✓	✓	✓	✓	4	M
Ismail et al. ³²	x	x	x	x	✓	✓	✓	✓	✓	✓	4	M
Slimani et al. ³⁸	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	1	L
Ullah et al. ³⁹	✓	✓	x	x	✓	✓	✓	✓	✓	✓	2	L
Sfendia et al. ³⁷	x	x	x	x	✓	✓	✓	✓	✓	✓	4	M
Boukrim et al. ³¹	✓	✓	x	x	✓	✓	✓	✓	✓	✓	2	L
Amini et al. ²⁹	✓	x	x	x	✓	✓	✓	✓	✓	✓	3	L
Najafpour et al. ³⁶	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0	L
Al-Musharaf et al. ²⁶	✓	✓	x	x	✓	✓	✓	✓	✓	✓	2	L
AlOmar et al. ²⁷	✓	✓	x	x	✓	✓	✓	✓	✓	✓	2	L
Baattaiah et al. ³⁰	x	x	x	x	✓	✓	✓	✓	✓	✓	4	M
Jalal et al. ³⁵	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	1	L
Alsalhe et al. ²⁸	x	x	x	x	✓	✓	✓	✓	✓	✓	4	M
Ismail et al. ³³	x	x	x	x	✓	✓	✓	✓	✓	✓	4	M

☒ = High-risk bias; ☑ = low-risk bias; L: low; M: moderate; H: high.

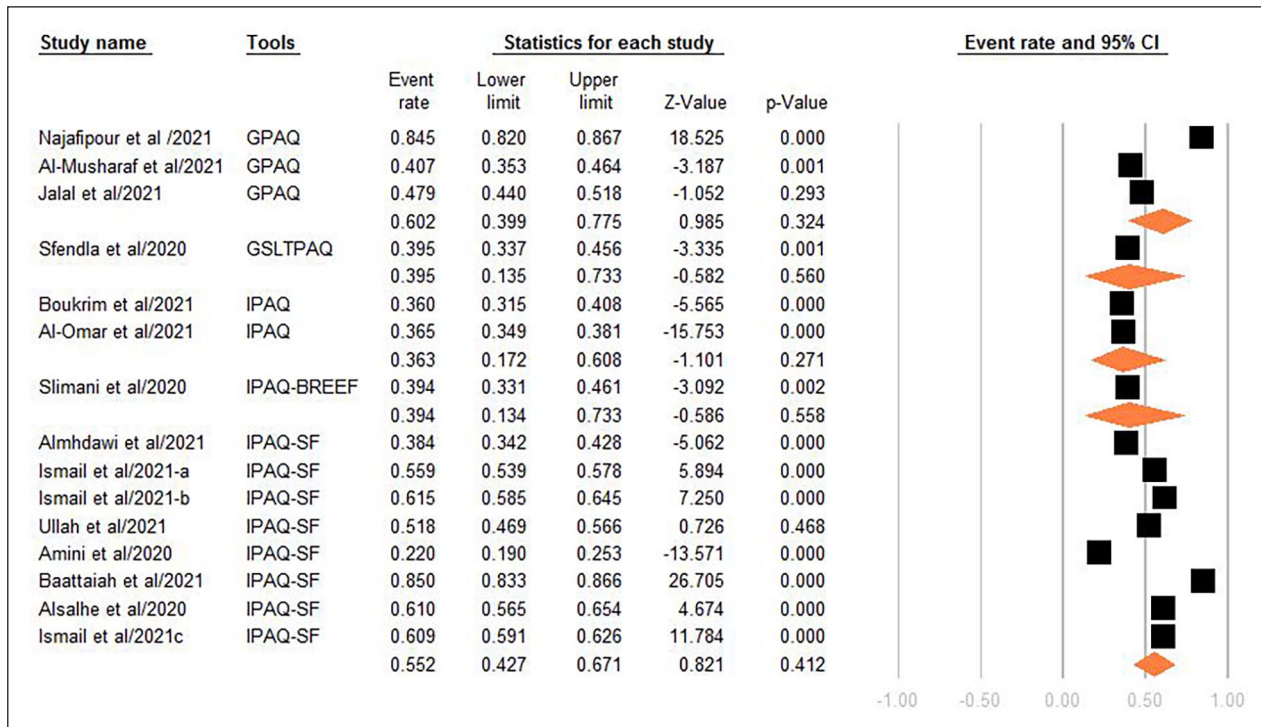


Figure 3. Subgroup analyses based on the different tools used in the included studies. The diamond position for different tools showed that the overall prevalence of FA among study population was 60.2, 39.5, 36.3, 39.4, and 55.2 for GPAQ, GSLTPAQ, IPAQ, IPAX-BREEF, and IPAQ-SF, respectively. Legend: Orange diamonds, effect of meta-analysis with different tools using for prevalence of FA indicating CIs; square, power of individual studies; line, CI of individual studies.

Table 3. Subgroup analysis based on used tools and settings.

Variable	Number studies	Effect size and 95% CI	p value	I ²	Model	
Overall, PA	15	51.6 (42.1, 0.61)	0.745	99.2	Random	
Subgroup by tools	GPAQ	3	60.2 (39.9, 77.5)	0.324	99.2	Random
	GSLTPAQ	1	39.5 (13.5, 73.3)	0.560	00	
	IPAQ	2	36.3 (17.2, 60.8)	0.271	00	
	IPAQ-BREEF	1	39.4 (13.4, 73.3)	0.558	00	
	IPAQ-SF	8	55.2 (42.7, 67.1)	0.412	99.1	
Subgroup by setting	Community-based	9	58.1 (47.6, 0.68)	0.129	99.2	Random
	Institution-based	6	41.8 (29.9, 54.7)	0.210	91.5	

CI: confidence interval; PA: physical activity; GPAQ: Global Physical Activity Questionnaire; GSLTPAQ: Godin-Shephard Leisure-Time Physical Activity Questionnaire; IPAQ: International Physical Activity Questionnaires; IPAQ-BREEF: International Physical Activity Questionnaires-BREF; IPAQ-SF: International Physical Activity Questionnaires-SF.

instance, Ismail et al.³³ revealed that the prevalence of PA among 18 countries decreased from 65% to 60.9% during the pandemic period. Al-Musharaf et al.²⁶ revealed that the prevalence of PA among Saudi women decreased from 47.5% to 40.7%. These results are in agreement with other studies conducted outside the eastern Mediterranean region.^{14,45}

Preliminary results of an international survey conducted among participants from Europe, North Africa, Western Asia, and other countries assumed that there was a significant decrease in PA during the COVID-19 period, and it was

demonstrated that PA decreased by 24%, and the daily sitting period increased by 28%.¹⁴ A study conducted in Canada revealed that 34% of participants reported becoming less active during the COVID-19 period.⁴⁵

Based on the limited available data (7 out of 15 studies), the prevalence of PA decreased during the COVID-19 pandemic among the countries of the Eastern Mediterranean region. Besides, the evidence of the benefits of PA in growth and development, can make individuals better physically and mentally, and reduce the risk of many non-communicable diseases, the literature assumed that regular PA is important

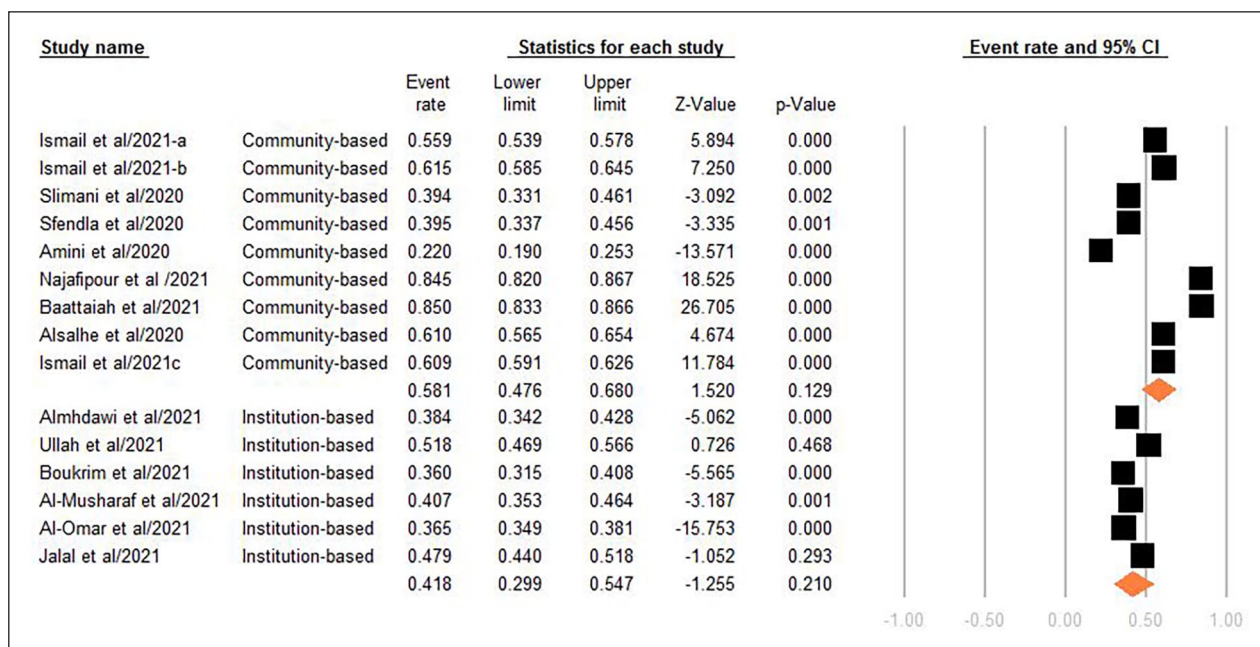


Figure 4. Subgroup analyses based of different setting in the included studies. Legend: Orange diamonds, effect of meta-analysis with different setting indicating confidence intervals (CIs); square, power of individual studies; line, CI of individual studies.

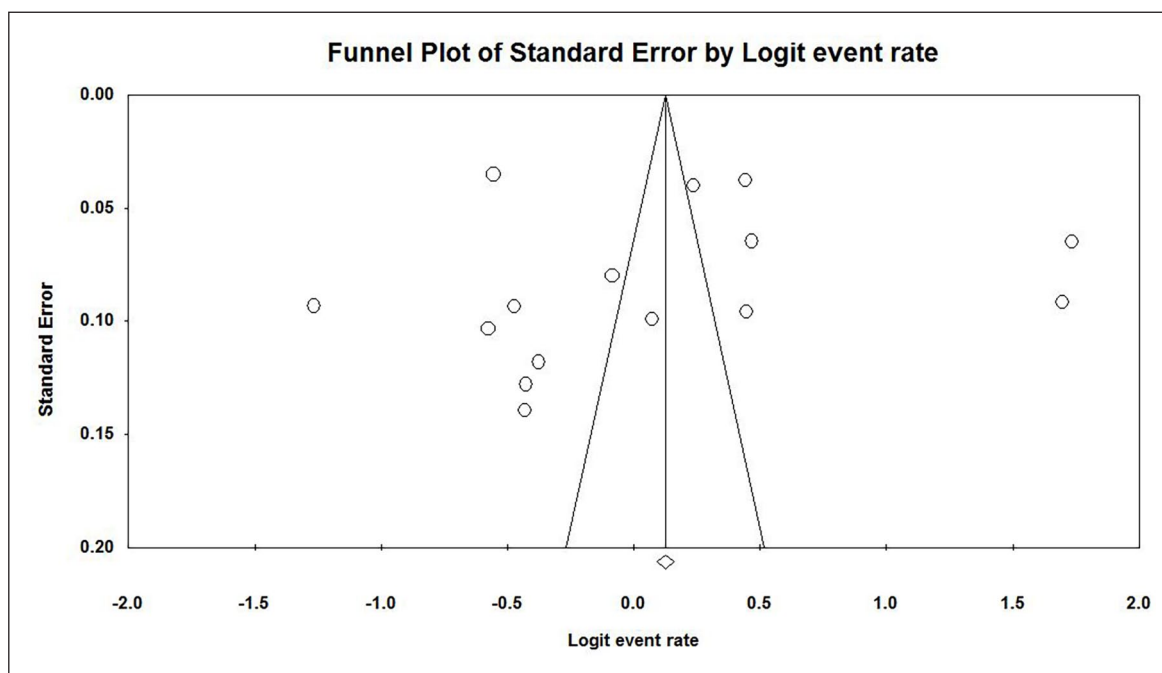


Figure 5. Funnel plot for investigating of publication bias in the included studies.

for resilience against COVID-19, and it has a therapeutic effect on the immune system.⁴⁶⁻⁴⁸

Research implications

The current review revealed that measurement of the prevalence of PA is not available in many countries in the Eastern

Mediterranean region, especially low-income countries. The absence of regular assessment and screening may lead to significant challenges in policy-making and planning programs at the national and regional levels. The use of standard tools can allow for measuring the prevalence of PA at the country level, make comparisons between different countries at the regional level, and support the building of surveillance systems.⁴³

There is an urgent need for large-scale measurement and reporting of PA and the use of standard tools that can allow for the regular assessment and screening of the PA prevalence. Moreover, representative samples from different countries located in EMR are essential to be able to view trends and detect differences between people. It may be helpful to detect any differences in PA based on occupation, religion, economic status, education level, and language.

Study strengths and limitations

The current systematic review and meta-analysis are one of few studies conducted to report the prevalence of PA among the adult population during the COVID-19 pandemic in the countries of the Eastern Mediterranean region. There are several potential limitations to this study. First, we limited the review to peer-reviewed published studies and excluded the gray literature. Second, we limited the review to English language studies. Also, data analysis was limited by the variation in instruments applied to assess PA. Finally, all the data reported are self-reported, and this may underestimate or overestimate the prevalence of PA.

Conclusions

This is the first systematic review and meta-analysis that has been reported pooled prevalence of PA, among the adults' population, among adults' population based on the different tools used, and among the adults' population based on the different settings during the COVID-19 pandemic in the countries of the Eastern Mediterranean region. Our study highlights the urgent need for large-scale measurement and reporting of PA and the use of standard tools that can allow for the regular assessment and screening of the PA prevalence to support evidence-informed policy and programs development at both national and regional levels.

Author contributions

EK and AHA contributed to conception and design. EK, AHA, and KMS contributed to screen the records, data extraction, and quality appraisal. MA-Z and EK contributed to data analysis. EK and AHA contributed to draft article. MK-N contributed to critical review. All authors approved the final version of the article for publication.

Availability of data and materials

All relevant data are with the article and the attached supplementary information.

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Supplemental material

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