

# Weight control practices among the Saudi Arabian population during the Covid-19 lockdown

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## ABSTRACT

**Objectives:** Physical activity appears to be essential to maintain health during the COVID-19 pandemic, specifically for those at high risk, because of its advantages mentally as well as physically. This study determines weight control behaviors among the Saudi population during the COVID-19 pandemic. **Methods:** The study was a cross-sectional survey of Saudis aged 18-60 and residents in the country during the lockdown period. The study sample was 384 people obtained from the Leslie formula for sample size calculations. The population covered all Saudi regions. **Results:** A total of 397 people responded to the survey. Among these people, 196 (49.4%) were male and 201 (50.6%) were female. The majority of them were urban residents (288; 72.5%). One hundred seventy-five (44.1%) had engaged in healthy behavior for weight control during the COVID-19. Factors that significantly affected these healthy behaviors were gender, employment, and educational level ( $P$  value  $<0.05$ ). During pandemic, certain activities and behaviors were affected ( $P$  value  $<0.05$ ), including smoking (36; 9.1%), exercising (255; 64.2%), dieting for weight loss (98; 24.7%), dieting for weight maintenance (102; 25.7%), regular dieting before COVID-19 (112; 28.2%), and maintaining exercise after pandemic (194; 48.9%). Other significantly affected healthy behaviors were decreasing food intake (301; 75.8%;  $P$  value 0.01) and eating less meat (200; 50.4%;  $P$  value 0.00). **Conclusions:** Healthy behavior for weight control during the COVID-19 pandemic was reported by less than half of the study population. Minority (15.6%) engaged in at least one unhealthy or extreme weight loss practice. Healthy behavior was significantly influenced by gender, employment, and educational level.

**Keywords:** COVID-19, healthy behavior, physical activities, Saudi Arabia, weight control

## Introduction

World Health Organization (WHO) declared new coronavirus outbreak a public health emergency of international concern.<sup>[1]</sup> The virus has already directly impacted almost all countries and has been reported on all the continents across the globe. As of September 7, 2020, the WHO reported 29,925,969 confirmed cases of COVID-19 globally, with 942,076 deaths.<sup>[2]</sup> In the early phase of the pandemic, conflicting statements on the sources of infection and the likelihood of human-to-human

transmission possibly aggravated the continued flare-up of the infection among the general public. The effect of globalization on world travel and communication may have facilitated the ease of the virus spread from China to other parts of the world within a short time. This resulted in severe and widespread morbidities and deaths that could have been prevented. A lack of proper understanding of the risks of transmission and the unavailability of specific treatment for the virus forced China to put the affected cities and provinces in lockdown and implement travel bans that later proved effective in containing the spread.<sup>[3]</sup> Many countries followed suit by taking strict measures, including enforcing the wearing of face masks and gloves, encouraging people to work from home to avoid contact with other people, and limiting the travel between provinces.<sup>[4]</sup> The restrictions blocked the flow of goods and services.

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Various health authorities and the WHO advised the public for strict restrictions and preventive measures.<sup>[5,6]</sup> This lifestyle can also lead to increased risk or potential worsening of chronic health conditions, especially among pre-morbid conditions. A reduction in physical activity and resting energy expenditure accompanied by increased calorie intake could increase these risks.<sup>[7]</sup> Long-term inactivity, generally associated with excessive calorie intake, is the major contributor to being overweight, followed by increased systemic inflammation.<sup>[8]</sup>

Regrettably, due to public health orders, recommendations to stay at home, school and park closures, and self-isolation by high-risk groups, many groups could not maintain regular physical activity patterns.<sup>[9]</sup> Evidence is emerging that obesity-related conditions appear to complicate the impact of the virus. Research on Chinese patients with COVID-19 has recognized a few hazardous components of extreme COVID-19, including age, cardiomyopathy, and obesity-related problems such as diabetes mellitus type 2 and hypertension.<sup>[10]</sup> Obesity has been mentioned as one of the main factors for developing severe morbidity and high mortality, which means that obesity is a high-grade risk factor for severe COVID-19.<sup>[11]</sup> Obesity-related conditions thus seem to worsen the effect of COVID-19. Saudi Arabia had recorded more than 300,000 COVID-19 cases and more than 4000 deaths. The country was under lockdown for about 5 months. Many people struggled with weight control during the lockdown because restrictions on the movement led to less physical activity and a sedentary lifestyle. Many studies have reported health problems associated with the lockdown elsewhere. This study determines weight control behaviors among the Saudi population during the COVID-19 pandemic.

## Material and Methods

Saudi Arabia is the country with the most giant landmass in the gulf region. Its population of 33,413,660 is also the largest among the gulf coast countries. The country recorded success in controlling the COVID-19 pandemic by instituting robust interventions such as the early closure of the country's borders, restrictions on the pilgrimage, and movement restrictions across the nation. The universal use of face masks, social distancing, control of crowds, early testing, quarantine, and contact tracing effectively curtailed the spread of the virus. Most of the population was in lockdown for 5 months.

This study used a cross-sectional survey that enrolled only Saudis between the ages of 18 and 60 who were residents in the country during the lockdown period. The study sample was 384 people obtained from the Leslie formula for sample-size calculations. Participants covered all regions of the Kingdom, covering rural and urban areas.

We used an adapted questionnaire—the modified international medical activity questionnaire<sup>[12]</sup>—for data collection. The questionnaire was electronically mailed to respondents. The first section of the questionnaire determined the respondents'

socioeconomic data, existing comorbidities, and participants' weight before and after the COVID-19 pandemic. The second section captured information about healthy lifestyles and specific weight control practices during the COVID-19 pandemic. Data were collected using Google Forms and downloaded to SPSS v22 for analysis. Analysis was made using SPSS, where variables were presented in frequency tables and percentages. Categorical variables were tested for associations using Chi-square tests. Associations between variables were considered significant where *P* values were less than 0.05.

The IRB number UBCOM/H-06-BH-087 (05/21) was from the University of Bisha, Saudi Arabia. Additionally, consent was obtained from the respondents before the questionnaire was mailed to them. The approval Date October 26<sup>th</sup> 2020.

## Results

This study addressed weight control behaviors among the Saudi population during the COVID-19 pandemic lockdown. A total of 397 people responded to the survey. Among these people, 196 (49.4%) were male and 201 (50.6%) were female. The majority of them were urban residents (288; 72.5%), married (114; 28.7%), and employed (353; 88.9%), and almost all of them received regular education. One hundred seventy-five of the respondents (44.1%) engaged in healthy behaviors for weight control during the COVID-19 pandemic, while most of them were involved in unhealthy behaviors (222; 55.9%). Factors that significantly affected healthy behaviors for weight control were gender, employment, and educational level (*P* value <0.05). Those infected by COVID-19 intended to diet to lose or maintain weight in the next few weeks had a history of dieting for weight loss or had participated in an organized weight loss program. Significant associations revealed positive behaviors for weight control [*P* value 0.05; see Table 1].

Some of the study population changed their practices during the COVID-19 pandemic. Activities and behaviors that were significantly affected (*P* value <0.05) were smoking (36; 9.1%), exercising (255; 64.2%), dieting for weight loss (98; 24.7%), dieting for weight maintenance (102; 25.7%), regular dieting before the COVID-19 pandemic (112; 28.2), and maintaining exercise after the pandemic (194; 48.9%). Sixty-two participants (15.6%) engaged in at least one unhealthy or extreme weight loss practice with no significant association with healthy behaviors during the COVID-19 pandemic [*P* value 0.97; see Table 2].

The population engaged in specific weight control practices during the COVID-19 pandemic. Specific activities were practiced by both the male and female populations in rural and urban areas of Saudi Arabia. Those who increased their exercise during the COVID-19 pandemic (194; 48.9%) significantly affected their healthy behavior (100; 25.2%) and *P* value (0.01).

Other practices that significantly affected healthy behavior are decreased food intake (301; 75.8%; *P* value 0.01) and eating less

**Table 1: Distribution according to the general characteristics and health of the Saudi population during the COVID-19 pandemic**

General characteristics		Behavior for weight control			P
		Healthy (No./%)	Unhealthy (No./%)	Total (No./%)	
Gender	Male	95 (23.9)	101 (39.5)	196 (49.4)	0.01
	Female	80 (59)	121 (41)	201 (50.6)	
Residency	Rural	44 (11.1)	65 (16.4)	109 (27.5)	0.35
	Urban	131 (33)	157 (39.5)	288 (72.5)	
Marital status	Single	49 (12.3)	72 (18.1)	121 (30.5)	0.73
	Married	114 (28.7)	138 (34.8)	252 (63.5)	
	Divorced	3 (0.8)	4 (1)	7 (1.8)	
	Widowed	4 (1)	2 (0.5)	6 (1.5)	
Employment	Unskilled worker				0.02
	Skilled worker	9 (2.3)	6 (1.5)	15 (3.8)	
	Businessperson	5 (1.2)	3 (0.8)	8 (2)	
	Police officer	13 (3.3)	29 (7.3)	42 (10.6)	
	Professional worker	64 (16.1)	55 (13.9)	119 (30)	
	Other	40 (10.1)	56 (14.1)	96 (24.2)	
Educational level	Unemployed	44 (11.1)	70 (17.6)	114 (28.7)	0.01
	Illiterate	0 (0)	2 (0.5)	2 (0.5)	
	Primary	3 (0.8)	4 (1)	7 (1.8)	
	Intermediate	5 (1.5)	9 (2.3)	14 (3.5)	
	Secondary	25 (6.3)	71 (17.9)	96 (24.2)	
	Diploma	21 (5.3)	25 (6.3)	46 (11.6)	
	University	107 (27)	104 (26.2)	211 (53.1)	
Monthly family income	Postgraduate	14 (3.5)	7 (1.8)	21 (5.3)	0.42
	≤3000	15 (3.8)	22 (5.5)	37 (9.3)	
	3,000-4,999	17 (4.3)	19 (4.8)	36 (9)	
	5,000-9,999	35 (8.8)	50 (12.6)	85 (21.4)	
	10,000-14,999	49 (12.3)	77 (19.4)	126 (31.7)	
	15,000-24,999	40 (10.1)	29 (7.3)	69 (17.4)	
Presence of chronic diseases	≥25,000	19 (4.8)	25 (6.3)	44 (11.1)	0.42
	Yes	56 (14.1)	67 (16.9)	123 (31.2)	
Gained more weight during the lockdown	No	119 (30)	155 (39)	273 (68.8)	0.39
	Yes	63 (15.9)	67 (16.9)	130 (32.7)	
Was infected with COVID-19	No	112 (28.2)	155 (39)	267 (67.3)	0.03
	Yes	8 (2)	4 (1)	12 (3)	
Was isolated due to suspected COVID-19 infection	No	167 (42)	218 (55)	385 (97)	0.27
	Yes	15 (3.8)	17 (4.3)	32 (8.1)	
Intend to diet to lose or maintain weight in the next few weeks	No	160 (40.3)	205 (51.6)	365 (91.9)	0.00
	Yes	120 (30.2)	78 (19.6)	200 (50.4)	
History of dieting for weight loss	No	53 (13.4)	144 (36.3)	197 (48.9)	0.00
	Yes	97 (24.4)	62 (15.6)	159 (40)	
History of participating in organized weight loss programs	No	78 (19.6)	160 (40.3)	238 (60)	0.00
	Yes	70 (17.6)	42 (10.6)	112 (28.2)	
	No	105 (26.4)	180 (45.3)	285 (71.8)	

meat (200; 50.4%; *P* value 0.00). About 246 participants (62%) decreased their fat intake, 234 (58.9%) reduced their calorie consumption, 267 (67.3%) increased their consumption of fruits and vegetables, 274 (69%) changed the type of food that they consume, 206 (51.9%) cut out sweets and junk food, and 172 (43.3%) stopped snacking.

A range of practical nutritional activities represented nutritional modalities: 227 (57.2%) skipped meals, 194 (48.9%) ate less bread and potatoes, and 214 (53.9%) fasted (for at least 24 h).

Some of the population behaved differently to control their weight during the pandemic. In total, 59 (14.8%) respondents took appetite suppressants, 64 (16.1%) took liquid diet supplements, 47 (11.8%) took diet pills, 56 (14.1%) took laxatives, 29 (7.3%) took diuretics, and 24 (6%) vomited after eating [see Table 3].

## Discussion

Weight control behaviors are very important in general and were a particular concern for the large population of Saudi Arabia during the COVID-19 pandemic. During the lockdown, it was

**Table 2: Identifying distribution according to the behavior of the Saudi population during the COVID-19 pandemic**

Behavior	Response	Behavior		Total (No./%)	P
		Healthy (No./%)	Unhealthy (No./%)		
Increased smoking during lockdown	Yes	9 (2.3)	27 (6.8)	36 (9.1)	0.01
	No	166 (41.8)	195 (49.1)	361 (90.9)	
Drank alcohol	Yes	5 (1.3)	12 (3)	17 (4.3)	0.40
	No	170 (42.8)	210 (52.8)	380 (95.7)	
Did exercise	Yes	152 (38.3)	103 (25.9)	255 (64.2)	0.00
	No	23 (5.8)	119 (30)	142 (35.8)	
Dieted for weight loss	Yes	89 (22.4)	9 (2.3)	98 (24.7)	0.00
	No	86 (21.7)	213 (53.7)	299 (75.3)	
Dieted for weight maintenance	Yes	99 (24.9)	3 (0.8)	102 (25.7)	0.00
	No	76 (19.1)	219 (55.2)	295 (74.3)	
Regularly dieted before COVID-19	Yes	70 (17.6)	42 (10.6)	112 (28.2)	0.00
	No	105 (26.4)	180 (45.3)	285 (71.8)	
Engaged in at least one unhealthy or extreme weight loss practice	Yes	28 (7.1)	34 (8.6)	62 (15.6)	0.97
	No	147 (37)	188 (47.4)	335 (84.4)	
Currently doing exercise	Yes	99 (24.9)	94 (23.7)	194 (48.9)	0.00
	No	75 (18.9)	128 (32.2)	203 (51.1)	

essential to implement healthy practices, especially for the people at higher risk of inactivity and obesity-related restrictions.<sup>[9]</sup> In the current study, we determined the weight control behaviors among the Saudi population during the COVID-19 pandemic to increase the understanding of this population's behavior during the crisis. We considered both genders and the rural and urban people across the country. There is growing concern about sedentary lifestyles as a public problem; even before lockdown, populations are advised to increase their physical activity.<sup>[13-15]</sup>

This study indicated that healthy behavior for weight control during the COVID-19 pandemic was reported (44%). In total, 15.6% of the participants engaged in at least one unhealthy or extreme weight loss practice. Healthy behavior was significantly influenced by gender, employment, and educational level, where the *P* value was <0.05. This correlates with other results in the literature as generally moderate levels of physical activity have been reported.<sup>[16,17]</sup> The study's findings suggest that there was an improvement in physical activity during the pandemic. Physical inactivity has been reported as high among the Saudi population,<sup>[18,19]</sup> below the level recommended for maintaining health.<sup>[20,21]</sup> The sedentary lifestyles and physical inactivity are possibly due to the standard of life in Saudi Arabia, with rapidly progressing economic growth.

The present study revealed that the pandemic significantly affected certain activities aimed at weight control, such as smoking, exercising, and dieting. Other studies have reported similar findings under normal conditions (no pandemic) and have reflected on factors influencing physical activity.<sup>[22,23]</sup> In rural areas of Saudi Arabia, the population engaged in many practical exercises to control their weight and maintain a healthy lifestyle. These activities were conducted by both males and females and significantly affected their healthy behavior.

During the COVID-19 pandemic, the Saudi population practiced a variety of healthy nutritional behaviors, such as decreasing their

food or calorie intake, eating less meat or fat, increasing their consumption of fruits and vegetables, changing the type of food they eat, and cutting out snacking, sweets, or junk food. This was possibly due to the psychological effects of the lockdown and sedentary lifestyles during this period. The media and the health authority implemented health promotion programs to address this. While part of the Saudi population behaved differently to maintain their weight during the pandemic, many nutritional modalities were adopted, including skipping meals and consuming fewer carbohydrates and fast food. Some took appetite suppressants, liquid diet supplements, diet pills, laxatives, or diuretics. The findings correlated well with previous results.<sup>[24]</sup>

The action taken by most countries to make people stay at home and limit their movement has vast economic and social consequences, especially on these populations' health. Staying home has the unintended adverse effect of reducing physical activity. Prolonged homestays have led to increased sedentary behaviors, such as spending excessive amounts of time sitting, reclining, or lying down.<sup>[5]</sup> This issue is addressed through health promotion programs in communities, primary healthcare, and social media. According to the health system in Saudi Arabia, most chronic diseases, including obesity, managed in primary health care centers under the responsibility of the primary care physicians.

This study provided important insights into weight control behaviors in the Saudi population. Healthy practices are essential at all times, with special considerations in COVID-19 times. However, recent literature has highlighted the relationship between the COVID-19 pandemic and the potential weight gain.<sup>[25]</sup>

## Conclusion

Healthy behavior for weight control during the COVID-19 pandemic was reported by less than half of the study population.

**Table 3: Distribution of the Saudi population according to specific weight control practices implemented during the COVID-19 pandemic**

Weight control practices		Behavior		Total (No./%)	P
		Healthy (No./%)	Unhealthy (No./%)		
Increased exercise	Yes	100 (25.2)	94 (23.7)	194 (48.9)	0.01
	No	75 (18.9)	128 (32.2)	203 (51.1)	
Decreased fat intake	Yes	117 (29.5)	129 (32.5)	246 (62)	0.07
	No	58 (14.6)	93 (23.4)	151 (38)	
Decreased amount of food	Yes	143 (36)	158 (39.8)	301 (75.8)	0.01
	No	32 (8.1)	64 (16.1)	96 (24.2)	
Reduced calories	Yes	118 (29.7)	116 (29.2)	234 (58.9)	0.09
	No	57 (14.4)	106 (26.7)	163 (41.1)	
Increased fruit and vegetable intake	Yes	126 (31.7)	141 (35.5)	267 (67.3)	0.07
	No	49 (12.3)	81 (20.4)	130 (32.7)	
Changed type of food	Yes	127 (32)	147 (37)	274 (69)	0.17
	No	48 (12)	75 (19)	123 (31)	
Cut out sweets and junk food	Yes	92 (23.2)	114 (28.7)	206 (51.9)	0.80
	No	83 (20.9)	108 (27.2)	191 (48.1)	
Cut out snacking	Yes	85 (21.4)	87 (21.9)	172 (43.3)	0.06
	No	90 (22.7)	135 (34)	225 (56.7)	
Ate less meat	Yes	101 (25.4)	92 (5.4)	200 (50.4)	0.00
	No	67 (16.9)	130 (32.7)	197 (49.6)	
Skipped meals	Yes	99 (24.9)	128 (32.2)	227 (57.2)	0.51
	No	76 (19.1)	94 (23.7)	170 (42.8)	
Ate less bread and potatoes	Yes	78 (19.6)	116 (29.2)	194 (48.9)	0.22
	No	97 (24.4)	106 (26.7)	203 (51.1)	
Fasted (for at least 24 h)	Yes	93 (23.4)	121 (30.5)	214 (53.9)	0.78
	No	82 (20.7)	101 (25.4)	183 (46.1)	
Took appetite suppressants	Yes	29 (7.3)	30 (7.6)	59 (14.8)	0.39
	No	146 (36.7)	192 (32.5)	338 (84.2)	
Took liquid diet supplements	Yes	35 (8.8)	29 (7.3)	64 (16.1)	0.62
	No	140 (35.3)	193 (48.6)	333 (83.9)	
Took diet pills	Yes	22 (5.5)	25 (6.3)	47 (11.8)	0.27
	No	153 (38.5)	197 (49.6)	350 (88.2)	
Took laxatives	Yes	26 (6.5)	30 (7.6)	56 (14.1)	0.27
	No	149 (37.5)	192 (48.4)	341 (85.9)	
Took diuretics	Yes	14 (3.5)	15 (3.8)	29 (7.3)	0.54
	No	161 (40.6)	207 (52.1)	368 (92.7)	
Vomited after eating	Yes	10 (2.5)	14 (3.5)	24 (6)	0.80
	No	165 (41.6)	208 (52.4)	373 (94)	

A minority of participants (15.6%) engaged in at least one unhealthy or extreme weight loss practice. Healthy behaviors were significantly influenced by gender, employment, and educational level.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

### References

1. World Health Organization. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV). Available from: [https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)). [Last accessed on 2020 Jan 30].
2. John Hopkins University: COVID-19 Data, corona resource center 18 September 2020. Available from: <https://coronavirus.jhu.edu/> [Last accessed on 2020 Sep 18].
3. Asia and Pacific. 2020. Travel ban goes into effect in Chinese city of Wuhan as authorities try to stop coronavirus

- spread. Available from: [https://www.washingtonpost.com/world/asia\\_pacific/nine-dead-as-chinese-coronavirus-spreads-despite-efforts-to-contain-it/2020/01/22/1eaade72-3c6d11ea-afe2-090eb37b60b1\\_story.html](https://www.washingtonpost.com/world/asia_pacific/nine-dead-as-chinese-coronavirus-spreads-despite-efforts-to-contain-it/2020/01/22/1eaade72-3c6d11ea-afe2-090eb37b60b1_story.html). [Last accessed on 2020 Jan 30].
4. Mediounia M, Madiounib R, Kaczor-Urbanowicz KE. COVID-19: How the quarantine could lead to the depreobesity. *Obesity Medicine* 2020;19:100255. doi: 10.1016/j.obmed. 2020.100255.
  5. Chen P, Mao L, Nassiss GP, Harmer P, Ainsworth BE, Li F. Coronavirus disease (COVID-19): The need to maintain regular physical activity while taking precautions. *J Sport Health Sci* 2020;9:103-4.
  6. Owen N, Sparling PB, Healy GN, Dunstan DW, Matthews CE. Sedentary behavior: Emerging evidence for a new health risk. *Mayo Clin Proc* 2010;85:1138-41.
  7. Quintanilha BJ, Reis BZ, Corrêa TAF, da Silva Duarte GB, Rogero MM. MicroRNAs and inflammation biomarkers in obesity. In: Faintuch J, Faintuch S, editors. *Precision Medicine for Investigators, Practitioners and Providers*. Academic Press; 2020. p. 179-85. doi: 10.1016/B978-0-12-819178-1.00017-4.
  8. Woods JA, Keylock KT, Lowder T, Vieira VJ, Zerkovich W, Dumich S, *et al*. Cardiovascular exercise training extends influenza vaccine seroprotection in sedentary older adults: The immune function intervention trial. *J Am Geriatr Soc* 2009;57:2183-91.
  9. Jiménez-Pavón D, Carbonell-Baeza A, Lavie CJ. Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people. *Prog Cardiovasc Dis* March 2020;63:386-8.
  10. Shi Y, Yu X, Zhao H, Wang H, Zhao R, Sheng J. Host susceptibility to severe COVID-19 and establishment of a host risk score: Findings of 487 cases outside Wuhan. *Crit Care* 2020;24:108.
  11. Simonnet A, Chetboun M, Poissy J, Raverdy V, Noulette J, Duhamel A, *et al*. High prevalence of obesity in severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) requiring invasive mechanical ventilation. *Obesity (Silver Spring)* 2020;28:1195-9.
  12. Maddison R, Mhurchu CN, Jiang Y, Vander Hoorn S, Rodgers A, Lawes CM, *et al*. International physical activity questionnaire (IPAQ) and New Zealand physical activity questionnaire (NZPAQ): A doubly labelled water validation. *Int J Behav Nutr Phys Act* 2007;4:62.
  13. <https://www.acsm.org/learn-develop-professionally/covid-19-updates-resources>. 20 September 2014.
  14. Dąbrowska J, Drosdzol A, Skrzypulec V, Plinta R. Physical activity and sexuality in perimenopausal women. *Eur J Contracept Reprod Health Care* 2010;15:423-32.
  15. Dąbrowska-Galas M, Plinta R, Dąbrowska J, Skrzypulec-Plinta V. Physical activity in students of the Medical University of Silesia in Poland. *Phys Ther* 2013;93:384-92.
  16. Dąbrowska J, Dąbrowska-Galas M, Naworska B, Wodarska M, Plinta R. The role of physical activity in preventing obesity in midlife women. *Prz Menopauzalny* 2015;14:13-9.
  17. Guimaraes AC, Baptista F. Influence of habitual physical activity on the symptoms of climacterium/menopause and the quality of life of middle-aged women. *Int J Womens Health* 2011;3:319-28.
  18. Majeed F. Association of BMI with diet and physical activity of female medical students at the University of Dammam, Kingdom of Saudi Arabia. *J Taibah Univ Med Sci* 2015;10:188-96.
  19. Al-Zalabani AH, Al-Hamdan NA, Saeed AA. The prevalence of physical activity and its socioeconomic correlates in Kingdom of Saudi Arabia: A cross-sectional population-based national survey. *J Taibah Univ Med Sci* 2015;10:208-15.
  20. World Health Organization (WHO). *Global Recommendations on Physical Activity for Health*. Geneva, Switzerland: WHO; 2010.
  21. United States Department of Health and Human Services. *Physical Activity Guidelines for Americans: Be Active, Healthy and Happy*. Washington, U.S: Department of Health and Human Services, USA; 2008.
  22. Van Der Horst K, Paw MJ, Twisk JW, Van Mechelen W. A brief review on correlates of physical activity and sedentariness in youth. *Med Sci Sports Exerc* 2007;39:1241-50.
  23. Dumith SC, Gigante DP, Domingues MR, Kohl HW. Physical activity change during adolescence: A systematic review and a pooled analysis. *Int J Epidemiol* 2011;40:685-98.
  24. Al-Hazzaa HM. Physical inactivity in Saudi Arabia revisited: A systematic review of inactivity prevalence and perceived barriers to active living. *Int J Health Sci* 2018;12:50.
  25. Bakaloudi DR, Barazzoni R, Bischoff SC, Breda J, Wickramasinghe K, Chourdakis M. Impact of the first COVID-19 lockdown on body weight: A combined systematic review and a meta-analysis. *Clin Nutr* 2021.