Obesity, Physical Activity and Sedentary Time during Covid-19 Confinement: Moroccan Adult Study

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Abstract Introduction: The objective of this study is to study the correlation between obesity, physical activity and sedentary behavior in a sample of the population in Kénitra, Morocco. **Materials and methods:** The obesity assessment was based on Body Mass Index (BMI), which pertains to sedentary time and physical activity. A questionnaire was completed by participants with respect to covid-19 precautions. The level of physical activity was evaluated with the International Physical Activity Questionnaire (IPAQ) short version. **Results:** Our study included 100 subjects (50 women and 50 men), the average age was 33.83 ± 14.72 years. Our sample showed that 32 percent of individuals who are pre-obese and 9 percent who are obese. The IPAQ score showed that 41% of individuals had high physical activity and 37% low physical activity and 22% moderate physical activity with an insignificant relationship between physical activity and BMI ($p=0.664$). Our study showed that 50% of individuals had sedentary activity times below 20 hours/week, and 28% had sedentary activity times between 20 and 30 hours/week, and 18% had sedentary activity times between 30 and 40 hours/week, and 4% had a significant relationship between sedentary time and BMI ($p=0.017$). **Conclusion:** Our results have shown that there are inconveniences of containment on the health of individuals, requiring the intervention of specialists to find suitable solutions.

Keywords Covid-19, Inactivity, Kenitra, Morocco, Obesity, Physical Activity

1. Introduction

The prevalence of obesity has steadily increased worldwide, with the number of obese people reaching 700 million over the past 40 years with a high rate among adolescents and children [1, 2]. Physical activity and inactivity are factors related to obesity [3]. The adoption of regular physical activity is an effective treatment for obesity and cardiovascular disease [4]. On the other hand, increased sedentary activity leads to weight gain, physical activity and sedentary behavior could be affected by the Covid-19 crisis and consequently a change in weight. In 2019 five million individuals with very high body mass index (BMI) died from Covid-19 virus [5, 6]. In Morocco as of 5 September 2021 the total number of cases has been 884,085 since the first case was identified in March 2020 [7]. With reference to WHO, physical activity is defined as any body movement produced by skeletal muscles, which leads to increased energy expenditure. Therefore, due to its close relationship with risk factors for NCDs (non-communicable diseases), regular and appropriate

physical activity has been shown to be an essential parameter for maintaining a favorable health status [8]. The objective of this study was to correlate obesity, physical activity and sedentary behavior during the period of confinement because of Covid-19 on a sample of the population of Kenitra, Morocco.

2. Material and Method

2.1. Data Collection

This is a cross-sectional, descriptive survey of a sample of 100 individuals (50% women (25±6) and 50% men), aged 18 to 60 years, excluding pregnant women and individuals with communicable chronic diseases. The study was developed in the city of Kenitra for 2 months from the beginning of March to the end of May 2021, and was developed with many repetitions because of the covid-19 pandemic.

2.2. Measuring Anthropometric Parameters

The weight (in Kg) was evaluated by an electronic weighting system with a precision of 0.1 Kg on individuals stripped lightly. The size (in m) was assessed using a locally manufactured toise with an accuracy of 0.5 cm, on weathered individuals, the head oriented horizontally, feet flat, buttocks, back were placed on the vertical board of the aircraft. The BMI (body mass index) was used as a rule to assess the weight status of respondents by weight-to-squared height $BMI = \text{Weight}/\text{Size}^2$ (kg/m²) and was considered a reliable index by WHO.

2.3. Measurement of Inactivity

Sedentarily was measured by the time spent sitting during the last seven days of the week and this includes time spent sitting at home (computer, television, video games, reading) and away from home (cafeteria, restaurant, work, company canteen). The average time was estimated

in minutes per Seven Days and the values obtained were classified into Four classes: less than 20 hours per week (< 20 hours/7 days), between 20 and 30 hours per week (20-30 hours/7 days), between 30 and 40 hours per week (30-40 hours/7 days), more than 40 hours per week (>40 hours/7 days).

2.4. Measuring Physical Activity

The measurement of sedentarity was based on the International Physical Activity Questionnaire (IPAQ) in its short version [9]. The questionnaire enabled us to evaluate Physical activity based on intensity (high, moderate, walking) over the last seven days, by duration intensity frequency IPAQ group cited a rule that allows energy expenditure to be evaluated for one week in metabolic equivalents (MET) in its MET-minutes/week unit and thanks to this evaluation the population has subdivided into three categories (high, moderate and low) [10].

2.5. Statistical Analysis

The data were entered and processed by Statistical Package for Social Science (SPSS) Version 17.5. And Statistical Analysis System (SAS) Version 9.3. The results obtained are expressed as percentage or mean ± standard deviation. The Pearson test was used to test the correlation between BMI and physical activity and between BMI and sedentary behavior. The value $p < 0.05$ represents the significance threshold for the tests performed.

3. Results

3.1. Evaluation of Anthropometric Parameters

A total of 100 participants (50 women and 50 men) were selected. Their average age was 33.83±14.72 years, the average weight was 71.11±13.28 Kg, the average height was 168.65±9.35 m, and the average BMI was 24.86±4.35 Kg/m², the results as shown in Table 1.

Table 1. Means of anthropometric characteristics of the entire population and in both sexes

	Female (average/Et) N=50	Men (average/Et) N=50	Female + men (average/Et) N=100
Age (years)	29,90±0,00	37,76±0,00	33,83±14,72
Weight (Kg)	63,72±10,40	78,51±11,69	71,11±13,28
Height (cm)	162,65±0,00	174,66±0,00	168,65±9,35
BMI (kg/m ²)	23,96±0,00	25,77±0,00	24,86±4,35

3.2. Evaluation of Physical Activity and Sedentary Time during Confinement

Figure 1. A circular histogram shows the percentage of the three levels of physical activity

Figure 2. Circular histogram shows the percentage of sedentary time in hour intervals for seven days

Figure 1 presents a circular histogram of the percentage of the three levels of physical activity adopted by individuals in our population, based on the short version of the International Physical Activity Questionnaire (IPAQ). Results showed that 41% of individuals have high physical activity and 37% have low physical activity and 22% of individuals have moderate physical activity.

Figure 2 shows a circular histogram of the percentage of sedentary time in hour intervals for seven days. The results show that 50% of the individuals have a sedentary activity time of less than 20 hours/week, and 28% between 20 and 30 hours/week, and 18% between 30 and 40 hours/week, as well as 4% exceeds 40 hours/week.

3.3. The Relationship between Overweight and Physical Activity

The results showed that in subjects with high PA, their maximum BMI average of 36.94 ± 0.00 (morbid obesity) and the minimum BMI average of 11.19 ± 0.00 (meanness), and in subjects with moderate and low PA, the maximum BMI average was 31.13 ± 1.10 (obese) and 36.94 ± 0.00 (morbid obesity), respectively. The Pearson test also showed a non-significant relationship between physical activity level and overweight ($p= 0.664$). Our results also showed that the maximum BMI average of 32.02 ± 0.66 (Obese) was observed in subjects with a sedentary time of less than 20 hours/week, and the Pearson test showed a significant relationship between overweight and sedentary time ($p=0.017$). The results of measuring the PA and the sedentary time of our participants by weight status are shown in Table 2.

Table 2. Association of obesity with physical activity and sedentary time

		Body Mass Index (BMI)					Pearson test
		M (average/Et)	CN (average/Et)	SO (average/Et)	O (average/Et)	OM (average/Et)	
Level of physical activity	Low	0,00±0,00	22,51±1,77	27,70±1,06	33,06±1,04	36,94±0,00	$p= 0,664^{**}$
	moderate	17,13±1,07	21,51±1,48	26,36±1,47	31,13±1,10	0,00±0,00	
	high	11,19±0,00	22,25±1,88	26,87±1,10	31,80±0,80	35,88±0,00	
Sedentary time (hour/week)	< 20	14,78±5,08	22,08±1,81	26,66±1,30	32,02±0,66	0,00±0,00	$p= 0,017^{*}$
	20-30	16,51±0,03	22,64±1,72	26,70±1,16	30,85±0,57	0,00±0,00	
	30-40	0,00±0,00	22,80±1,61	27,83±1,22	31,91±2,67	36,94±0,00	
	>40	0,00±0,00	21,27±3,01	26,62±0,00	0,00±0,00	35,88±0,00	

**Significant difference ** no significant difference.

M: thin, CN: Normal Corpulence, SO: Overweight/near-obese, O: Obese, OM: Morbid Obesity

Figure 3. Boxplot representing the relationship between the level of physical activity and gender

Figure 4. Boxplot representing the relationship sedentary time and gender

To confirm the results found we carry out the boxplot test to confirm the results found, and according to figures 3 and 4 our results are logical and correct.

4. Discussion

The frequency of obesity in our population defined according to the WHO criteria during the period of

confinement due to Covid-19 was 32% of the individuals who are pre-obese and 9% who are obese with the predominance of men (72.7%) than women (27.3%). These BMI values are comparable with another study that was conducted on a population of 2002 British adults during the period of confinement due to covid-19, the study found that 32% of the sample were classified as obese [11].

Several studies suggest that sedentary behavior, or lack of physical activity, has been among the determinants of obesity and cardiovascular disease [12, 13, 14]. In our case the weight overload was higher in subjects who spent more than 30 hours/week sitting and we also found that the increase in sedentary time was significantly associated with the increase in BMI (Body Mass Index). This result is consistent with a study in Tunisia which showed that the prevalence of obesity has been higher among people who have passed 28 hours per week [15]. This result could be explained by the increase in energy intake due to the increase in seated time that excites the appetite and as a result increased consumption of food during the containment period as pointed out by C. Ebbeling et al [16] by a study of children and which found that subjects consumed a higher amount of food in time sitting in front of the television. Precautionary measures during containment with a negative effect on the behaviors of weight gain protection as shown by Rebecca L. Pearl in 2020 [17], who suggested that restrictions to limit the spread of Covid-19 led to a rise in prominence among the population.

In the same vein, studies have shown that the adoption of a low sedentary time leads to a decrease in the value of the BMI [18, 19].

In our study the level of physical activity of our participants, according to the IPAQ score, was low in 37% of cases, moderate in 22% of cases, and high in 41% of cases. As respondents stated, they encountered barriers that affected physical activity. Our results are different from another study conducted in the city of Kenitra using a General Physical Activity Questionnaire (GPAQ) which found that 58.4% of adults have low levels of physical activity, 23.2% have moderate levels of physical activity, and 17.5% have shown high levels of physical activity (according to the GPAQ Analysis Guide) [20]. Several studies suggest that there is a significant relationship between physical activity and obesity [21, 22]. According to our results, no significant difference has been observed between physical activity and the Weighting of individuals, our result and in agreement with several studies [23, 24]. Probably there are other factors accompanying containment that could influence weight gain, e.g. psychic factor (depression and negative emotion) or eating behavior [25, 26], this factor could cause hyperphagic access and thus weight gain [27]. Those affected by this eating behavior disorder are most at risk of attack by Covid-19 (obesity is affecting cellular immunity) as well as the availability and accessibility of food (storage) during

containment would trigger food stimulus and as a result increase in weight gain, these factors may explain results obtained during containment due to Covid-19 [28, 29, 30].

In order to test these assumptions, further studies will come to understand the mechanisms involved in the risk of eating disorder relapse in this specific context such as a study carried out in Canada which found that a plant-based diet can reduce weight [31]. This will allow the care of patients with eating disorder to be adapted to the best possible extent and prevent the onset of eating disorder, by providing a case-by-case care according to the mechanisms specifically involved for a given individual.

5. Conclusions

Our results show that containment related to Covid-19 has an impact on weight-status in adults in the city of Kenitra. Indeed, people with high sedentary rates are likely to be obese, which requires an adequate strategy to combat weight gain during and after the confinement period and to encourage physical activity and to raise awareness among patients about diet and the adverse effects of sedentary behavior, all of which will protect individuals' health from obesity-related diseases. Further work is needed to reveal the consequences of containment for public health.

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