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## Impact of the COVID-19 Pandemic on Health Lifestyle in Patients with Peripheral Artery Disease: A Cross-sectional Study

--Manuscript Draft--

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<b>Response to Reviewers:</b>	<p>Reviewer:</p> <p>MATERIAL AND METHODS Please indicate year. Answer: As suggested, we added this information: "...on March 16, 2020 with quarantine, and non-essential services closed on March 24, 2020. Data collection was performed through a phone interview, between May 15, 2020 and August 22, 2020...".</p> <p>Understanding there is expertise in research with PAD there remains a concern for the validity of the tool used. Suggest commenting on the potential bias and lack of rigor and validity secondary to a non validated questionnaire Answer: We completely agree with the reviewer. Thus, as suggested, we rewrote the sentence: "...The questionnaire used in this study was a non validated questionnaire developed by our group, based on questionnaires and previous studies. 11-15 Despite the group has experience in research with PAD, the use of non validated questionnaire has less methodological rigor and is also more susceptible to information bias...".</p>

**Reviewer:**

**MATERIAL AND METHODS**

**Please indicate year.**

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The majority of patients self-reported spending more time watching TV and sitting.

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Only 28.7% of patients self-reported practicing physical exercise.

Most patients self-reported worse physical and mental health.

*Original Article*

**Impact of the COVID-19 Pandemic on Health Lifestyle in Patients with Peripheral Artery Disease: A Cross-sectional Study**

**Running head:** COVID-19 and Peripheral Artery Disease

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**Conflict of interest:** The authors have no conflict of interest.

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Original Article

**Impact of the COVID-19 pandemic on health lifestyle in patients with peripheral artery disease**

**Running head:** COVID-19 and Peripheral Artery Disease

**Conflict of interest**

The authors have no conflict of interest.

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4 **ABSTRACT**  
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6 **Background:** Social isolation has been one of the main strategies to prevent the spread of Coro-  
7 navirus 2019 (COVID-19). However, the impact of social isolation on the lifestyle of patients with  
8 peripheral artery disease (PAD) and claudication symptoms remains unclear.  
9

10 **Objectives:** To analyze the perceptions of patients with PAD of the impact of social isolation pro-  
11 voked by COVID-19 pandemic on health lifestyle.  
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14 **Design:** Cross-sectional.  
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16 **Setting:** The database of studies developed by our group involving patients with PAD from public  
17 hospitals in São Paulo.  
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19 **Methods:** In this cross-sectional survey study, 136 patients with PAD (61% men, 68±9 years old,  
20 0.55±0.17 ankle-brachial index, 82.4% with a PAD diagnosis ≥5 years old) were included. Health  
21 lifestyle factors were assessed through a telephone interview using a questionnaire containing  
22 questions related to: (a) COVID-19 personal care; (b) mental health; (c) health risk habits; (d)  
23 eating behavior; (e) lifestyle; (f) physical activity; (g) overall health; and (h) peripheral artery dis-  
24 ease health care.  
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26 **Results:** The majority of patients self-reported spending more time watching TV and sitting during  
27 the COVID-19 pandemic and only 28.7% were practicing physical exercise. Anxiety and unhap-  
28 piness were the most prevalent feelings self-reported among patients and 43.4% reported a decline  
29 in walking capacity.  
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32 **Conclusion:** Most patients with PAD self-reported increased sedentary behavior, lower physical  
33 activity level, and worse physical and mental health during the COVID-19 pandemic. Thus, it is  
34 necessary to adopt strategies to improve the quality of life of these patients during this period.  
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4 **Keywords:** Coronavirus 2019, social isolation, peripheral artery disease, physical activity, mental  
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## 10 11 **INTRODUCTION**

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14 Patients with peripheral artery disease (PAD) and claudication symptoms present with  
15 walking impairment <sup>1</sup> and several cardiovascular risk factors, such as smoking, hypertension, and  
16 dyslipidemia. <sup>1-5</sup> The first line therapy for these patients includes stimulus to physical activity prac-  
17 tice, improvements in healthy eating, the treatment of comorbid conditions, such as. hypertension,  
18 cardiac disease and more recently, management of mental health. <sup>6,7</sup>  
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26 In December 2019, a novel severe acute respiratory syndrome coronavirus (SARS-Cov-2)  
27 called Coronavirus 2019 (COVID-19) was first identified in the city of Wuhan, China and subse-  
28 quently declared a global pandemic, with more than 200.174.880 cases and 4.255.890 deaths reg-  
29 istered worldwide by August 5, 2021. <sup>8</sup> Social isolation has been one of the main strategies used  
30 to prevent the spread of COVID-19, however, this strategy has resulted in unintended negative  
31 consequences on the lifestyle of the population. <sup>9-10</sup> Amnar et al. (2020), through an international  
32 online survey involving people from different continents, observed a reduction in physical activity  
33 level, an increase in daily sitting time, and unhealthy eating habits during the COVID-19 pan-  
34 demic. Hossain et al. (2020) in a review study also observed worsening mental health of the pop-  
35 ulation due to social isolation. Whether similar results occur in patients with PAD, who frequently  
36 report low physical activity level, poor eating habits, and mental health, is unclear. Thus, the cur-  
37 rent study investigated the perceptions of patients with PAD and the impact of COVID-19 on  
38 health lifestyle. The hypothesis of the study was that social isolation negatively affects lifestyle,  
39 aggravating the physical and mental health, and unhealthy eating habits of these patients.  
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## 2. MATERIAL AND METHODS

### Study design and patients

This observational, descriptive, cross-sectional survey study, included patients with PAD and claudication symptoms (i.e. residents of metropolitan cities) recruited from the database of studies developed and published before the COVID-19 pandemic by our group.<sup>1,3-5,11-13</sup> This study was approved by the Universidade Nove de Julho' Ethics Committee before data collection (CAAE #31529220.8.0000.5511). All participants verbally gave informed consent by phone prior to participation. Participants did not identify themselves and their answers were only included in the sample if they gave authorization before the protocol started. All procedures follow the national legislation and Declaration of Helsinki.

Patients were included if they met the following criteria: a) agreed to participate and respond to all questions of the survey; b) previous diagnosis of PAD; c) age > 45 years old; d) had ankle-brachial index (ABI)  $\leq 0.90$  in one or both legs, and; e) absence of non-compressible vessels, amputated limbs and/or ulcers. Patients were only excluded if: a) presented disabilities such as cognitive, hearing, or speech during phone call that compromises the answer to the questionnaire.

### Data collection

Social isolation in São Paulo was recommended on March 16, 2020 with quarantine, and non-essential services closed on March 24, 2020. Data collection was performed through a phone interview, between May 15, 2020 and August 22, 2020. The evaluation of the impact of COVID-19 on health lifestyle was assessed through a questionnaire developed by the researchers of the study, based on questionnaires and previous studies.<sup>11-15</sup>



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4 The questionnaire was composed of questions divided into 8 domains: (a) COVID-19 per-  
5 sonal care; (b) mental health; (c) health risk habits; (d) eating behavior; (e) lifestyle; (f) physical  
6 activity; (g) overall health; and (h) peripheral artery disease health care. The questions used in the  
7 present analysis are presented below.  
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14 Personal information was accessed from our database including information on sex (“fe-  
15 male” or “male”), date of birth (DD/MM/YYYY), time of PAD diagnosis (in years), and PAD  
16 severity (ankle-brachial index).  
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21 Covid-19 personal care: involved questions on the recommendations for personal care dur-  
22 ing the Covid-19 pandemic. The patient was required to report all that were applicable from the  
23 possible answers: “washing hands”, “alcohol gel”, “avoid leaving home (shelter in place)”, “avoid  
24 crowds”, “avoid other family members (outside household)”, “avoid shaking hands”, “avoid eating  
25 out”, and “social isolation”. In order to gain direct information about a COVID-19 diagnosis, pa-  
26 tients were asked: 1 – Have you had contact with someone who was diagnosed with COVID-19?,  
27 2 – Have you been diagnosed with COVID-19? If yes, 3 – Have you recovered? Answers to all  
28 questions were “Yes” or “No”.  
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41 Mental health: This domain is composed of 3-self-reported items aiming to identify fre-  
42 quent feelings related to the COVID-19 pandemic. The following questions were used: 1 – Due to  
43 the COVID-19, are you feeling more anxious?; 2 – Due to the COVID-19, are you feeling over-  
44 whelmingly unhappy?; 3 - Due to the COVID-19, are you feeling more stressed?; 4- Due to the  
45 COVID-19, are you feeling depressed? Answers to all questions were “Yes” or “No”.  
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53 Health risk behavior: This domain aimed to identify frequent social habits. The selected  
54 questions were as follows: 1 – Do you smoke?; 2 – Due to social isolation, do you spend more  
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4 time sitting?; 3 – With the COVID-19 pandemic, do you feel that your television use has increased?

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7 Answers to all items were “No”, or “Yes”.

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9 Eating behavior: To explore the possible impacts of COVID-19 on the frequent eating hab-  
10 its, the following questions were asked: 1 – Due to the COVID-19 pandemic, are your eating hab-  
11 its: “unchanged”, “worsened” or “improved”?; 2 –Due to the COVID-19 pandemic, do you feel  
12 that your fruit intake has increased?; 3 – Due to the COVID-19 pandemic, do you feel that your  
13 intake of sweets has increased? 4 – Due to the COVID-19 pandemic, do you feel that your intake  
14 of vegetables has increased? 5 – Due to the COVID-19 pandemic, do you feel that your fried food  
15 intake has increased? Possible answers to questions 2 to 5 of this topic were “No”, or “Yes”.

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26 Physical activity: In order to assess frequent physical activity habits, participants were  
27 asked the following questions: 1-Did you regularly practice physical activity before the COVID-  
28 19 pandemic?; 2- Have you been practicing physical activity regularly, at least once a week, during  
29 the COVID-19 pandemic?; 3 – How many times do you exercise a week at the moment?; 4 –Do  
30 you usually exercise less than 30 min, between 30 and 60 minutes or more than 60 minutes?; 5 –  
31 What type of exercise do you do?

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41 Overall health: From the list of diseases, the participant is required to report the presence  
42 of all diagnosed diseases, such as hypertension, diabetes, high cholesterol, high triglycerides, car-  
43 diopathy, or other.

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Peripheral artery disease health care: from this domain patients were asked: “Do you feel  
that your ability to walk has decreased in recent weeks?” Possible answers were “yes” or “no”.

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4 **Statistical analyses**  
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6 All statistical analysis were performed using the software SPSS (version 20). The data are  
7 presented as mean and standard deviations for continuous variables and relative frequencies for  
8 categorical variables.  
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16 **3. RESULTS**  
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18 A flowchart of the study is provided in Figure 1. One hundred and sixty-seven patients  
19 were contacted. Of these, 18 patients died before the COVID-19 pandemic, 3 did not agree to  
20 participate, and 10 did not meet the inclusion criteria. Thus, 136 patients with PAD and claudica-  
21 tion symptoms (61% men, 68±9 years old, 0.55±0.17 ankle-brachial index, 82.4% had the PAD  
22 diagnosis ≥5 years old) participated in the study. Of these, two patients had been diagnosed with  
23 and recovered from COVID-19. The majority of patients followed preventive attitudes to avoid  
24 COVID-19 contagion, such as social isolation (88.2%) and hand sanitization (98.5%) (Table 1).  
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35 \*\*\*Table 1\*\*\*  
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37 Table 2 shows the sedentary and physical activity habits of patients with PAD during the  
38 COVID-19 pandemic. Most patients self-reported spending more time watching TV and sitting,  
39 58.8% and 76.5%, respectively. Before the COVID-19 pandemic, 54.4% of patients were physi-  
40 cally active, decreasing to 28.7% during the COVID-19 pandemic.  
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48 \*\*\*Table 2\*\*\*  
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50 Table 3 shows the eating habits, physical and mental health of patients with PAD during  
51 the COVID-19 pandemic. Approximately, seventy-nine percent of patients had not modified their  
52 eating habits and only 10.3% reported worsened eating habits. In addition, approximately, forty-  
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4 three percent of patients reported a reduction in walking capacity, anxiety, and unhappiness had  
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6 increased in more than 30.1% of patients.  
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9 \*\*\*Table 3\*\*\*  
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#### 11 12 13 14 **4. DISCUSSION**

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16 This study revealed the majority of patients self report spending more time watching TV  
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18 and sitting during the COVID-19 pandemic, with only 28.7% physically exercising. In addition,  
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20 forty-three percent of patient reported the most prevalent self reported feeling of anxiety, unhap-  
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22 piness, and noted decline in walking capacity.  
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26 The majority of the patients presented with different co-morbidities, such as hypertension,  
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28 dyslipidemia, and diabetes. The study results corroborate with other studies <sup>1-5</sup> that also demon-  
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30 strated a high prevalence of cardiovascular risk factors in patients with PAD, classifying them as  
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32 a risk group for COVID-19. <sup>16</sup> Jin et al (2020) state the number of co-morbidities has been associ-  
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34 ated with higher severity and mortality among patients with a COVID-19 diagnosis. Among our  
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36 sample, two patients had been diagnosed with and recovered from COVID-19. This result is inter-  
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38 esting because São Paulo had the highest number of cases and deaths of all cities in Brazil. <sup>17</sup> The  
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40 low number of cases of COVID-19 among our sample may be related to their high adherence to  
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42 preventive measures. Most of our patients were in social isolation (88.2%), avoiding contact with  
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44 other people (97.1%) or leaving their homes (83.8%), and using hygienic strategies, such as hand  
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46 sanitization (98.5%). These precautions suggest that preventive attitudes could be useful to avoid  
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48 contagion in this group.  
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55 In accordance with other studies performed with subjects without PAD, <sup>18,19</sup> patients self-  
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57 reported spending more time watching TV and sitting compared with the period before COVID-  
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4 19. This is alarming for these patients who already presented high sedentary behavior<sup>13</sup> and also,  
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6 especially, among the patients with a higher body mass index and lower walking capacity.<sup>12</sup> A  
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8 small number of patients with PAD also self-reported (28.7%) the continuation of regular physical  
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10 exercise practice. Recent studies<sup>9,20,21</sup> also observed a negative impact of the COVID-19 pandemic  
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12 on physical activity level of the population in different countries. Studies<sup>3,22</sup> performed prior to  
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14 the COVID-19 pandemic highlighted that the majority of PAD patients were physically inactive.  
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16 This result corroborates the impairment in walking capacity reported by 43.4% of patients com-  
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18 pared with before COVID-19. Lower walking capacity has been associated with worse prognosis  
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20 in this population.<sup>23,24</sup> Thus, exacerbation of these harmful behaviors due to social isolation has  
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22 aggravated the worsening in health of these patients.  
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29 Many patients reported being more anxious, unhappy, stressed, and depressed than before  
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31 the pandemic, which is particularly worrying since studies before the COVID-19 pandemic  
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33 showed that patients with PAD already presented deleterious alterations in mental health compared  
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35 to subjects without PAD.<sup>25,26</sup> Factors such as social distancing from family and friends, for being  
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37 included in a main risk group, and also reduced physical activity level might have contributed to  
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39 these factors. Future studies should investigate the factors associated with mental health during  
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41 social isolation in patients with PAD.  
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46 Since physical activity, management of cardiovascular risk factors, and mental health are  
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48 the cornerstones of clinical treatment of PAD, these results could be useful for health authorities  
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50 to develop future strategies to avoid the clinical impairment caused by the COVID-19 pandemic  
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52 in PAD. In this context, our data support the importance of studies analyzing the feasibility and  
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54 health effects of behavior change programs using telemedicine consultations to improve overall  
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4 health (sedentary time, physical and mental health, healthy eating habits, and physical activity),  
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6 unsupervised home-based exercise programs, and tele-rehabilitation programs.  
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## 10 11 **5. LIMITATIONS** 12

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14 The questionnaire used in this study was a non validated questionnaire developed by our  
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16 group, based on questionnaires and previous studies.<sup>11-15</sup> Despite the group has experience in re-  
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18 search with PAD, the use of non validated questionnaire has less methodological rigor and is also  
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20 more susceptible to information bias. The PAD severity was not assessed due to the social isolation  
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22 adopted to contain of COVID-19, however, as all patients were recruited from a previously com-  
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24 piled database. We can attest all of them have a confirmed PAD diagnosis. In addition, a group of  
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26 individuals without PAD was not included in this study.  
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## 33 34 **6. CONCLUSION** 35

36 Most patients with PAD self-reported increased sedentary behavior, lower physical activity  
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38 level, and worse physical and mental health during the COVID-19 pandemic. Behavior change  
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40 programs involving nutritional, psychological, physical activity monitoring among others in order  
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42 to improve quality of life these patients should be adopted to counteract the consequences of  
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44 COVID-19 pandemic on lifestyle.  
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39 extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteries Endorsed  
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41 by: the European Stroke Organization (ESO). The Task Force for the Diagnosis and Treatment of  
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43 Peripheral Arterial Diseases of the European Society of Cardiology (ESC) and of the European  
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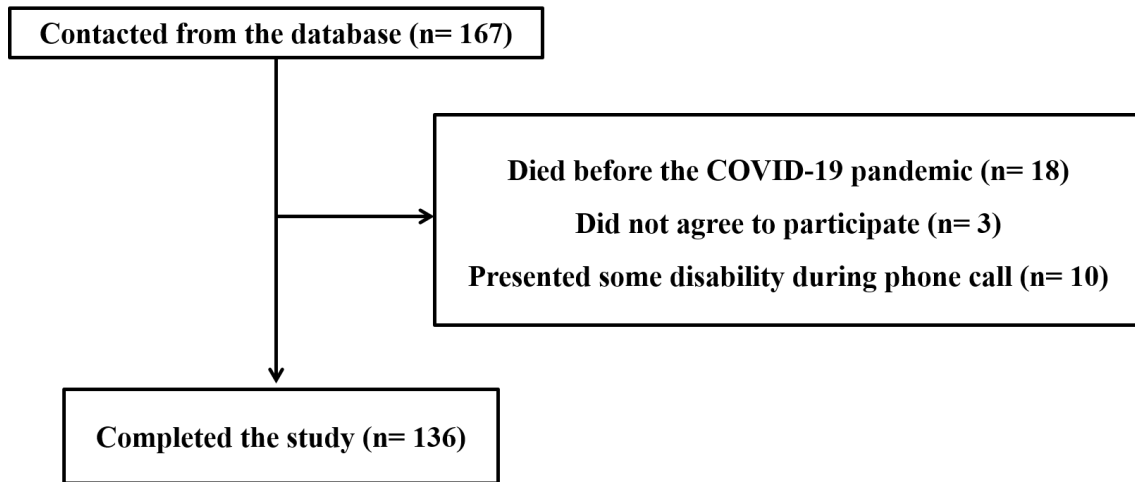
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**Figure legends**

Fig. 1 Participants' flowchart



**Table 1.** Factors related with COVID-19 in patients with peripheral artery disease.

	N=136
Variables, n (% yes)	
COVID-19 diagnosis	2 (1.5)
Recovered COVID-19*	2 (100)
<i>Preventive attitudes</i>	
Social isolation	120 (88.2)
Hands sanitization	134 (98.5)
Avoid leaving home	114 (83.8)
Avoid contact people	132 (97.1)
Contact with people diagnosed with COVID-19	7 (5.1)
<i>Comorbid conditions</i>	
Smoking	21 (15.4)
Ex-smoker	84 (61.8)
Diabetes mellitus	61 (44.9)
Hypertension	114 (83.8)
Dyslipidemia	105 (77.2)
Respiratory disease	22 (16.2)

Data presented as absolute and relative frequency. \*: n=2.

**Table 2.** Impact of COVID-19 on sedentary and physical activity habits in patients with peripheral artery disease (n=136).

Patients with peripheral artery disease	
Variables, n (% yes)	
<i>Sedentary habits</i> (n=136)	
Spend more time watching TV	80 (58.8)
Spend more time sitting	104 (76.5)
<i>Physical activity habits</i> (n=136)	
Physical exercise before COVID-19	74 (54.4)
Physical exercise currently	39 (28.7)
<i>Modalities</i> (n=39)	
Aerobic exercise	24 (61.5)
Functional exercise	14 (35.9)
<i>Frequency</i> (n=39)	
1–2 x/week	8 (20.5)
3–4 x/week	11 (28.2)
5–7 x/week	20 (51.3)
<i>Duration</i> (n=39)	
≤ 30 min	10 (25.6)
31-60 min	23 (59.0)
≥ 61 min	6 (15.4)

Data presented as absolute and relative frequency.

**Table 3.** Impact of COVID-19 on eating habits and physical and mental health in patients with peripheral artery disease.

		N=136
Variables, n (% yes)		
<i>Eating habits</i>		
	healthier	15 (11.0)
	equal	107 (78.7)
	less healthy	14 (10.3)
	Increase in consumption of fried foods	14 (10.3)
	Increase in consumption of sweets	24 (17.6)
	Increase in consumption of fruits	46 (33.8)
	Increase in consumption of vegetables/legumes	33 (24.3)
<i>Physical health</i>		
	Decline in walking capacity	59 (43.4)
<i>Mental health</i>		
	More anxious	69 (50.7)
	Unhappier	41 (30.1)
	More stressed	34 (25.0)
	More depressed	27 (19.9)

Data presented as absolute and relative frequency.

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**Conflict of interest**

The authors have no conflict of interest.