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Research Article / Araştırma Makalesi

COVID-19 versus physical inactivity – a self-reported questionnaire study

COVID-19 pandemi sürecinin fiziksel inaktiviteye etkisi

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ABSTRACT

Objective: COVID-19 is linked with significant mortality and morbidity. To curb the spread of the pandemic, curfews and lockdowns were imposed in many countries, leading to reduced physical activity (PA) irrespective of race, ethnicity, or income level. Although some papers documented how PA level was affected by COVID-19 in children and elderly in some countries, no similar data is available in Turkey during the pandemic. Therefore, we aimed to document the changes in step count in Turkey following the first reported case.

Materials and Methods: A total of 1427 participants were included in the study (male: n=242, female: n=1185), and were asked to fill out an online survey with questions on demographic information, working conditions, medical history, and average daily step count for two months before (January-February) and after (March-April) the outbreak of COVID-19 (10 March) in Turkey. Two-way repeated measure variance analysis and independent-sample t-tests were used to analyze the data.

Results: Data revealed that step count/day decreased by 43.5% (pre: 6564 ± 3615 steps/day vs. during: 3707 ± 3006 steps/day; p<0.05) during the pandemic compared to the pre-pandemic, with no difference between males (32.9%) and females (45.9%) (p>0.05). A similar significant reduction (p>0.05) in step count was observed in the working (pre: 6795 ± 3832 steps/day vs. post: 4027 ± 3223 steps/day) and unemployed adults (pre: 6337 ± 3374 steps/day vs. post: 3390 ± 2742 steps/day) (p<0.001).

Conclusion: Compared with the pre-pandemic, step count markedly decreased in all groups during the pandemic in Turkey, regardless of gender and medical condition. This study provides preliminary data on how the COVID-19 pandemic has impacted step count in Turkey.

Keywords: *COVID-19, step count, physical activity, pandemic*

ÖZ

Amaç: COVID-19, mortalite ve morbidite ile önemli ölçüde ilişkilidir. Bu ölümcül salgının yayılmasını engellemek için getirilen sokağa çıkma yasakları ve kısıtlamalar, ırk, etnik köken veya gelir düzeyine bakılmaksızın çeşitli ülkelerde fiziksel aktivitenin (FA) azalmasına yol açmıştır. Bazı ülkelerde çocukların ve yaşlıların FA düzeyinin COVID-19'dan nasıl etkilendiğini gösteren makaleler olmasına karşın, pandemi sırasında Türkiye'deki adım sayılarındaki değişikliği bildiren veri yoktur. Bu nedenle, bu çalışmada Türkiye'deki bildirilen ilk COVID-19 vakasından sonra adım sayısındaki değişikliklerin gösterilmesi amaçlandı.

Gereç ve Yöntemler: Toplamda 1427 gönüllünün (Erkek: n=242, Kadın: n=1185) yer aldığı çalışmada katılımcıların demografik bilgileri, çalışma koşulları, tıbbi geçmişleri ve Türkiye'de COVID-19 (10 Mart) salgınından iki ay önce (Ocak -Şubat) ve iki ay sonraki (Mart-Nisan) adım sayıları sorgulandı. Verilerin analizinde iki yönlü tekrarlı ölçüm varyans analizi ve bağımsız örneklerde t-testi kullanıldı.

Bulgular: Elde edilen veriler, pandemi sırasında COVID-19 salgını öncesine kıyasla günlük adım sayılarının %43.5 azaldığını (ön: 6564 ± 3615 adım/gün, son: 3707 ± 3006 adım/gün; p<0.05) gösterdi. Bu farklılık erkek (%32.9) ve kadın (%45.9) arasında benzerdir (p>0.05). Hem çalışanlarda (ön: 6795 ± 3832 adım/gün, son: 4027 ± 3223 adım/gün) hem işsizlerde (ön: 6337 ± 3374 adım/gün, son: 3390 ± 2742 adım/gün) pandemi sırasında adım sayısında önemli bir azalma (p<0.001) gözlendi. Bu azalış gruplar arasında benzerdir (p>0.05).

Sonuç: Elde edilen bulgular, Türkiye'de, pandemi öncesine kıyasla pandemide çalışma koşulları ve cinsiyete bakılmaksızın tüm gruplarda adım sayısının önemli ölçüde azaldığını göstermektedir. Bu çalışma, Türkiye'de COVID-19 pandemisinden adım sayılarının nasıl etkilendiğine dair ilk ön verileri sağlamaktadır.

Anahtar Sözcükler: *COVID-19, adım sayısı, fiziksel aktivite, pandemi*

INTRODUCTION

The globally pandemic coronavirus disease 2019 (COVID-19) is an emerging respiratory infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Since the first case reported in early December 2019 in Wuhan, China, this deadly virus rapidly spread to the majority of countries worldwide, affecting more than ninety-four million individuals, and causing 2034527 deaths as of January 20, 2021 (1), widespread suffering, panic, social unrest, and economic instability. A pandemic of this scale has already created dramatic challenges all over the world in terms

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of economy, social interactions, and individual lifestyles and caused various diseases ranging from asymptomatic to fatal ones (2-4). In the infected people, the main symptoms concern the lower respiratory tract with the potential of leading to fatal pneumonia, hypoxemia, difficulty in breathing and acute respiratory distress syndrome (5). Although some remedies and viable vaccines may provide comfort and alleviate symptoms of this unprecedented virus, it appears that the best way to curb the spread of COVID-19 in this period is still self-isolation, wearing masks, avoiding close social contact with people (6).

Besides, physical inactivity (PI) or sedentarism is considered a major risk factor for a range of adverse outcomes (7-11), causing over three million deaths annually even prior to COVID-19 (7) due to its deleterious effects on health. However, despite the positive effects of physical activity (PA) on physical and mental health (12-15), it is more challenging than usual to continue normal PA patterns during the COVID-19 pandemic because of public health orders, recommendations to stay at home, school and park closures, and self-isolation (16). Besides, the possible expected outcome of these lifestyle changes during the COVID-19 pandemic is markedly reduced daily PA level and increased sedentary behaviors due to the lockdown and curfew imposed to curb this deadly pandemic (17). Considering a recently published study reporting that even one wk of reduced PA substantially lowered myofibrillar protein synthesis rates (18) and caused the loss of muscle mass and strength, impaired insulin sensitivity, as well as an increased systemic inflammation (19), one can assume that lockdowns and curfews imposed for months may be more or as harmful for health as the COVID-19 pandemic. To address the impact of the COVID-19 on PA, Hemphill et al. measured step count in children with congenital heart disease, and reported considerably reduced PA level after March 11, when the COVID-19 outbreak pandemic was declared by the World Health Organisation (WHO), compared with before the pandemic (20). A descriptive study supporting Hemphill's findings showed rapid worldwide step count decreases during the COVID-19 pandemic in 189 countries (21). However, there is no data available that presents how daily step count was affected by the COVID-19 pandemic in Turkey. Therefore, we aimed to compare the changes in step count two months before and after 10 March, when the first case of COVID-19 was reported in Turkey.

MATERIALS and METHODS

We conducted a self-reported questionnaire study. The inclusion criteria covered all age groups with/without preexisting medical conditions. Out of 1481 participants (female: n=1185, male: n=242) who filled out the online survey built using Google Forms, the data of 54 people (3.6% of the participants) who stated that they did not record the number of steps was not included in the final analysis. In addition, 46 participants were minors for whom parental consent was not obtained, as the study was based on voluntary participation and did not involve any intervention. The participants consisted of healthy, unhealthy, young, middle age, old, working, unemployed populations with different education levels including university (65.4%), high school (19.3%), graduate (13.3%) and primary school (2.0%) graduation. Participants were informed about the purpose and method of the study. Institutional approved consent included in the questionnaire was obtained from participants who declared that they voluntarily participated in the study. The study protocol was approved by the Institutional non-interventional clinical research ethics board and was conducted in accordance with the Helsinki Declaration.

Data collection

The collection instrument was built on the Google Forms platform and was disseminated via the internet through applications and social networks: WhatsApp groups, Instagram, and Facebook, from May 15 to June 1, 2020. Each participant had the right to complete the questionnaire once. The questionnaire built was linked to a specific Google user's account whereby data security was ensured. An informative text appeared at the top of the questionnaire by which the participants were informed in detail about the study. The questionnaire consisted of seventeen questions including demographic information, working condition independent of physical work, medical history, method of measuring step count and the average step count. Afterwards, the collected data was converted into an excel spreadsheet, where a refinement of analysis was performed to exclude inadmissible data such as 50000 to 60000 steps per day. In addition, step count data that similar for all the considered months were excluded from the study. In addition, the answers given to the question about chronic disease were examined and those participants who reported having at least one of the chronic diseases classified by the WHO (22) were accepted as participant with chronic disease.

The answers to the questions about the participants' step count were based on two months before (January-February) and two months after (March-April) 10 March, when the first COVID-19 case was reported in Turkey. Step counts were considered from January 10 to February 10, February 10 to March 10, March 10 to April 10, April 10 to May 10, and accordingly, the average step count per month was calculated. Participants were asked to fill in the number of steps on the forms by writing the average step count for January, February, March and April 2020; recorded using a smartphone, smartwatch or pedometer. Self-reported body weight and height figures were used, and body mass index (BMI) scores were calculated [weight (kg)/height (m)^2] (Table 1).

Table 1. Characteristics of the participants

Variables	Female (n=1185)	Male (n=242)
Age (years)	26.7 ± 7.5	28.6 ± 10.0
Height (cm)	164.8 ± 5.8	177.7 ± 7.3
Body mass (kg)	61.5 ± 10.8	79.8 ± 12.9
BMI (kg/m^2)	22.6 ± 3.7	25.2 ± 3.6

Figures as mean ± SD; BMI: body mass index

Statistical Analysis

A two-way repeated-measures analysis of variance (time x gender) was used to determine whether main effects existed between the groups and over time, followed by a Bonferroni post hoc test. Independent sample t-test was used to determine if differences between the pre- and post-pandemic months existed across outcome variables. Statistical analyses were performed using SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY, USA), and the level of significance was set at $p<0.05$. All data are presented as means ± standard deviation.

RESULTS

The characteristics of the participants are presented in Table 1. Of the total of 1427 valid responses in the sample, 83% of the people were female, while 17% were male. The majority of the participants (about 97%) were between the ages of 18 and 59 (Table 2). Unsurprisingly, the working conditions of the participants recruited were considerably affected by the pandemic ($p<0.05$), yielding an increased work-from-home trend and markedly decreased working from office (Fig. 1). There was a strong trend toward decreasing step count from February through April for all the classified groups (Fig. 2).

Table 2. Age distribution of participants

Gender	**Female** (n=1185)	**Male** (n=242)
<18 yrs	46 (3.9)	6 (2.5)
18-29 yrs	859 (72.5)	166 (68.6)
30-59 yrs	276 (23.3)	64 (26.4)
≥**60** yrs	4 (0.3)	6 (2.5)

Figures as n (%)

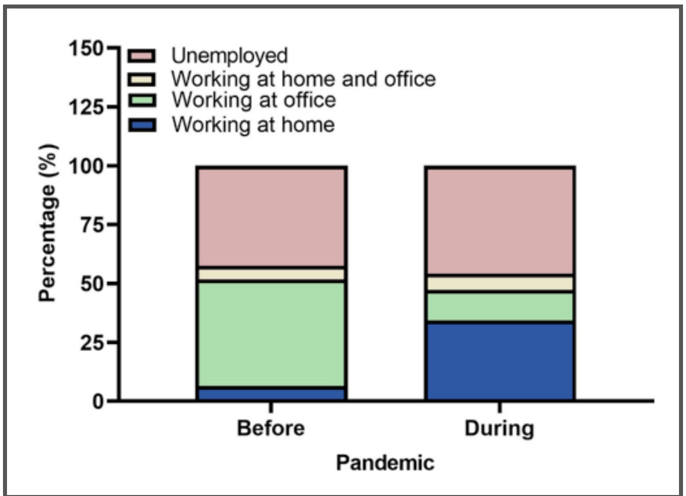

Figure 1. Changes in working condition before and during the pandemic

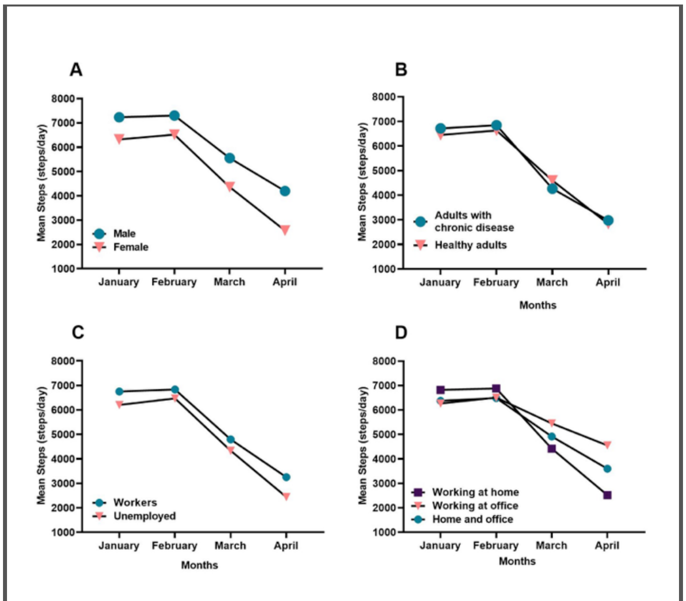

Figure 2. Changes in step count by gender (A), pre-existing medical condition (B), work status (C) and working condition (D) before and during the pandemic

The recorded step count (step/day) were markedly decreased by 43.5% (pre: 6564 ± 3615 steps/day vs. during: 3707 ± 3006 steps/day; $p<0.05$) during the pandemic compared with before the COVID-19 outbreak (10 March) for both sexes (Fig. 2A, Fig. 3), with no difference ($p>0.05$) between males (32.9%) and females (45.9%). There were similarly significant reductions in step count in healthy adults (pre: 6539 ± 3529 steps/day vs. during: 3717 ± 2978 steps/day; $p<0.001$) and adults with chronic disease (pre: 6782 ± 4289 steps/day vs. during: 3622 ± 3621 steps/day; $p<0.001$) between the pre- and post- pandemic months ($p<0.05$) (Fig. 2B, Fig. 4), showing that pre-existing medical condition did not affect step count.

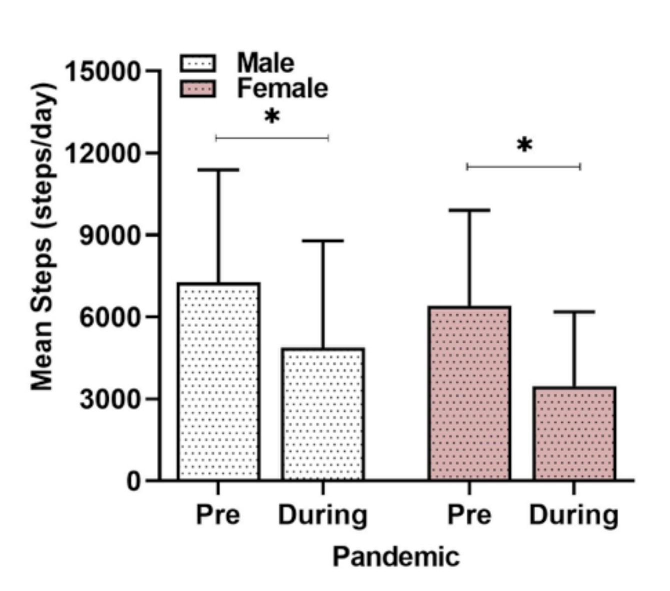

Figure 3. Changes in step count by gender (*: p<0.05).

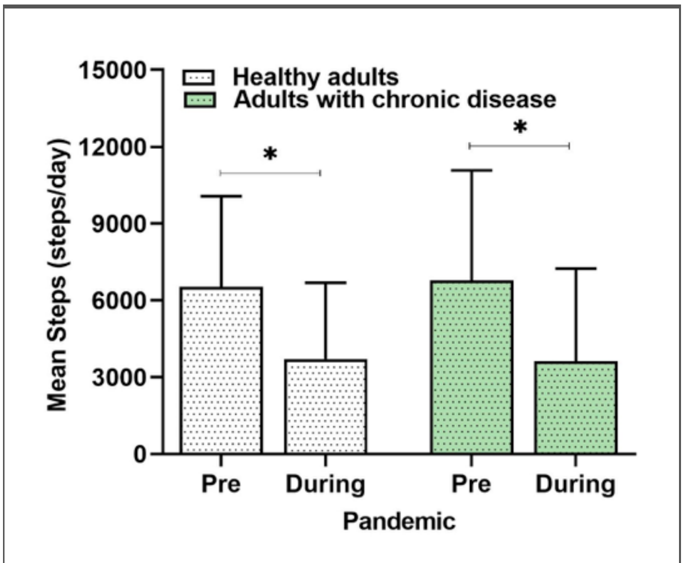

Figure 4. Changes in step count by health status (*: p<0.05)

Step count was similar in pre-pandemic months (January and February) for adults with chronic diseases (Fig. 2B) and in workers (Fig. 2C), yet there were significant differences in healthy adults (January: 6449 ± 3646 steps/day vs. February: 6630 ± 3658 steps/day; p=0.001; Fig. 2B), and in unemployed adults (January: 6204 ± 3518 steps/day vs. February: 6471 ± 3526 steps/day; p<0.001; Fig. 2C). Significant reductions in step count occurred in the working (pre: 6795 ± 3832 steps/day vs. post: 4027 ± 3223 steps/day) and unemployed adults (pre: 6337 ± 3374 steps/day vs. post: 3390 ± 2742 steps/day; p<0.001) from before to during the pandemic months, and this was similar between groups (p>0.05; Fig. 2C, Fig. 5).

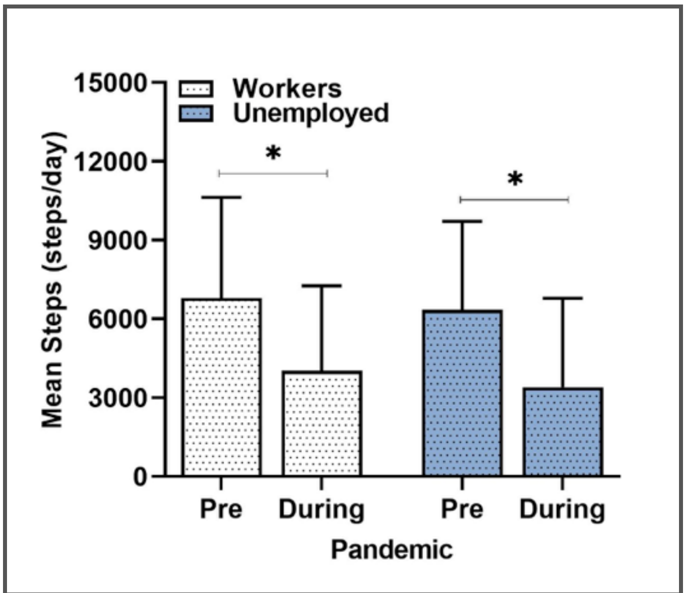

Figure 5. Changes in step count in workers and unemployed (*: p<0.05)

There was no difference in step count by working condition before the pandemic months (p>0.05), yet during the pandemic months those who worked from office had higher step count in March (5450 ± 3795 steps/day vs. 4419 ± 3138 steps/day; p=0.058) and in April (4550 ± 4244 steps/day vs. 2519 ± 3110 steps/day; p<0.001) than those who worked from home (Fig. 2D).

DISCUSSION

The main finding of the current study was that the PA level of Turkish population included was markedly decreased after the outbreak of COVID-19. This is the first study to report changes in step count in the Turkish population following the outbreak of COVID-19 and the findings of the current study unveil substantial changes in the working conditions following this challenging pandemic.

It has recently been suggested that there are two simultaneous important pandemics: the first one is the COVID-19 pandemic and second one with a different nature is PI (2,23). Unfortunately, all the data available convincingly warns that the PI pandemic will persist after the world recovers from the COVID-19 virus, and the health and economic impacts of the PI pandemic will continue to be severe (24).

According to the WHO, 31% of individuals 15 years or older are physically inactive. Considering the high levels of global PI associated with numerous adverse health outcomes (13,21,25) including dyslipidaemia (26), microvascular dysfunction and peripheral insulin resistance (27), cardiovascular disorders and metabolic syndrome (28), it is estimated that approximately 3.2 million deaths each year are attributed to this unhealthy lifestyle behaviors (12). Ding et al. reported that costs of physical inactivity were approximately globally $53.8 billion, contributing to $13.7 billion in productivity loses and resulted in 13.4 million disability-adjusted life-years (29).

It appears that the ongoing global crisis caused by the spread of COVID-19 disease exerts profound effects on human health and social life in many communities all over the world. Lockdowns and isolation imposed to curb the COVID-19 pandemic run the risk of reduced PA with potential long-term consequences (6), and these unfavourable effects of short- and long-term PI before or during the pandemic likely occur rapidly (30). A study supporting this notion by Krogh-Madsen et al. (31) reported that decreased daily activity levels in healthy young males from 10501 to 1344 steps/day for just two weeks led to a 17% decline in skeletal muscle insulin sensitivity, 7% in cardiovascular fitness, and 3% in lean leg mass.

Shad et al. (18) also determined that only a week of reduction in step count caused substantial decline in daily myofibrillar protein synthesis rates, and decline in whole-body insulin sensitivity. Therefore, considering the second and even third wave of the pandemic, it will be important to understand the long-term impact of reduced PA on health. Moreover, since regular exercise is known to modulate the immune system and to provide protection against some diseases such as obesity, diabetes and hypertension that cause severe COVID-19 disease (2,32), regular exercise and PA might be considered as important strategies to cope with disruptions caused by COVID-19.

Cytokines released by cells play major role in the immune system. Among these cytokines, interleukin (IL)-6, IL-10, and tumor necrosis factor-alpha (TNFα) associated with adverse clinical symptoms (23) were found to be markedly high in COVID-19 infected intensive care unit patients (33). Also, considering the positive impacts of regular exercise on lung function and respiratory infection/illness including COVID-19 by inducing anti-inflammatory cytokines (34), reducing systemic inflammation (35) and oxidative stress markers (36), PA strategies should be undertaken to encourage people to participate in physical activities that are appropriate for their age and medical condition to avoid short- and long-term negative health impacts of reduced PA and to relieve the symptoms of the disease. Furthermore, to attenuate the negative health outcomes of the imposed curfews and lockdowns on daily PA, people should also implement practical lifestyle strategies that will increase energy expenditure, to be less sedentary during lockdowns (25,37,38).

Our study had some limitations. For example, we used an online survey method to determine the PA level determined by step count. As the data is based on answers given to this survey, it might not reflect PA level. Therefore, further studies that are capable of measuring PA level, depending on the mode and intensity using appropriate devices are needed and will help to interpret changes in PA patterns during the pandemic. In addition, the majority of participants (83%) of this study were women, which makes it difficult to apply the results to society. Lastly, the survey used was filled out by the participants online. Instead, a face-to-face survey method might allow researchers for more in-depth data collection and comprehensive understanding.

CONCLUSION

The present study provides preliminary data on the changes in step count before and during the COVID-19 pandemic in Turkey. The impact of reduced PA caused by COVID-19 mainly depends on the magnitude of reduction, so careful monitoring of PA levels in different populations is required. Regular PA is a vital first step to maintain cardiometabolic-health, and may also be a protective factor to cope positively with isolation-related challenges. These approaches aiming to increase PA levels should be maintained for months. By implementing supportive lifestyle strategies for the necessity and effectiveness of PA, long-term negative health effects due to reduced PA can be avoided. Therefore, it is necessary to monitor changes in PA levels due to COVID-19. Also, promoting appropriate physical activities will help to overcome inactivity during the outbreak of COVID-19. Continuous PA monitoring data will also provide unique insight about the impact of COVID-19, which will inform scientists about potential health consequences, and help in developing interventions, both during the pandemic and in the future.

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Conflict of Interest / Çıkar Çatışması

The authors declared no conflicts of interest with respect to authorship and/or publication of the article.

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