Risk Factors of Work-Related Musculoskeletal Disorders among Computer Users Post-COVID-19 Pandemic at Al-Baha University

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ABSTRACT

Background: Due to the worldwide lockdowns brought on by the Covid-19 epidemic, a natural increase in the use of digital technologies has occurred, leading to an increase in musculoskeletal disorders among computer users.

Aims: This study aimed to investigate the risk factors for work-related musculoskeletal disorders (WMSD) among computer users' post-COVID-19 pandemic at Al-Baha University.

Methods: A cross-sectional study design was utilized; three hundred computer users participated in the study selected by simple random sampling at Al-Baha University for 4 months. Data was obtained by modified standardized Nordic Musculoskeletal Questionnaire, posture observation checklist, and workstation observation checklist, and analyzed by SPSS 20.

Results: In the prevalence of WMSD among the respondents; the uppermost prevalence rate of WMSDs symptoms in the last 12 months was related to the neck (62.7%), lower back (59%), upper back (55.3%), right shoulder (46%), and right wrist (45.3%). In total preventive ergonomic practices scored workstation design 70 %, and 63.3% respectively of the participants scored poorly. Multivariate and univariate regression models showed that female participants were 2.189 times more likely to develop WMSDs than male participants [OR= 2.189, 95% CI 1.063 – 4.507]. Older age was 1.685 times more likely to develop WMSDs than younger age [OR= 1.308, 95% CI 1.193 – 1.434].

Conclusion: The highest regions of the body that experienced work musculoskeletal disorders post-COVID-19 pandemic were the neck ,lower back, upper back, and right shoulder. Being female, older age, and years of working as a computer user were predictor factors of developing WMSDs. Respondents who have good preventive ergonomic practices and workstation adjustment were less likely to develop WMSDs.

Keywords: Computer users, WMSDs, Ergonomics, Risk factors, Workstation adjustment, Post COVID 19

INTRODUCTION

Coronavirus 2019 (COVID-19) is a serious respiratory infection caused by the new coronavirus[1]. At the end of 2019, the first case of coronavirus disease (COVID-19) was detected in Wuhan, China, and then scattered around the globe[2]. The epidemiological picture is constantly evolving, and on May 13, 4,170,424 cases and 287,399 confirmed deaths were reported (WHO report)[3]. By April 27, 2020, the virus had been distributed to at least 185 nations and infected more than three million individuals, causing at least 210,000 deaths[4]. The disease is said to be transmitted through droplets from human saliva, eyes, and nose[5], so the disease is forceful society into physical distancing to prevent its spread, and government policy has specified that communities are required to work from home, a study from home, and pray from home[2]. As people use more laptops and computers during and after the COVID outbreak for a while, this could lead to intentional injuries and a high prevalence of computer-related musculoskeletal disorders[6]. The rapid technological development in the use of electronic data has affected both employees and the workplace[7]. Risk factors for musculoskeletal pain include demographic characteristics, personality characteristics, and psychological, social, organizational, and physical aspects of work[8]. Computers' visual display unit (VDU) is one factor that can contribute to musculoskeletal work disorder (WMSD) among employees[9]. In a computer workstation, the improper sitting posture that a professional attains while performing computer-related tasks is also affected by the chair and plays a major role in WMSD risks[10]. Musculoskeletal disorders related to working in a computer practice are predominantly associated with the upper extremities, neck, shoulder, back, hands, wrists[11], fingers, cartilage, and spinal discs[12]. MSDs are very popular, and the risk raises with age[7]. The most common factors were physical load at work, and excessive strength[13]. Previous studies found an extreme incidence of MSDs in Saudi Arabia and demonstrated several challenges to managing various MSDs[14]. Additionally, previous studies suggested that age, taller body height, lower aerobic fitness, endurance, extreme flexibility, previous injury, participation in recreational sports activity, and even older running shoes are risk factors to develop MSD[15]. In a survey conducted by the Brazilian Institute of Geography and Statistics (IBGE), about 27 million Brazilians aged 18 or over suffer from musculoskeletal pain[16]. Ergonomic risk factors include workstation conditions, repetitive motions, improper posture, and stationary postures operating without any change in posture[17]. Standard Nordic questionnaires were used to assess specific neck, shoulders, back, elbow, wrist, hand, thigh, knee, and foot musculoskeletal disorders. This questionnaire is very valuable for evaluating musculoskeletal disorders in epidemiological research[11]. In an office environment, employees tend only to use tables and chairs to perform their tasks, however, according to studies, this setting

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causes discomfort to employees, especially in the upper extremities, and an important origin of the disease is work-related musculoskeletal pain[18]. Activities or tasks such as handling loads, repetitive motions, or vibrations are among the well-established workplace risk factors for MSDs[19]. Work-related musculoskeletal disorders (WMSD) are the most common occupational hazards[20]. Work-related musculoskeletal disorders significantly affect the quality of life and lead to lost work time or absenteeism, increased work restrictions, and transfer to another job[21]. Work-related musculoskeletal disorders are rarely life-threatening but reduce the quality of life, increase financial burden, and pose a major public health problem[22].

Work-related Musculoskeletal discomfort (WMSDs) or pain is a huge burden nowadays and most population are facing difficulties in their jobs or tasks of daily routine[20]. After the lockdown period computer users and employees returned to their offices at Al-Baha university they found that all services electronic such as clearance, contract renewal, custody services, employee cards, feedback services, greeting cards, hiring faculty members, mersal, etc. Therefore, the present studyaims to investigate work-related musculoskeletal disorders among computer users' post-COVID-19 pandemic at Al-Baha University.

MATERIALS AND METHODS

Research Design: A cross-sectional study design was utilized**.**

Setting: The study was carried out at Al-Baha University. Al Baha University involves two main administrative buildings at Al Aquiq and Buher sections.

Study Period: The study was conducted during the period of eight months from 10/10/2021-10/5/2022.

Subjects: Computer users and employees working in the pre-mentioned settings. They were selected as compatible with the next inclusion criteria.

- Using a computer for more than 2 years
- Without any physical disability
- Willing to participate in the study

Sampling Technique and Sample Size: A simple random sampling technique was applied to select the sample. The sample size was computed using EPI info 7 software according to the average number of employees in the 50% expected frequency with an acceptable error of 5% and a confidence limit of 95%. Al-Baha University consists of two main administrative buildings with 1362 computer user employees. Participants were recruited for this study based on the overall percentage of the employee in each administrative building of the University. The sampling frame was prepared for 300 computer user employees of Al-Baha university (141 males and 159 females) after excluding those who were not eligible for the study. Finally, a simple random sampling technique of the random number table method was applied to select the study participants from the sampling frame.

Data Collection Tools: Data was collected from the employees by interviewing the study participants and was adopted and modified to suit the purpose of the study.
One tool was utilized.

Part (I): The first part of the questionnaire was used to gather data about the participants including their demographic characteristics (age, gender, height, weight, number of working hours per day, and number of years of experience**).** The questionnaire was designed to assess musculoskeletal pain involving 9 body regions neck, shoulders, elbows, wrists, upper back, lower back, hips, knees, and ankles. For assessing the prevalence of WMSD according to body regions, the Nordic Musculoskeletal Questionnaire was adopted[23]. The participants provided information related to their pain symptoms such as pain, ache, discomfort, and numbness (yes, no) during the last 12 months and the last 7 days. And if at any time during the last 12 months been prevented from doing normal work because of the trouble. The body mass index was estimated based on the participant's height and weight.

Part (II): The computer user's preventive ergonomic practices observation checklist consists of 10 items in response to (yes scored 1, no scored 0, and NA scored -1).
Scoring system: Total points of observational preventive ergonomic practices of computer users score was 10 points

- Good 100- 70% = 10- 7 points
- Fair 70%- 50% = 6- 5 points
- Poor <50% = 4 - zero points

Part (III): The computer workstation observation checklist consists of 21 items in response to (yes scored 1, no scored 0, and NA scored -1).
Scoring system: Percent of observational workstation modification score was calculated as follows: -
Total points of workstation modification score were 21 points

- Good 100- 70% = 21- 15 points
- Fair 70%- 50% = 14- 11 points
- Poor <50% = 10 - zero points

PROCEDURE

Ethical Consideration: An ethical approval was obtained from the institutional review board of Al-Baha university (IRB: 43102210) on 13/02/1443. Ethical consideration was maintained by taking informed consent from the study subjects and ensuring the anonymity of collected data. A self-administered questionnaire, together with an invitation letter and information about the study, was distributed to each computer user employee by hand.

Tool was developed by the researchers after a thorough review of relevant recent literature and the NORDIC sheet was adopted.

The tool was tested for its content validity through a jury of 5 experts in public health and the necessary modifications were done accordingly.

Test of reliability was conducted on 25 computer users using Cronbach's Alpha. Correlation Cronbach's Alpha was for Computer Users preventive ergonomic practices Observation checklist = 0.781, and on Computer Workstation Observation checklist = 0.788.

A pilot study was done on 30 computer users which were not incorporated in the study to assure the clarity and applicability of the tool and the required modifications were done.

Using the interview and observational checklist sheet for collecting the data

Statistical analysis of the collected data was conducted utilizing SPSS 20 and suitable descriptive and analytical statistical tests were utilized to describe and analyze the relationship between variables.

- Descriptive: number, percentage, arithmetic mean, standard deviation and Pie chart.
- Multivariate and Univariate regression analysis to predict the risk factors for developing WMSDs.

RESULTS

Table 1 Illustrates the detail of the socio-demographic characteristics of the employees, based on the distribution, the female employees are more than the male employee at 53% and 47%, respectively. Furthermore, the highest age group of the employees is between 30 to 40 years old (54.3%), with a mean of 38.45 ± 6.73. Therefore; the participant's employee mean height, weight, and body mass index are 160.99 ± 7.20, 74.88 ± 14.69, and 2.84±0.031 respectively. Additionally, regarding the years of experience, nearly a third of the employee (31%) was between 10-15 years with a mean of 11.29±5.73. The mean number of hours worked during the week is 17.28±11.45.

Table1: Distribution of the studied samples according to demographic data (n = 300)

Demographic data	No.	%
Gender		
Male	141	47.0
Female	159	53.0
Age		
<30	25	8.3
30-40	163	54.3
40-50	86	28.7
≥50	26	8.7
Mean ± SD.	38.45 ± 6.73	
Height		
Mean ± SD.	160.99 ± 7.20	
Weight		
Mean ± SD.	74.88 ± 14.69	
Body mass index Mean ± SD.	2.84±0.031	
How many years have you been doing this job		
<5	35	11.7
5-10	85	28.3
10-15	93	31.0
≥15	87	29.0
Mean ± SD.	11.29 ± 5.73	
How many hours do you work each week?		
Mean ± SD.	17.28 ± 11.45	

SD: Standard deviation

Table 2 represents the distribution of the studied samples according to the NORDIC sheet about assessing the prevalence of WMSD in the employee body region in the last 12 months. The results showed that the neck is the most problem which is experienced by the employee with the percentage at 62.7%, then followed by the lower back at 59%, upper back at 55.3%, right shoulder at 46%, and right wrist at 45.3%.

About employees who at any time during the last 12 months been prevented from doing their normal work or activities because of the WMSD trouble, the results showed that the neck is the most problem which is experienced by the employee with the percentage at 56%, then followed by lower back at 52%, right shoulder at 50.3%, upper back at 47.7%, wrist 42.7%, and elbows 33.3%.

Concerning employees having any trouble at any time during the last 7 days, the results showed that the neck is the most problem which is experienced by the employee with the percentage at 61%, then followed by shoulders at 52.3%, wrist at 52%, lower back at 41.7%, and upper back at 26.7%.

Table 2: Distribution of the studied samples according to the NORDIC sheet of assessing the prevalence of WMSD (n = 300)

	To be answered by everyone		To be answered by those who have had trouble			
	Have you at any time during the last 12 months had trouble (ache, pain, discomfort, numbness)		Have you at any time during the last 12 months been prevented from doing your normal work because of the trouble		Have you had any trouble at any time during the last 7 days?	
	No.	%	No.	%	No.	%
Neck						
No	112	37.3	132	44.0	117	39.0
Yes	188	62.7	168	56.0	183	61.0
Shoulders						
No	122	40.7	149	49.7	143	47.7
Yes			151	50.3	157	52.3
Yes, the Right shoulder	138	46.0	0	0.0	0	0.0
Yes, Both shoulders	40	13.3	0	0.0	0	0.0
Elbows						
No	234	78.0	200	66.7	223	74.3
Yes			100	33.3	77	25.7
Yes, right elbow	66	22.0	0	0.0	0	0.0
Wrist						
No	144	48.0	172	57.3	144	48.0
Yes			128	42.7	156	52.0
Yes, Right wrists/ hands	136	45.3	0	0.0	0	0.0
Yes, Both wrists/ hands	20	6.7	0	0.0	0	0.0
Up back						
No	134	44.7	157	52.3	220	73.3
Yes	166	55.3	143	47.7	80	26.7
Low back						
No	123	41.0	144	48.0	175	58.3
Yes	177	59.0	156	52.0	125	41.7
Hips						
No	236	78.7	278	92.7	230	76.7
Yes	64	21.3	22	7.3	70	23.3
Knees						
No	233	77.7	270	90.0	247	82.3
Yes	67	22.3	30	10.0	53	17.7
Ankles						
No	296	98.7	274	91.3	274	91.3
Yes	4	1.3	26	8.7	26	8.7

Figure 1 represent the distribution of the employee according to their total preventive ergonomic practices score, the results showed that 70 % of the employees have poor, 22.7% fair, and only 7.3% of them have good preventive ergonomic practices score.

Table 3 Represent the distribution of the studied samples according to their level of computer workstation design, the results illustrate that the desk and document holder are the poorest (92.7%), followed by footrest (88%), and layout (72.7%).

Table 3: Distribution of the studied samples according to their level of Computer workstation design (n = 300)

Part (III) Computer workstation observation checklist	Poor (<50%)		Fair (50%- 70%)		Good (70- 100%)	
	No.	%	No.	%	No.	%
Chair	102	34.0	88	29.3	110	36.7
Desk	278	92.7	0	0.0	22	7.3
Footrest	264	88.0	0	0.0	12.0	12.0
Document holder	278	92.7	7	2.3	15	5.0
Monitor	70	23.3	201	67.0	29	9.7
Layout	218	72.7	8	2.7	74	24.7
Environment	16	5.3	84	28.0	200	66.7

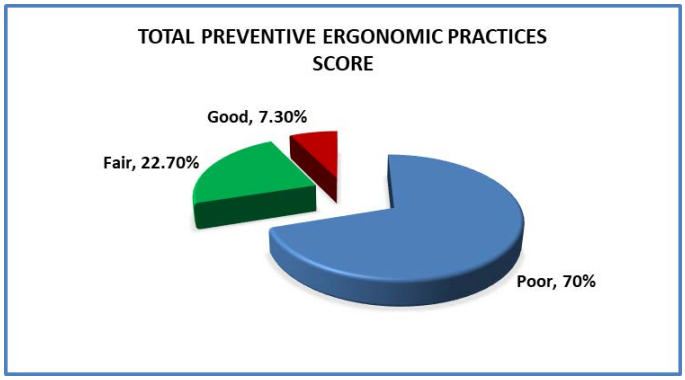

Figure 1: Distribution of the studied sample according to their total preventive ergonomic practices score (n = 300)

Figure 2 Illustrate the distribution of the studied sample according to their total score of workstation design, the results showed that 63.3% of the employees have poor, 20% of them are fair, while only 16.7% of them have good workstation design.

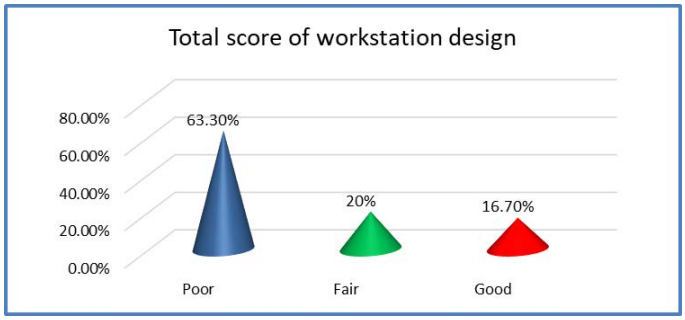

Figure 2: Distribution of the studied sample according to their total score of workstation design

Table 4 declares univariate and multivariate logistic regression analysis, which was employed to assess the effect of the independent variables affecting WMSDs among the computer users. Study participants who were female were 2.189 times more likely to develop WMSDs than male participants [OR= 2.189, 95% CI 1.063 – 4.507]. Respondents who were older age were 1.685 times more likely to develop WMSDs than younger age [OR= 1.308, 95% CI 1.193 – 1.434]. Respondents with an increased period of being computer users were 8 times more likely to develop WMSDs [OR= 7.934, 95% CI 2.325 – 27.080]. Furthermore, respondents with good preventive ergonomic practices and good computer workstation adjustment were 0.939 and 0.984 times less likely to develop WMSDs respectively [OR= 0.939, 95% CI 0.890 – 0.991] & [OR= 0.984, 95% CI (0.966 – 1.003)]

Table 4: Univariate and Multivariate Logistic regression analysis of factors associated with work-related musculoskeletal disorders (WMSDs) among computer users. (n = 264 vs. 36) for different parameters

	Univariate		#Multivariate	
	p	OR (LL – UL 95%C.I)	p	OR (LL – UL 95%C.I)
Females	0.033*	2.189 (1.063 – 4.507)	0.152	0.072 (0.002 – 2.649)
Older Age	<0.001*	1.308 (1.193 – 1.434)	0.027*	1.685 (1.060 – 2.681)
Height	0.019*	0.953 (0.916 – 0.992)	0.092	0.781 (0.586 – 1.041)
Weight	0.677	0.995 (0.972 – 1.019)		
Increased Period of being a computer user	<0.001*	6.393 (3.082 – 13.262)	0.001*	7.934 (2.325 – 27.080)
How many hours do you work each week	0.056	0.974 (0.947 – 1.001)		
Good preventive ergonomic practices score	0.010*	0.983 (0.971 – 0.996)	0.021*	0.939 (0.890 – 0.991)
Good Computer workstation adjustment score	0.012*	0.984 (0.966 – 1.003)	0.011*	0.984 (0.966 – 1.003)

OR: Odd`s ratio
C.I: Confidence interval
LL: Lower limit
UL: Upper Limit
#: All variables with p<0.05 was included in the multivariate
*: Statistically significant at p ≤ 0.05

DISCUSSION

After the COVID-19 pandemic, the current study was conducted at Al-Baha University to examine the risk factors for work-related musculoskeletal disorders among computer users' employees. Due to the worldwide lockdowns brought on by the Covid-19 epidemic, a natural increase in the use of digital technologies has occurred[24]. Institutions continue to utilize these digital tools in the post-lockdown period, including our university, Al Baha, which embraced this digitalization era. Like any new technology, digitalization has both anticipated and unanticipated consequences[25]. However, every innovation comes with downsides or negative effects on human health. The relationship between computer use and musculoskeletal disorders (MSDs) has been demonstrated in several types of research[25,26]. Our work supports earlier results that MSDs among computer users are a widespread problem, providing additional validation.

For determining the prevalence of WMSDs among the computer users who were the subject of our study, we used the NORDIC sheet. According to the findings, the participants' most painful body parts over the previous seven days were their necks, shoulders, wrists, lower backs, and upper backs, respectively. This discomfort had a significant impact on their ability to go about their daily life activities. These findings concurred with other research conducted in Iran, Turkey, Egypt, and Saudi Arabia[27,28].

Our findings showed that the uppermost prevalence rate of WMSDs symptoms in the last 12 months was related to the neck (62.7%), lower back (59%), upper back (55.3%), right shoulder (46%), and right wrist (45.3%). These findings are consistent with a prior study of Iranian office workers conducted at Shiraz University of Medical Sciences, which found that the neck (60.16%), lower back (57.10%), and shoulders (54.03%) had the highest prevalence rates of WMSD symptoms over the previous 12 months[29]. We believe that the socio-cultural similarity of the population may be the cause of the similarity in these findings. By contrast, the existing study had a lower prevalence as compared to the study conducted in India/Punjab 83.5%[30], and Ghana 83.5%[31]. Job stress and societal variables may play a role in the discrepancy[32].

The discipline of ergonomics entails setting up the workplace so that the individual may function comfortably in it. Workstation circumstances, repeated motions, awkward postures, static postures, and workstation modification are all ergonomic risk factors for computer users that are connected to WMSDs. Adhering to ergonomic guidelines helps to decrease WMSDs and prevents numerous possible injuries[33]. The current study used an observational checklist to investigate the participants' preventive practices during using the computer. We observed that 70 % of the participants have poor preventive ergonomic practices scores, and only 7.3% have good scores. Additionally, those respondents with good preventive ergonomic practices were significantly less likely to develop WMSDs [OR= 0.939, 95% CI 0.890 – 0.991]. A similar result was also found in an additional study led by Jasmine M et al.[34]. Which exhibited a prevalence of 69.8% among those who did not have appropriate preventive ergonomic practices? The current study's conclusion that poor ergonomic practices among computer users are substantially connected with the prevalence of musculoskeletal disorders is supported by the researchers[35,36]. This is because poor preventative ergonomics practices can result in stiffness and compression across the skeletal and muscular systems, which causes aching and pain in certain body locations[37].

The layout of workstations in offices can significantly impact employees' health. To improve worker productivity and lower environmental risk factors for developing different musculoskeletal disorders, efforts are being undertaken to build an ergonomically safe work environment[8]. We observed that only 16.7% of respondents in the current study had good workstation adjustment scores, whereas 63.3% had low workstation adjustment scores. Those who have good workstation adjustment scores were significantly less likely to develop WMSDs [OR= 0.984 (0.966 – 1.003). Poor computer workstation adjustment is a strong predictor of respondents' development of WMSDs, according to our study. Although the workstations are now movable, most customers are still unsure of how to correctly adjust their furniture. Therefore, it is critical to give computer users training so they can comfortably place their workstations for their purpose[39]. Our findings are in line with earlier studies. Workstation design and job demands have been proven to be related to a higher frequency of pain[40,41].

The findings of our study showed that women were more than twice times as likely as men to experience WMSDs [OR= 2.189, 95% CI 1.063 - 4.507]. This study was comparable to the ones that were done by[42,43]. This can be because women are in charge of other responsibilities in addition to their workload. This study did not agree with another one[44] carried out among Northwest Ethiopia bank workers. This discrepancy could be brought on by the workload[45].

The users' ages also matter a lot when it comes to investigating WMSD risk factors. Older study participants had a 1.685 times higher risk of developing WMSDs than younger participants [OR= 1.308, 95% CI 1.193-1.434]. This might be because younger users, particularly those who have used computers in school or at college, are more likely to be confident and knowledgeable about computer workstation adjustment and ergonomic preventive practices than older users. This is consistent with earlier research, which found that those over 30 with poor posture at work had a higher chance of developing work-related musculoskeletal disorders[46,47].

Finally, the respondents of our study with increased periods of being computer users were eight times more likely to develop WMSDs [OR= 7.934, 95% CI 2.325 – 27.080]. This is consistent with past research by Calik et al. and Ardahan et al. We believe that computer users who are subjected to higher static load and postural disturbances with increasing computer usage time may have musculoskeletal discomfort that is more severe[48,49].

Even while the study made every effort to show the extent of WMSDs among computer users and its associated risk factors, it had several limitations. Our findings are based on self-reporting because WMSDs have not been confirmed by clinical diagnosis in the recent 12 months. It is therefore likely that participants misremembered and ultimately developed a recall bias. Furthermore, the amount of use of smart phones and personal computers for both personal and professional purposes was not measured in this study.

CONCLUSION

Based on the existent study findings, it can be concluded that the highest regions of the body that experienced work musculoskeletal disorders post-COVID-19 pandemic were the neck, lower back, upper back, and right shoulder. Being female, older age, and years of working as a computer user were predictor factors of developing WMSDs. Respondents who have good preventive ergonomic practices and workstation adjustment were less likely to develop WMSDs.

RECOMMENDATIONS

- Based on the findings of the current study, it is advised to:
- Conducting an ergonomic training program as a component of the initial training for all employees who use computers.
- Creating a hotline and online learning resources on visual ergonomics for digital users to promote connection and communication.
- Requiring computer users to undergo routine and periodic physical examinations for WMSDs with a reliable reporting system.
- Conducting further research based on clinical diagnosis of WMSDs.

Authorship Contribution: All authors share equal effort contribution towards (1) substantial contributions to conception and design, acquisition, analysis and interpretation of data; (2) drafting the article and revising it critically for important intellectual content; and (3) final approval of the manuscript version to be published. Yes.

Potential Conflict of Interest: None

Competing Interest: None

Acceptance Date: 25 February 2023

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