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Medical Specialists Evidenced-Based Opinion for the Prevalence of Musculoskeletal, Balance and Gait Impairments in Post Covid-19 Patients: A Cross-Sectional Study

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Background: The COVID-19 pandemic significantly impacted healthcare access and posed a global challenge. The emergence of new variants such as Delta, Omicron, and FLIRT serves as a reminder of the ongoing threat. COVID-19 survivors often experienced new or aggravated musculoskeletal discomfort, which can be attributed to the virus's impact on the musculoskeletal system and the disruptions caused by the pandemic.
Methods: The study adopted a cross-sectional design to gather information from 50 medical specialists engaged in clinical practice. These specialists were asked to share their observations on the prevalence of musculoskeletal, balance, and gait impairments in patients who had contracted COVID-19 after the pandemic. A face-to-face interview survey was conducted, utilizing multiple-choice questions, and participants' responses were recorded using a 5-point Likert Scale.
Result: Descriptive analysis using SPSS was utilized. The mean and standard deviation of musculoskeletal disorders (MSD's) were calculated to be 62.52±6.58, with a high-frequency percentage of severe musculoskeletal disorders (56.0%, 28.3) and moderate MSDs (44%, 22). The prevalence of myalgia (74%) and joint pain (74%), as well as an increase in several patients with MSDs (72%) in the outpatient department, had a high agreement percentage respectively. The level of significance was set at $p \leq 0.05$.
Conclusion: Musculoskeletal disorders (MSDs), balance issues and gait problems are commonly observed as post-COVID conditions, with myalgia, joint pain, and decreased physical activity being the most prevalent. The findings suggest that healthcare professionals should prioritize preventive measures to address these issues in patients who have recuperated from the virus.

Keywords: COVID-19, musculoskeletal disorders (MSD's), pandemic.

1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic has had a significant impact on healthcare access and has been a difficult global issue [1]. According to the World Health Organization's (WHO) social distancing and risk-attenuating guidelines, it has become challenging in many settings to provide safe, effective, and efficient clinical care, including primary and secondary physiotherapy, in public and private clinics due to the circumstances and pressures of the pandemic [2, 3]. During the pandemic, many patients with non-emergency musculoskeletal problems delayed or skipped physiotherapy sessions [4]. Physical therapy is most frequently sought for musculoskeletal complaints, including acute or persistent pain in the muscles, ligaments, bones, and nerves [5].

Musculoskeletal pain is one of COVID-19's typical symptoms. Compared to the other primary symptoms like fever, they are less frequent. However, there is growing evidence that COVID-19 can significantly affect the musculoskeletal and neurological systems [6, 7]. According to a recent comprehensive assessment of COVID-19's neurological and musculoskeletal characteristics, myalgia and back pain were prevalent in 19% and 10% of cases, respectively [8]. According to research by Sahin et al., the heads and limbs of COVID-19-infected individuals had the highest pain. Additionally, after the infection has cleared up, researchers have found that neck and back pain can last longer than anticipated [9]. Furthermore, following the COVID-19 lockout, there was a reported increase in the prevalence of musculoskeletal illnesses among Saudi physicians.

A mix of psychological, personal, and occupational variables could be to blame for this [10]. According to American Thoracic Society (ATS) guidelines, Tuzan et al. assessed the degree of pain in 150 post-COVID-19 patients using the numeric rating scale (NRS) and classified them into severe and non-severe groups. The NRS scores for the two groups were essentially the same. With diabetes (23.3%), cardiovascular disease (27.3%), and hypertension (34.0%), about 34.0% of the population had at least one comorbidity [11]. Fatigue ranked highest among the musculoskeletal symptoms that people described, followed by myalgia, arthralgia, and back pain. Back pain was the most commonly reported musculoskeletal pain when the investigators examined its location. They found that the primary symptom of myalgia in COVID-19 is ischemic myalgia brought on by hypoxia. The triangle pattern of myalgia, weakness, and weariness can be utilized to reflect muscular involvement [11]. The prevalence of musculoskeletal pain, including neck and lower back pain, is influenced by reduced levels of physical activity (PA) during the quinine period [12]. This validates the study's conclusions, which looked at 2044 university students in Italy. When they analyzed the students' physical activity levels before and after the pandemic for a year, they found a noteworthy decline in PA levels as well as a drop in the prevalence of neck discomfort (43.5%) and low back pain (33.5%) [13]. Reducing inactive time and engaging in at least 150 minutes of physical activity per week are recommended by the World Health Organization (WHO) [14].

In a recent study, a group of fifty medical specialists provided their expert analysis on the impact of musculoskeletal discomfort, balance and gait impairments based on their clinical experience. The pain areas were categorized into the back, head, neck, lower limbs, and upper limbs. Among patients with COVID-19, lower limb pain was the most prevalent, followed by head and neck pain. Factors such as early degeneration, and reduced calcium and Vitamin D

levels were identified as major contributors to early fatigue and decreased physical activity. The study also found a significant correlation between musculoskeletal discomfort among COVID-19 patients and BMI, smoking, physical activity levels, overall health, and the severity of the disease's symptoms. These elements could aid in the understanding of why certain COVID-19 patients have musculoskeletal discomfort while others do not [15].

The significance and necessity of rehabilitation, particularly physical therapy, in addressing post-COVID-19 complications are highlighted by these findings. The study specifically examined musculoskeletal pain that occurs after recovering from COVID-19.

The primary concern in global healthcare is currently the needs and care of individuals who have survived the pandemic [16]. It is essential to understand the impact of COVID-19 on the musculoskeletal system and provide comprehensive interventions, including physical rehabilitation. Previous studies have not explored the perspectives of various medical specialists and physicians regarding musculoskeletal discomfort, balance, and gait abnormalities in post-COVID-19 patients [1].

2. Methods

Design and participants:

This study was conducted using a convenience sample in Punjab and Madhya Pradesh, focusing on recovered COVID-19 patients aged 18-45 with musculoskeletal issues. Approval for the project was granted by the Institutional Ethics Committee Review Board.

The study was registered on the Clinical Trial Registry India with registration number CTRI/2023/03/050962, dated 22/03/2023. Before participation, informed consent was obtained from each physician involved in the study.

Sample Size

Based on an anticipated moderate effect size (d=0.45) [12], the sample size required for the physician survey will be at least 50, with a significance level of 0.05 and a power of 90%. The calculation for sample size was performed using G Power ® 3.1.9.4.

Survey [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14]

Based on earlier research, an English self-administered questionnaire was created and modified [11, 13, 15]. Printed one-part forms were distributed to Medical Specialists like Orthopaedics, Chest Physicians, Neurologists, rheumatologists, and General practitioners who treated patients who had recovered from COVID-19 and were attending private clinics or hospital OPD. Medical Specialists have been approached at Medical Colleges, Multispeciality hospitals, and private clinics in Madhya Pradesh (Indore, Bhopal) and Punjab.

The initial section of the questionnaire focused on gathering information regarding the Physicians' demographic characteristics, including details about their Institutions, Designations, and Specializations.

The second section included concise inquiries regarding clinical characteristics, including the rise in the number of patients visiting the outpatient department (OPD) with musculoskeletal issues like joint pain, symptoms associated with musculoskeletal pain, the onset of pain, signs of early degeneration, and any abnormalities in gait and balance following the COVID-19 pandemic.

The third section of the questionnaire included a 5-point numerical rating scale (NRS) to evaluate the prevalence of pain related to musculoskeletal, balance, and gait issues after COVID-19 infection. The last section of the questionnaire consisted of Likert-scale items that assessed pain location, perception of musculoskeletal pain, balance and gait abnormalities, radiological evidence of early degeneration, and levels of physical activity. The interview was conducted by the primary researcher.

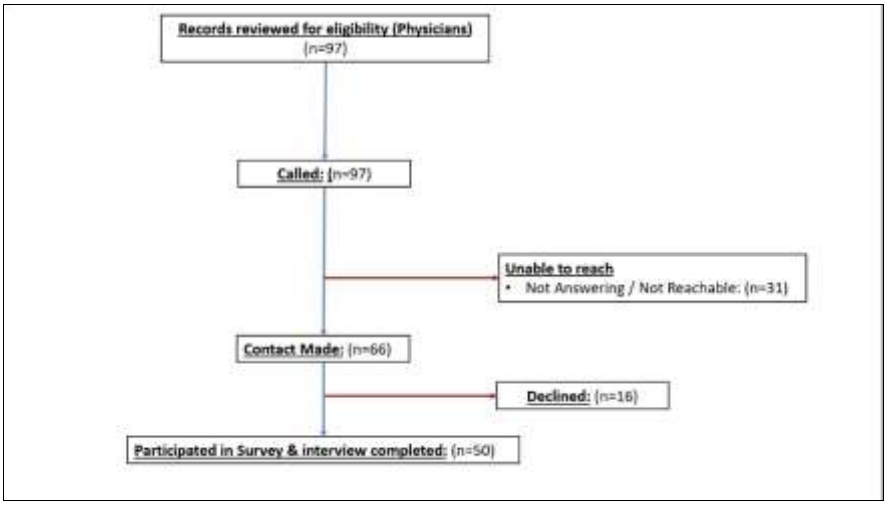

Figure1: COREQ Flowchart

Outcome measures

Prevalence of musculoskeletal disorder, balance and gait abnormalities using Likert scale (5-point scale) scores were used to assess post-infection MSD, balance and gait abnormalities with COVID-19 patients by physicians' evidence-based opinion.

Data collection

Before distribution, the survey underwent validation in a presurvey involving eight respondents to assess face validity, content validity, and question clarity. Feedback from medical specialists in the presurvey was utilized to enhance content validity, while adjustments were made to improve face validity by aligning selections with the questions. Recommendations and responses from the participants were carefully considered during the modification process of the questions.

The interviewer conducted face-to-face interviews with physicians from Punjab and Madhya Pradesh, visiting various hospitals, private clinics, and nursing homes. Contact details were obtained from their electronic records, and appointments were scheduled in advance. Participants were required to complete questionnaires in person, without the option of an

online mode. A brief overview of the study's objectives was given before collecting the questionnaire responses.

Statistical analysis

All statistical analyses were conducted using SPSS version 27.0. Descriptive statistics were calculated to characterize the study sample. The statistical significance of the categorical responses to various items in each perception category was assessed using the Non-parametric Pearson's chi-square fitness test (table 5). A paired t-test was used to compare the mean after COVID-19 infection. The Percentage frequency distribution was analyzed for each question response. Furthermore, the one-way ANOVA and student's t-test for independent samples were employed to examine the mean pain score difference with the categorical factors. A p-value of 0.05 was used to determine statistical significance in reporting the results.

3. Result

The study sample included 50 medical specialists. Table 1 shows the response obtained by the study subject about the perception item. The Demographic analysis for Percentage and Frequency distribution includes an analysis of Physicians' Organization, Specialization, and Designation (table 2). The statistical result of the variable shows that the frequency percentage of different organization was 6(12%), 28(56%), 2(4%),6(12%), 3(6%), 5(10%), frequency Percentage of different specialization recorded was 1(2%), 5(10%), 21(42%), 15(30%), 4(8%), 4(8%). Frequency percentage of different Designation variable was 2(4%), !7(34%), 19(38%), 8(16%), 3(6%) respectively. The majority of specialists were Orthopaedics (n=50, 42%), with 38%working as Designation of Associate Professor in medical college. The Mean percentage score is 74.55%.

The result of the nonparametric chi-square fitness test was found to be non-significant for the perception of musculoskeletal disorder with $p \leq 0.05$. The comparison of the mean pain score difference after being infected with COVID-19 about the socio-demographic and clinical characteristics of study subjects shows no statistically significant difference.

The comparison of study subjects' perceptions of pain in the musculoskeletal system after being infected with COVID-19 is given in Table 6.

Table 1: Response obtained by study subject about the perception item.

S. No.	The Perception Item	The response of study subjects' perceptions
1.	Is there an increase in the number of patients with Musculoskeletal problems in OPD after COVID-19.?	14% strongly agree, agree by 72%, 4% of them as neutral, and 10% remaining as disagree.
2.	Is there an increase in the incidence of fractures after Covid-19.?	Strongly agree by 2%, agree by 12%, 60% as neutral, and the remaining disagree and strongly disagree.
3.	Is there an increase in evidence of strain/sprain after Covid-19.?	42% of them were neutral, 4% strongly agreed 38% agreed, and 16% disagreed or strongly disagreed.
4.	Is there an increase in prevalence of viral arthralgia after COVID-19.?	68% agree, 16% strongly agree and neutral.
5.	Is there an increase in the prevalence of myalgia after Covid-19.?	74% agree, 26% strongly agree.
6.	Is there an increase in the prevalence of arthritis pain after Covid-19.?	4% disagreed, 26% were neutral, 54% of them agreed, 16% strongly agreed.
7.	Is there an increase in the incidence of symptoms of early fatigue after Covid-19.?	66% agree, 32% strongly agree, 2% disagree.

8.	Is there any decrease in the physical activity on mild exertion after Covid-19.?	72% agree, 12% strongly agree and neutral, 4% disagree.
9.	new onset of back pain, neck pain, and hip/knee pain	46%, 48%, 52% agree, 10%, 8%, 24% strongly agree, 34%, 10%, 18% neutral.
10.	Is there an increase in history of frequent fall and Gait abnormalities after Covid-19.?	34% agree, 6% strongly agree, 30% neutral, 28% disagree remaining strongly disagree
11.	Is there an increase in the history of Balance impairment after COVID-19.?	52% agree, 24% strongly agree, 18% neutral, 6% disagree.
12.	Is there an increase in evidence of the frequency of joint pain after Covid-19.?	74% agree, 16% strongly agree, 8% neutral
13.	Is there an increase in the frequency of swelling in and around joints after Covid-19.?	58% agree, 6% strongly agree, 18% remain neutral and disagree
14.	Is there an increase in prevalence of decrease in Ca+ and Vitamin D levels after Covid-19.? And Is there an increase in the incidence of radiological evidence of degeneration changes present among the targeted age group population (18 to 45 years).?	44%, 50% agree, 12%,14% strongly agree,34%,28% neutral,10%, 4% disagree and remaining strongly disagree.

DATA ANALYSIS

Table No 2: DEMOGRAPHIC PROFILE OF THE SUBJECTS

Variables	Opts	Percentage (%)	Frequency(f)
Name of Organization	a) Index Medical college	12%	6
	b) SAIMS	56%	28
	c) PIMS	4%	2
	d) Peoples medical college	12%	6
	e) Apollo Hospital	6%	3
	f) Sacret Heart Hospital	10%	5
Specialization	a) MCH	2%	1
	b) Neurologist	10%	5
	c) Orthopaedics	42%	21
	d) Chest Physician	30%	15
	e) Neuro physician	8%	4
	f) Rheumatologist	8%	4
Designation	a) Professor	4%	2
	b) Assistant professor	34%	17
	c) Associate professor	38%	19
	d) Senior Residents	16%	8
	e) Consultants	6%	3
	f) Junior Residents	2%	1

Table no 3: Frequency & Percentage distribution level.

CRITERIA MEASURE OF MUSCULOSKELETAL DISORDER SCORE		
LEVEL OF SCORES N= 50	PERCENTAGE	FREQUENCY
SEVERE MUSCULOSKELETAL DISORDER. (62-85)	56.0%	28
MODERATE MUSCULOSKELETAL DISORDER. (40-61)	44.0%	22
MILD MUSCULOSKELETAL DISORDER. (17-39)	0.0%	0

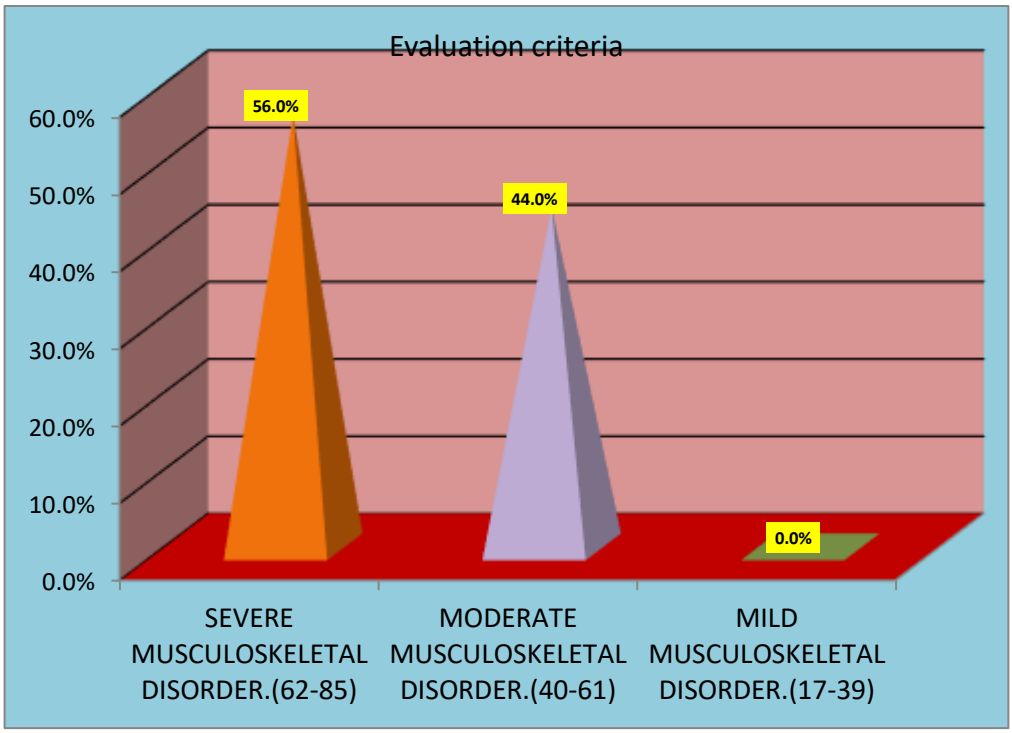

Figure no 2: Frequency & Percentage distribution level.

Table No 4: Descriptive statistics for the prevalence of MSD'S

					N=	50	
DESCRIPTIVE STATISTICS	Mean	Median	S.D.	Maximum	Minimum	Range	Mean %
MUSCULOSKELETAL DISORDER SCORE	62.52	62.5	6.58	82	50	32	73.55
Maximum=85 Minimum=17							

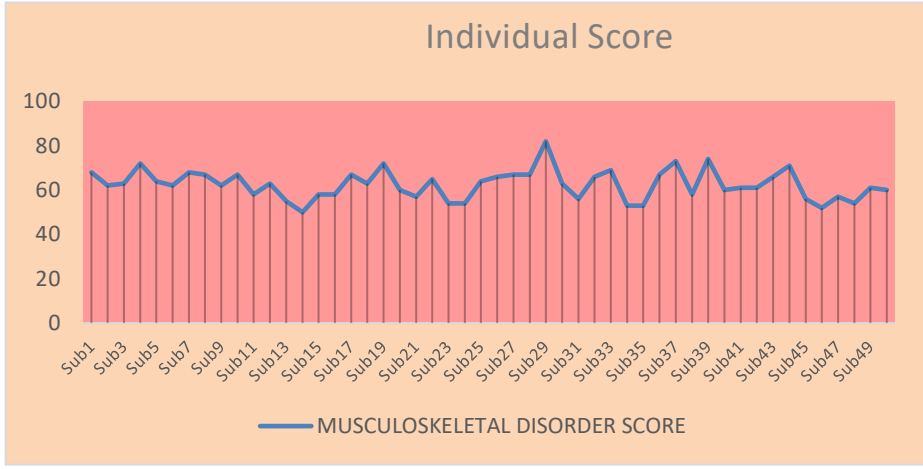

Figure 3: Line diagram showing Individual Scores

Table No 5: Table Showing Descriptive Stats of Demographic Variables.

Variables	Opts	Mean	SD	N
Name of Organization	a) Index Medical college	67.7	7.79	6
	b) SAIMS	61.1	4.86	28
	c) PIMS	56.5	6.36	2
	d) Peoples medical college	63.8	10.17	6
	e) Apollo Hospital	64.3	2.52	3
	f) Sacret Heart Hospital	64.0	8.54	5
Specialization	a) MCH	71.0		1
	b) Neurologist	66.4	7.23	5
	c) Orthopaedics	62.6	3.80	21
	d) Chest Physician	58.3	5.97	15
	e) Neuro physician	65.5	8.89	4
	f) Rheumatologist	68.3	10.01	4
Designation	a) Professor	74.0	11.31	2
	b) Assistant professor	64.5	5.78	17
	c) Associate professor	61.1	5.80	19
	d) Senior Residents	57.6	5.83	8
	e) Consultants	66.0	2.65	3
	f) Junior Residents	61.0		1

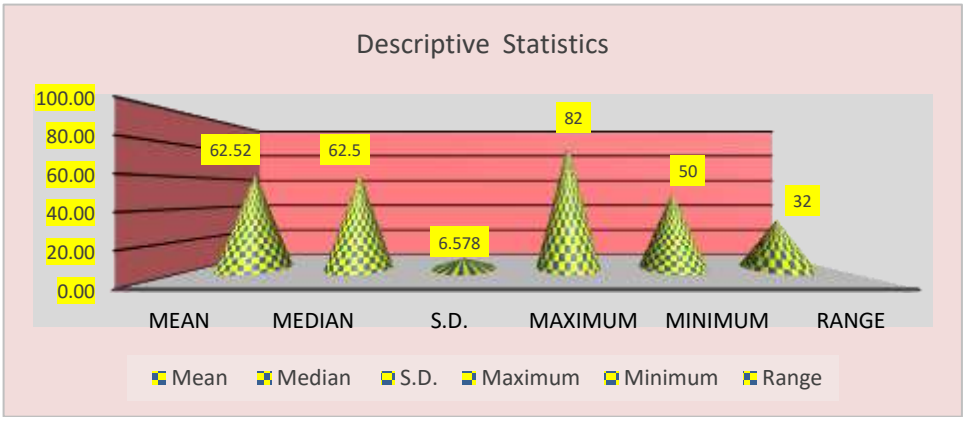

Figure no. 4: Conical Shaped diagram representing descriptive statistics level of Musculoskeletal

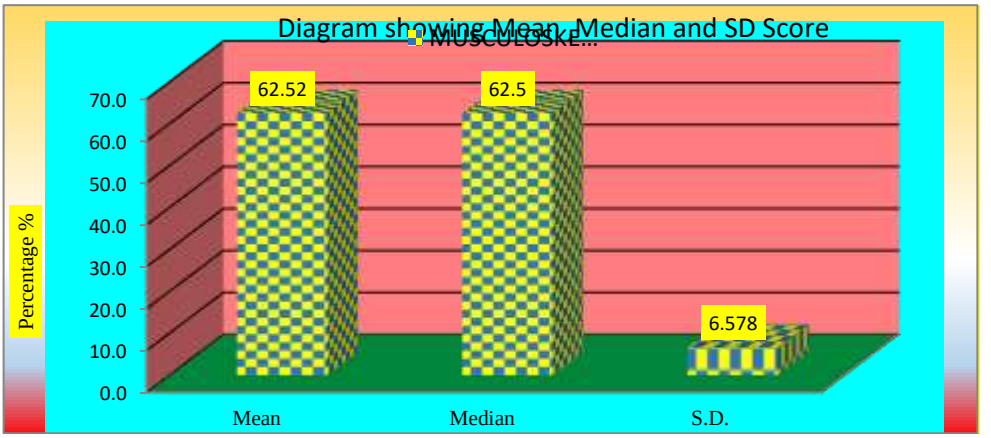

Figure no. 5: Bar diagram representing Mean, Median& SD of MSD's Scores

Table 6: Study subjects' perceptions towards musculoskeletal pain post-COVID-19

Perception Items	N(%)	X^2-value	p-value
1. Is there an increase in the incidence of fracture after covid-19		14.906	0.094*
Strongly Agree	1(2%)		
Agree	6(12%)		
Disagree	13(26%)		
Undecided	30(60%)		
Strongly Disagree	0(0%)		
2. Is there an increase in evidence of strain/sprain after COVID-19		5.922	.748*
Strongly Agree	2(4%)		
Agree	19(38%)		
Disagree	8(16%)		
Undecided	21(42%)		
Strongly Disagree	0(0%)		
3. Is there an increase in the prevalence of viral arthralgia after COVID-19		12.733	0.047*
Strongly Agree	8(16%)		
Agree	34(68%)		
Disagree	0(0%)		
Undecided	8(16%)		
Strongly Disagree	0(0%)		
4. Is there an increase in prevalence of myalgia after COVID-19		3.552	0.314*
Strongly Agree	13(26%)		
Agree	37(74%)		
Disagree	0(0%)		
Undecided	0(0%)		
Strongly Disagree	0(0%)		
5. Is there an increase in arthritis pain after covid-19		34.712	<0.001*
Strongly Agree	8(16%)		
Agree	27(54%)		
Disagree	2(4%)		
Undecided	13(26%)		
Strongly Disagree	0(0%)		
6. Is there an increase in incidence of symptoms of early fatigue after COVID-19		30.389	<0.001*
Strongly Agree	16(32%)		
Agree	33(66%)		
Disagree	1(2%)		
Undecided	0(0%)		
Strongly Disagree	0(0%)		
7. Is there any decrease in physical activity on mild exertion after COVID-19		6.888	.649*
Strongly Agree	6(12%)		
Agree	36(72%)		
Disagree	2(4%)		
Undecided	6(12%)		
Strongly Disagree	0(0%)		
8. Is there an increase in the incidence of new onset of backache after COVID-19		21.024	0.050*
Strongly Agree	5(10%)		
Agree	23(46%)		
Disagree	4(8%)		
Undecided	17(34%)		
Strongly Disagree	1(2%)		
9. Is there an increase in the incidence of new onset of neck pain after COVID-19		20.673	0.055*
Strongly Agree	4(8%)		
Agree	24(48%)		
Disagree	6(12%)		
Undecided	15(30%)		
Strongly Disagree	1(2%)		
10. Is there an increase in the incidence of new onset of hip/knee pain after COVID-19		9.004	.437*
Strongly Agree	12(24%)		

Agree	26(52%)		
Disagree	3(6%)		
Undecided	9(18%)		
Strongly Disagree	0(0%)		
11. Is there an increase in history of frequent fall and gait abnormalities after COVID-19		5.036	.957*
Strongly Agree	3(6%)		
Agree	17(34%)		
Disagree	14(28%)		
Undecided	15(30%)		
Strongly Disagree	1(2%)		
12. Is there an increase in the history of balance impairment after COVID-19		10.409	.580*
Strongly Agree	5(10%)		
Agree	17(34%)		
Disagree	11(22%)		
Undecided	15(30%)		
Strongly Disagree	2(4%)		
13. Is there an increase in evidence of the frequency of joint pain after COVID-19		43.298	<0.001*
Strongly Agree	8(16%)		
Agree	37(74%)		
Disagree	1(2%)		
Undecided	4(8%)		
Strongly Disagree	0(0%)		
14. Is there an increase in the frequency of swelling in and around joints after COVID-19		8.387	.496*
Strongly Agree	3(6%)		
Agree	29(58%)		
Disagree	9(18%)		
Undecided	9(18% [15] [16] [17] [18] [19] [20] [21] [22] [23])		
Strongly Disagree	0(0%)		
15. Is there an increase in the prevalence of a decrease in calcium and Vitamin D levels after COVID-19		9.107	.427*
Strongly Agree	6(12%)		
Agree	22(44%)		
Disagree	5(10%)		
Undecided	17(34%)		
Strongly Disagree	0(0%)		
16. Is there an increase in the incidence of radiological evidence of degeneration changes present among the targeted age group population (18-45 years)		24.413	.018*
Strongly Agree	7(14%)		
Agree	25(50%)		
Disagree	2(4%)		
Undecided	14(28%)		
Strongly Disagree	0(0%)		
17. Is there an increase in the number of patients with musculoskeletal problems in OPD after COVID-1		32.521	<0.001
Strongly Agree	(7)14%		
Agree	(36)72%		
Disagree	(5)10%		
Undecided	(2)4%		
Strongly Disagree	(0)0%		

Note: N: number, %: percentage, X2 -value: related to Pearson's Chi-square test,

* significance level was set at $p \leq 0.01$

4. Discussion

The present study showed that there is an increased prevalence of severe musculoskeletal problems (56%) based on the Physician's evidence-based responses.

Additionally, according to survey self-reporting, we found that COVID-19 patients have an increase in the number of patients with musculoskeletal problems in OPD after COVID-19.

The findings also reveal the increased prevalence of myalgia, joint pain, and arthralgia. Also, there is reduced physical activity and early fatigue reporting to physicians after the period of covid-19 pandemic.

The study provides evidence from concerned medical specialists regarding the increased frequency of new onset of low back pain, cervical pain, and hip and knee pain respectively. The arthritis pain was also reported to be more after covid-19 infection. However, the swelling around the joints is not very prevalent.

According to the physician's opinion, there is an increased frequency of early degeneration in joints and muscles after exposure to COVID-19. Radiological investigations like x-rays can be taken as supportive evidence for which the majority of orthopedics has agreed for features of early degeneration prevailing in the affected population.

The responses were biased toward agree or strongly agree and away from disagree or strongly disagree when asked if the intensity and frequency of their pain had increased. This suggests that there was a non-random shift toward more severe and frequent pain before versus following their COVID-19 illness.

Patients with recovered COVID-19 have pain that worsens and persists, which is consistent with earlier research [8, 9, 11, 15,] that reported comparable occurrences in other recovered COVID-19 patient populations. Myalgias, generalized weakness, and arthralgia are among the symptoms that are persistent after COVID-19 infection that have been documented in 25% to 50% of recovered patients with COVID-19 in the case series by Carfi et al. [17]. In a similar vein, Alkodaymi and colleagues (2022) examined the frequency of persistent indications After reviewing 3209 research, it was discovered that around 22% of the 257,348 population developed myalgia 12 weeks after contracting COVID-19 [18]. Regarding the location of musculoskeletal pain, the discovery that low back pain was common among COVID-19 patients who had recovered is consistent with research by Sagat et al. They discovered that during quarantine, low back pain severity increased, especially in those between the ages of 35 and 49. The following causes for these results were found to be consistent: high levels of stress, longer work hours, and telecommuting [12]. Nonetheless, Tuzun et al. reported that widespread pain was the most frequent form of pain experienced by COVID-19 patients who had recovered [11]. Back pain came in second. In a sample of recovered COVID-19 patients, several risk factors—including the degree of COVID-19 symptoms, age, unhealthy lifestyle habits such as smoking, and inadequate physical activity—were found to be strongly associated with musculoskeletal pain [15] [1].

Pain worsening may be associated with low levels of physical activity [12, 19]. The current results indicate that patients who have recovered from COVID-19 but still experience persistent musculoskeletal symptoms like myalgia, arthritis, reduced physical activity, and early fatigue. This suggests that healthcare professionals should work with these patients to

increase their level of activity. According to the results of a significant meta-analysis of reviews, exercise can enhance physical function, minimize discomfort, and enhance quality of life [20]. COVID-19 may cause musculoskeletal complaints in more than one way; these hypotheses are not mutually exclusive. Firstly, it has been determined that COVID-19 patients with musculoskeletal symptoms had elevated levels of lactate dehydrogenase (LDH) and creatine kinase, which are generated in response to tissue damage [22]. LDH levels were found to be significantly higher in recovered COVID-19 patients with fatigue than in recovered COVID-19 patients without fatigue [8]. A secondary hypothesis is that musculoskeletal pain arises from a COVID-19 inflammatory cytokine storm, which is characterized by the release of pro-inflammatory cytokines such as interleukin-6 [23, 24]. Thirdly, it's possible that, in specific cases, inadequate muscle vascularization linked to COVID-19-associated thromboses is the cause of muscular pain [25, 26]. Lastly, interactions between coronavirus spike proteins and ACE2 (angiotensin-converting enzyme 2) in muscles are involved in the formation of COVID-19. It is unknown, therefore, how important this association is for the progression and symptoms of COVID-19 [27,]

There are some limitations that should be addressed in interpreting our results. First, it should be noted that this was a convenience sample and might not accurately reflect the entire medical specialists or health workers. Second, bias in the self-administered questionnaire responses could skew the results. Thirdly, there has been no research done on the validity and reliability of the self-administered questionnaire. The questionnaire was modified from earlier research, though. Finally, it is crucial to remember that musculoskeletal symptoms are complex and have a wide range of confounding variables, including social, physical, and psychological ones, that were uncontrollable in this investigation. It may take longer and require more statistical power in subsequent research to find this correlation in the multivariate analysis.

5. Conclusion

According to the response of medical practitioners COVID-19 patients who have recovered are reporting more frequent and intense pain episodes than they did before getting sick. In contrast to their pre-illness activity levels, features of early degeneration, reduced Calcium, and Vit D are reported in COVID-19 recovered patients. Physicians in coordination with Physical therapists should give healed COVID-19 patients who have ongoing musculoskeletal complaints additional attention by giving them the activities they need to do and increasing their level of activity.

- Funding

No funds were received.

- Data availability

The data that support the findings of this study are available upon request to the corresponding author.

Declarations

- Conflict of interest

We confirm that there are no known conflicts of interest associated with this publication.

- Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the Declaration of Helsinki and its later amendments or comparable ethical standards. This study was approved by the “ ”, registration number: “ ” and all participants provided informed consent before participation.

- Consent for publication

Not applicable.

- Competing interests

The authors declare no competing interest.

References

1. M. C. A. &. S. J. Sidiq, " Insights into current trends, challenges, and future recommendations for physiotherapy clinical trials in India: Letter to editor," European Journal of Physiotherapy, pp. 1-3, 2024.
2. W. P. Stanhope J, " Learning from COVID-19 to improve access to physiotherapy.," Australian Journal of Prime Health, pp. 271-2, 2020;.
3. R. K. S. Y. Q. M. A. I. C. A. S. H. Islam MS, "Current knowledge of COVID-19 and infection prevention and control strategies in healthcare settings: a global analysis.," Infect Control Hosp Epidemiol. , vol. 41, pp. 1196-206, 2020.
4. d. C. C. Pinto TF, " SARS CoV-2 (COVID-19): lessons to be learned by Brazilian physical therapists," Brazilian Journal Physical Therapy. , vol. 24, pp. 185-6, 2020.
5. B. R. F. C. Dantas LO, "Digital physical therapy in the COVID-19 pandemic.," Brazilian Journal Physical Therapy. , vol. 24, pp. 381-3, 2020.
6. H. D. C. M. V. T. N. M. B. R. W. A. M. L. Smith E, "The global burden of other musculoskeletal disorders: estimates from the global burden of Disease 2010 study," Annals Rheumatic Disease. , vol. 73, pp. 1462-9, 2014.
7. M. S. W. Y. M. Y. Y. R. W. Q. S. C. S. S. R. S. R. H. Z. H. Adhikari SP, "Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review.," Infectious Disease Poverty., vol. 9, pp. 1-2, 2020;.
8. H. M. A. M. H. M. K. D. M. G. K. A. S. A. Ahmed MU, " Neurological manifestations of COVID-19 (SARS-CoV-2): a review.," Front Neurol, p. 518, 2020;.
9. C. S. A. M. B. A. A. M. A. V. E. U. N. K. B. Abdullahi A, "Neurological and musculoskeletal features of COVID-19: a systematic review and meta-analysis.," Front Neurol., p. 687, 2020;.
10. A. A. G.-A. K. A. C. Ö. H. K. B. Sahin T, "Pain symptoms in COVID-19.," American Journal Physical Medicine Rehabilitation., vol. 100, pp. 307-12, 2021;.
11. A. RS., "Levels of physical activity and prevalence of musculoskeletal disorders among physicians in Saudi Arabia post-COVID-19 lockdown: an epidemiological cross-sectional analysis.," Journal Primary Care Community Health. 2021, 2021.
12. K. A. O. D. Y. T. P. D. Tuzun S, "Assessment of musculoskeletal pain, fatigue and grip strength in hospitalized patients with COVID-19.," European Joural Physical Rehabilitation Medicine,

pp. 653-62, 2021;.

13. B. P. P. G. P. T. D. K. D. Šagát P, "Impact of COVID19quarantine on low back pain intensity, prevalence, and associated risk factors among adult citizens residing in riyadh (Saudi Arabia): a cross-sectional study," International Journal of Environmental Research and Public Health. , p. 7302, 2020;.
14. T. B. R. S. D. R. M. M. G. B. A. P. A. M. G. Roggio F, "One year of COVID-19 pandemic in Italy: effect of sedentary behavior on physical activity levels and musculoskeletal pain among university students," International Journal of Environmental Research and Public Health. 2021;, p. 8680, 2021.
15. A.-A. S. B. S. B. K. B. M. C. G. C. C. C. J. C. S. C. R. D. P. Bull FC, "World Health Organization 2020 guidelines on physical activity and sedentary behaviour.," Brazilizn Journal of Sports Medicine., pp. 1451-62, 2020;54:1451–62..
16. N. SM., "Musculoskeletal symptoms and its associated factors among post-COVID-19 patients attended in a rehabilitation centre.," International Journal of Medicine Science Clinical Invention. , pp. 5251-7, 2021.
17. H. E. G. C. H. H. P. R. N. L. H. K. R. J. D. F. C. G. M. L. Docherty AB, " Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study.," BMJ. , p. 369, 2020.
18. B. R. L. F. Carfì A, "Persistent symptoms in patients after acute COVID-19.," JAMA. , pp. 603-5, 2020.
19. O. O. F. N. A. S. B. A. R. R. M. O. M. O. Y. G. D. T. R. K. Z. Alkodaymi MS, "Prevalence of post-acute COVID-19 syndrome symptoms at different follow-up periods: a systematic review and meta-analysis.," Clinical Microbiol Infection. , pp. 657-66, 2022.
20. K. Y. M. O. O. K. D. Toprak Celenay S, "Coronaphobia, musculoskeletal pain, and sleep quality in stay-at home and continued-working persons during the 3-month Covid-19 pandemic lockdown in Turkey," Chronobiol International journal. , vol. 37, pp. 1778-85, 2020.
21. M. R. C. C. M. D. C. L. S. B. Geneen LJ, "Physical activity and exercise for chronic pain in adults: an overview of Cochrane Reviews.," 2017.
22. C. E. K. A. Borisovskaya A, "Exercise and chronic pain. Adv Exp Med Biol," Advance Experimental Medicine Biology, pp. 233-53, 2020;.
23. J. H. W. M. H. Y. C. S. H. Q. C. J. H. C. Z. Y. W. D. M. X. Mao L, "Neurologic manifestations of hospitalized patients with coronavirus disease 2019 in Wuhan, China.," JAMA neurol. , pp. 638-90, 2020.
24. G. D. D. G. A. G. J. S. N. H. A. …. U. M. Booth, "Barriers and facilitators to physical activity for people with persistent musculoskeletal pain: systematic review and synthesis using the Theoretical Domains Framework.," European Journal of Physiotherapy,, pp. 1-14, 2023.