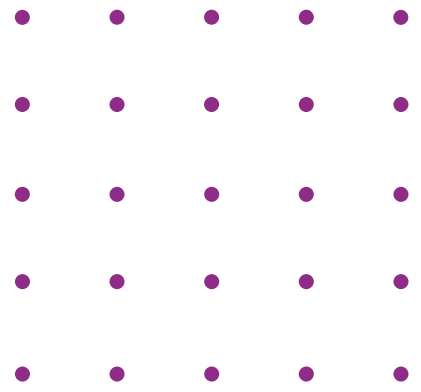




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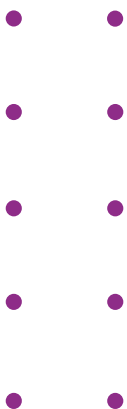


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Impact of Physical and Psychological Rehabilitation on Quality of Life among Ischemic Heart Disease Patients: A Current Perspective

M. Naveed Babur¹, Tayyaba Ayub²

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Editorial

Cardiovascular diseases cause approximately one-third of deaths worldwide ^[1]. Among cardiovascular illnesses, ischemic heart disease (IHD) ranks as the most prevalent ^[2]. Indeed, IHD is acknowledged as an important threat to sustainable development in the 21st century ^[3]. In 2020, around 19.1 million deaths were ascribed to IHD universally. Accessible epidemiologic proof showed that the presence of hypertension, hypercholesterolemia, and excessive cigarette smoking, either separately or in blend, are unequivocal gamble factors in the general population. Factors, for example, obesity, heavy coffee drinking, diabetes mellitus, and a positive family background of ischemic coronary illness are likewise significant, even though the extra explanation of their general significance is as yet required. In later years, two different regions of the existence design had been emphatically embroiled as risk factors; in particular, conduct qualities and propensities for active work, either occupation-related or relaxation time. Tragically, these two regions were not investigated in the absolute earliest epidemiologic examinations, and further documentation of their impact on the normal history of ischemic coronary illness is as yet required.^[4] The evidence accessible at present emphatically proposes that people can be ordered tentatively as indicated by their behavioral trait and propensities for movement. As a general rule, the people with exuberant, ineffectively coordinated drive, expanded Hypochondriasis (MMPI) and expanded Movement Drive (TTS) have a higher frequency of myocardial localized necrosis than those subjects who miss the mark on qualities. Rosenman and Friedman marked such people as having character design Type A. The pace of myocardial localized necrosis seems, by all accounts, to be roughly one-around 50% of that of the stationary population in men who are either routinely truly dynamic over the course of life or who partake in an occupation that requests customary actual work; i.e., transport guides, postal carriers, and so on^[5]. Cardiac Rehabilitation (CR) is an exhaustive multi-disciplinary program to decrease morbidity and mortality in cardiovascular patients. Key advantages additionally remember decreased re-hospitalization and enhancements for personal satisfaction and capability. Patients go through heart restoration comprising of a progression of mediations to streamline their physical, mental, and social working and to settle, slow, or invert the movement of atherosclerosis basic their condition. Such recovery is fundamental in diminishing cardiovascular disease burden, and programs for secondary prevention represent important components of preventive care.

Cardiac rehabilitation has been shown to be both cost-effective and clinically effective in patients with coronary artery disease and heart failure (HF) with reduced ejection fraction.

The current guidelines outline the core components of cardiac rehabilitation and secondary prevention programs and specify the means of evaluation and intervention and the expected outcomes of such interventions. This large-scale trial demonstrates the effectiveness of exercise-based rehabilitation and psychological rehabilitation in older patients. ^[6]

Although the short-term clinical outcomes in hospitalized patients were shown to be improved with the acute-phase initiation of cardiac rehabilitation. The multicenter, randomized, controlled ACTIVE-EMS trial, was introduced in different studies to early rehabilitation and demonstrated greater improvement in lower extremity function in older patients with frailty who were hospitalized without adverse events. Further evidence is needed to determine the efficacy of aerobic exercise and psycho-educational support (problem-solving therapy) in cardiac rehabilitation. Lifestyle and emotional mindset, as well as patient education about the disease, play a critical role in ischaemic heart disease (IHD) outcomes. A psycho-educational approach aims to treat the patient as a whole by emphasizing patient education and empowerment, as well as offering psychological support based on individual needs. The clinical impact of a healthy lifestyle on IHD, emphasizes behavioral modification when necessary. We report recommendations for physical activity that have been confirmed in the setting of IHD and then summarize the interventions aimed at smoking cessation and the management of psychological disorders. Many studies show the greatest impact of cardiac rehabilitation on Ischemic Heart disease but there is limited data on combined psychological and physical rehabilitation. ^[7] A recent study conducted in Pakistan by Mustansar.A on 2021 showed that cardiac rehabilitation greatly improves the quality of life of patients with ischemic heart disease following traditional rehabilitation compared to the conventional group.^[8] Another study conducted by Roksolana.N in 2019 concluded that psychological intervention improved the quality of life of patients. patients, who are scheduled for surgical operation due to ischemic heart disease, a pre-rehabilitation with an individual approach is necessary. Such a program should be multifaceted and should include psychotherapy or improved education regarding behavioral traits, and supervised programs of regular physical activity. Of the three approaches, physical activity might be considered the keystone, since it offers a positive approach to health maintenance and can serve as the source around which an individual modifies the remainder of his life style. Coordination of the educational system and family structure with the efforts of the physical is required to make such a preventive program feasible and successful.^[9]

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Comparative Analysis of Reflective Thinking among Final Year Students of Doctor of Physical Therapy from Different Universities

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ABSTRACT

Aim: This study aimed to assess the level of qualitative reflective thinking among final-year undergraduate students majoring in Physical Therapy across different universities.

Methods: A cross-sectional analytical study was conducted from July 2022 to January 2023 among final-year Physical Therapy students from Government College University Faisalabad (GCUF), the University of Sargodha (UOS), and the University of Health Sciences (UHS) in Pakistan. A sample size of n=216 was collected through purposive sampling. Qualitative Reflective Thinking was measured using the Reflective Thinking Questionnaire (RTQ), categorized into habitual action, understanding, reflection, and critical reflection.

Results: Descriptive analysis presented demographic data, and Friedman's ANOVA revealed significant differences in reflective thinking among students ($p \leq 0.05$). Post hoc comparisons indicated the reflective thinking level as UHS > GCUF > UOS. Demographically, female students and those exposed to problem-based and evidence-based learning exhibited higher reflective thinking.

Conclusion: The findings suggested the need for task-specific practice to enhance reflective thinking, particularly critical reflection, essential for successful clinical careers. The study identified that UHS students demonstrated the highest reflective thinking level. To foster reflective practitioners, additional emphasis on self-reflection and critical reasoning, coupled with exposure to uncertain circumstances, is crucial for student development.

Keywords: Reflective thinking, Critical reflection, Critical reasoning, Critical thoughts, Habitual action, Reflection, Understanding.



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Original Research Article

Introduction:

Reflection is the process of persistent, comprehensive evaluation of active thought and information in light of the evidence to justify the judgment that it tends to lead [1]. This is a cognitive process that involves observation, assessment, and evaluation of a student's descriptive performance [2]. Reflection in the healthcare profession is an ongoing process of learning and is core to professional development. The objective of standardized reflection is to allow an individual to reflect on, educate about, and advance their professional skills [3].

"Reflective thinking is a kind of critical thinking that indicates higher, more advanced thinking than rote thinking". The phases of reflective thinking are as follows: such as habitual action, understanding, reflection, and critical reflection [4]. Through reflective thinking, an individual should be able to analyze and evaluate any confusion or problem, motivating themselves to overcome challenges. Reflective thinking aids in problem-solving, process control, determining the optimal approach for the next step, developing improved plans for future resolutions, and effectively managing issues [5]. Human beings build and grow knowledge through thinking, indicating that human

thinking is employed for active learning. Each individual has a unique degree of thinking [6].

Reflective thinking helps to develop a questioning attitude and new perspective in the professional and students [7]. Habitual action is defined as an activity that is regularly performed, typically with minimal conscious thought. It is a physical and automatic activity that operates independently of cognitive processes. Understanding involves distinguishing learning and reading from other situations. Reflection, characterized by active, attentive, and thorough consideration of information, represents a higher level of reflective thinking. Critical thinking, the pinnacle of reflective thinking, denotes behaviors that are well-informed, and grounded in observation and emotions [8]. Reflective thinking could be viewed as a measure of learner achievement. Reflective learners are conscious of their learning; as a result, they can manage and access what learners know, what learners need to know, and how to fill the gaps in their knowledge. By reflecting on thinking, we evaluate student self-reflection. Self-reflection is a person's attitude towards active self-examination and this kind of attitude develops inside a mature mental approach that can aid

individuals to learn actual knowledge in life. The primary key in self-examination is self-reflection, which can facilitate psychological self-healing [9]. Reflective thinking encourages students to learn and enjoy the process of learning [10].

Reflective thinking is a skill that helps students in expressing tacit learning strategies, which are the incapacity to communicate what they know since they just learn and cannot understand. Reflective thinking may help students to engage in a successful learning process [11]. Reflective thinking is divided into two categories: reflection during action and reflection after action. Reflection during the action is defined as thinking critically while performing an activity. On the other hand, reflection after the action is characterized as thinking critically after engaging in an activity [12]. As a learning strategy, self-reflection includes identifying self-monitoring by independent learning objectives, plans, approaches, experiences, and outcomes, as well as recognizing and creating understanding or gaining new perspectives [13].

After the process of reflective thinking, learning, and self-assessment phase of reflective practice. Reflective practice is defined as "learning through it and from experiences to gain new insights about self and practice" [14]. Students improved in the three phases of reflective practice: awareness of thoughts and feelings, critical examination of the circumstance, and formation of new perspectives according to an analysis of their reflective journals [15]. The primary expectation of healthcare practitioners is the development of strong clinical reasoning abilities as well as the capacity to reflect on practice to improve their experience [16].

Being a reflective practitioner is an essential life ability not just for student practitioners, but also for graduate practitioners because it encourages them to think about it and critically evaluate their experiences, helping them to become more effective in practice [17]. In the majority of American states, the current physical therapy profession has achieved the legal rights and obligations of autonomous practice [18]. As a result, patients now have more expectations of physical therapists to provide excellent, effective healthcare services that they can trust. Therefore, physiotherapy programs must include courses that educate students on professional autonomy and qualification responsibilities. This preparation involves developing the expertise, abilities, understanding, and qualities needed for performing this responsibility. Thus, physical therapists must become effective reflective learners early in their professional careers to develop individual abilities and expertise [19].

Methods:

Cross-sectional observational study was conducted between July 2022 and January 2023 to measure the level of qualitative reflective thinking among final-year undergraduate students majoring in Physical Therapy across three universities in Pakistan. This included final-year Physical Therapy students from Government College University Faisalabad (GCUF), the University of Sargodha (UOS), and the University of Health Sciences (UHS).

The sample size, calculated using the Rao soft software with a 95% power of the study and a 5% probability of error, was determined to be n=216. Final Year Physical Therapy Student. Participants were selected based on specific criteria to ensure the relevance and integrity of the research findings. Final-year undergraduate students majoring in Physical Therapy were included in the study, regardless of gender, provided they demonstrated good understanding abilities. Conversely,

individuals enrolled in programs other than Physical Therapy, those unwilling to participate, and those with incomplete forms were excluded from the study.

Recruitment was carried out using purposive sampling, a non-probability sampling technique. This method allowed researchers to intentionally select participants based on predefined criteria, ensuring representation from the target population.

Before participation, all selected students were provided with detailed information about the study, and written informed consent was obtained. This process ensured that participants were fully aware of the study's purpose, procedures, and the voluntary nature of their involvement.

Participants were assured of the confidentiality of their identity and responses, promoting open and honest participation.

Data was collected using the Reflective Thinking Questionnaire (RTQ), a Likert-type scale developed by Kember [20]. The RTQ assessed reflective thinking through four constructs: Habitual action (HA), Understanding (U), Reflection (R), and Critical Reflection (CR) [21]. Habitual action and understanding are associated with well-structured tasks, while reflection and critical reflection focus on relatively unstructured problem-solving [22]. Participants were assured of the confidentiality of their identities.

Data were analyzed using SPSS version 23. Descriptive statistics, including frequency tables, percentages, and mean \pm SD, were employed to present demographic data. Comparative analysis was conducted using Friedman's ANOVA, and post hoc analysis was performed to compare reflective thinking among students. The significance level ($p \leq 0.05$) was considered.

Ethical approval was obtained from the research ethical committee of "Muhammad Institute of Medical and Allied Sciences" (Approval No.: 2022/IRB/2/PT/09). Informed written consent was obtained from all participants, emphasizing the voluntary nature of participation and the confidentiality of their information.

Results:

The results of the study provided valuable insights into the reflective thinking levels among final-year physical therapy students from different universities.

Socio-Demographic Variables	Description	GCUF (%)	UOS (%)	UHS (%)	X2	P
Gender	Female	75.5	71.83	97.02	27.054	0.00
	Male	24.5	28.17	2.99		
Problem-Based Learning	Yes	66.66	36.62	80.59	29.638	0.00
	No	33.33	63.38	19.40		
Evidence-Based Learning	Yes	70.51	39.44	91.04	42.127	0.00
	No	29.49	60.56	8.96		
Decision Making	Research article	32.9	26.76	37.31	9.893	0.042
	Books	30.1	38.02	16.42		
	Supervisor	37.0	35.21	46.27		

Table 1: GCUF= Government College University Faisalabad, UOS= University of Sargodha, UHS= University of Health Sciences, %= percentage, X2= Pearson's chi-squared, P= coefficient of alpha

Table 1: Demographic Variables and Sources of Evidence Among Participants

Female participants dominated across all universities (GCUF: 75.5%, UOS: 71.83%, UHS: 97.02%). A substantial proportion of students engage in problem-based learning, with the highest percentage in UHS (GCUF: 66.66%, UOS: 36.62%, UHS: 80.59%). Evidence-based learning is prevalent, particularly in UHS (GCUF: 70.51%, UOS: 39.44%, UHS: 91.04%).

Decision-making sources include research article reading, books, and supervisor guidance, with varying preferences among universities (e.g., GCUF: 32.9%, 30.1%, 37%; UOS: 26.76%, 38.02%, 35.21%; UHS: 37.31%, 16.42%, 46.27%). These findings elucidated the demographic characteristics and educational practices of the participants, setting the stage for a nuanced exploration of reflective thinking levels in the subsequent sections of the study.

Variables	GCUF n=78 (Mean ± SD)	UOS n=71 (Mean ± SD)	UHS n=67 (Mean ± SD)	F	p	Post Hoc tests
Habitual action	11.67 ± 2.15	10.21 ± 1.83	12.33 ± 2.29	18.538	0.000	UHS>GCU>UOS
Understanding	11.55 ± 2.11	10.28 ± 2.17	13.52 ± 2.67	34.119	0.000	UHS>GCU>UOS
Reflection	11.53 ± 2.38	10.39 ± 1.73	13.82 ± 2.24	45.716	0.000	UHS>GCU>UOS
Critical Reflection	11.59 ± 2.35	9.82 ± 2.15	14.15 ± 2.72	56.218	0.000	UHS>GCU>UOS
Age	22.77 ± 1.76	22.97 ± 1.70	22.12 ± 1.50	4.899	0.000	UHS>GCU>UOS
Number of Patients catered	6.63 ± 5.90	5.37 ± 4.79	8.15 ± 6.19	4.178	0.017	UHS>GCU>UOS

Table 2: GCUF= Government College University Faisalabad, UOS= University of Sargodha, UHS= University of Health Sciences, F= effect size, P= coefficient of alpha

Table 2: University-Based Comparison in Level of Reflective Thinking

The analysis of reflective thinking among final-year physical therapy students from different universities revealed noteworthy findings. UHS consistently outperforms GCUF and UOS across various dimensions. UHS students exhibited higher scores in habitual action (12.33 ± 2.29), understanding (13.52 ± 2.67), reflection (13.82 ± 2.24), and critical reflection (14.15 ± 2.72) compared to their counterparts.

Significant differences in mean scores highlight UHS as the university with the most profound levels of understanding and critical reflection. Additionally, UHS students, on average, have a slightly lower age (22.12 ± 1.50) compared to GCUF (22.77 ± 1.76) and UOS (22.97 ± 1.70). Furthermore, UHS students report catering to a higher number of patients (8.15 ± 6.19), indicating potentially more extensive clinical exposure. Overall, these findings underscore the variation in reflective thinking levels and related factors among final-year physical therapy students from different universities.

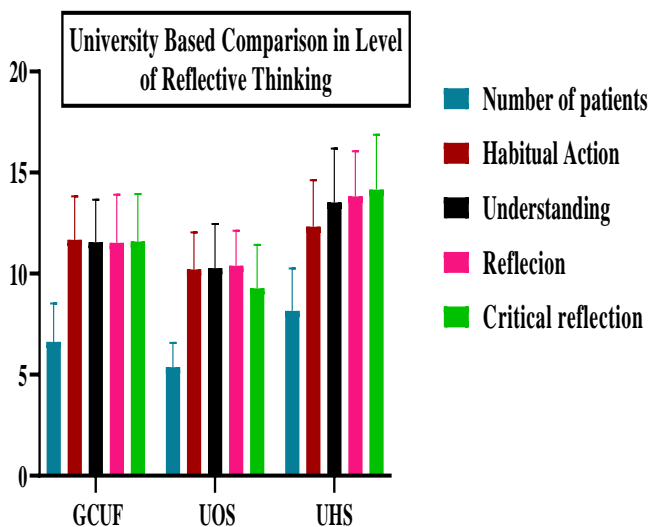


Figure: GCUF= Government College University Faisalabad, UOS= University of Sargodha, UHS= University of Health Sciences

Figure 1: Comparative Analysis of Reflective Thinking Process

The graphical representation depicts a greater inclination towards reflective thinking, understanding, and critical reflection among UHS students.

Discussion:

This study aimed to investigate the level of Reflective Thinking among final-year Physical Therapy students, evaluating the effectiveness of the curriculum in fostering reflective thinking throughout the course. This inquiry was vital for shaping future physical therapists into reflective practitioners, a crucial component of effective clinical decision-making.

Ugur Akpur conducted a study examining the structural relationships between critical thinking, reflective thinking, creative thinking, and their connection to academic accomplishment [23]. The research revealed significant and positive relationships among critical thinking, reflective thinking, creative thinking, and academic achievement. Greenberger emphasized the importance of reflection in generating learning situations with outcomes dependent on experiences, specific contexts, and literature-guided practices [24].

Karnieli-Miller et al. explored the relationship between medical students' communication skills and reflective abilities, highlighting the positive impact of strong reflective abilities on communication skills, particularly in providing explanations to patients [25].

In the present study, students demonstrated proficiency in self-reflection and critical reasoning. However, the findings suggested the need for more time, appropriate triggers, and skills to deal with uncertain circumstances to become successful reflective practitioners, emphasizing the importance of cultivating involuntary habitual activity. Ulger K assessed the association between imaginative thought and students' critical thinking skills, revealing a positive connection between low-level creative reasoning and critical thinking abilities. The study suggested that problem-solving techniques stimulate the development of reflective thinking and innovative ideas [26].

The current study compared reflective thinking levels among final-year physical therapy students from different universities, revealing a statistically significant difference between students from various institutions in their reflective thinking abilities. Flowers et al. investigated changes in clinical skills, self-efficacy, and critical reasoning among Physical Therapy undergraduate students after pediatric experiential learning. The study concluded that a high dose of pediatric experiential learning positively impacted students' self-perceived professional skills and self-efficacy [27].

Costello et al. conducted a cross-sectional study exploring grit, self-reflection, and anxiety among Physical Therapy undergraduate students. The study found that PT students scored higher on the Self-Reflection and Insight Measure compared to nursing and medical students. The variations in grit scale scores over time suggested a developing attitude of expertise and educational experiences [28].

Greenfield et al. utilized six concepts to enhance reflective practice in early clinical experiences, including clinical decision-making, client communication, the impact of the practice environment, the development of administrative and clinical skills, the significance of clinical experiences in validating learning, and the development of learning strategies [29]. Ziebart and MacDermid conducted a scoping review emphasizing reflection as an essential component of practice in

physical therapy. They called for improved reflection implementation and a deeper pool of research to advance reflective practice^[30].

Orit Karnieli-Miller examined the relationships between medical students' reflective abilities displayed in writing narratives and communication skills demonstrated in simulated patients breaking bad news situations. The study suggested that a high level of reflective capacity may enhance communication abilities, particularly in delivering explanations to patients and managing emotions empathically^[31].

Conclusion:

This study advocated for a continued emphasis on self-reflection and critical reasoning within the curriculum, coupled with exposure to uncertain circumstances, to further enhance students' reflective thinking abilities. The recognition of UHS as a leading institution in this regard provides valuable insights for other academic institutions aiming to produce reflective practitioners within the field of Physical Therapy.

Limitations:

The study acknowledged potential limitations, including the use of self-reported data and the inherent subjectivity in measuring reflective thinking. The findings may be context-specific to the selected universities and may not be generalized to other academic settings.

Declarations:

Ethical aspects: The subjects were recruited after taking written informed consent. All of them were informed about the purpose and potential benefits of study.

Consent for publication: All the co-authors of this study are potentially willing to publish this paper in your worthy journal

Registration: This study was conducted after taking approval from research ethical committee of "Muhammad Institute of Medical and Allied Sciences"

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Levels of Physical Activity, Psychological Wellbeing, and Health Related Quality of Life among Pakistani Female Basketball Players

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ABSTRACT

Background: Competitive sports like basketball, football, and tennis are considered the most effective to reduce anxiety, stress, and depression levels. On the other hand, competitive players exhibit a more significant quality of life than non-players.

Objective: This study aimed to determine the levels of physical activity, psychological wellbeing, and health-related quality of life in female basketball players in Pakistan.

Material and Methods: 121 Pakistani female basketball players participated in this cross-sectional study. Personal information forms, International Physical Activity Questionnaire Short-Form 7 (IPAQ SF 7), Depression, Anxiety and Stress Scale-21 (DASS-21), and 36-Item Short-Form Health Survey (SF-36) were used as data collection tools. Descriptive statistical analysis was performed to observe the level of each variable individually using the SPSS 21 version.

Results: Out of 121 female participants, 65 were engaged in vigorous physical activity (VPA); 48 were satisfying the criteria for moderate physical activity (MPA), and only 8 females were involved in low physical activity (LPA). Participants had a mean age of 19 years. On the DASS 21 scale, only 3 participants had severe depression; moderate depression was prevalent only in 6 females; mild depression was common in 46 females while 66 females were normal. Severe anxiety levels were present only among 2 females; 6 females were facing moderate anxiety while 45 had mild anxiety. 0.826% of participants had severe stress; 7.438% of females were dealing with moderate stress while 38.84% were dealing with mild stress. Moreover, participants marked more than average scores in each item of the SF-36 questionnaire indicating a significant quality of life.

Conclusion: The majority of female basketball players were highly physically active, and nearly all of them demonstrated excellent psychological well-being and significant health-related quality of life (HRQoL).

Keywords: Basketball players, female, physical activity, exercise, mental health, quality of life.

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Original Research Article

Introduction:

Regular physical activity (PA) is more evident in young people and from the past two decades, its importance has increasingly been known [1]. Caspersen has defined PA as "any bodily movement produced by skeletal muscles that require energy expenditure" [2]. According to "The Physical Activity Guidelines for American" each age group can achieve satisfactory levels of well-being by implementing the recommended level of PA in their daily living. Children and adolescents aged 6 - 17 years old should partake in no less than 60 minutes of moderate physical activity (MPA) every day [3]. This recommendation is particularly significant for girls given they have a higher probability of having related health issues due to an insufficient amount of physical activity [1] and typically partake in less exercise than boys [4,5]. Adult individuals should take part in moderate-intensity physical

activity for a minimum of 150-300 minutes per week, whereas in the case of vigorous-intensity physical activity, it should be at least 75-150 minutes a week [3]. According to one report on "U.S. PA in young adults (12-15)", MVPA is more beneficial and evident in adolescents. Apart from school-based physical education and gym classes, youngsters in the U.S. take part in different kinds of physical activities like basketball, football, and dancing. Competitive sports like basketball, football, hockey, tennis, etc. are highly challenging sports activities. The highest activity in which 48% of American adolescent boys are participating is basketball. Meanwhile, after running and walking, 21.4% of girls are taking part in basketball to achieve the advantageous levels of PA [6]. Instructed coach education sessions can reduce physical inactivity in players without affecting their motivation levels and enhance MVPA [4]. PA is essential for maintaining physical and psychological wellbeing.

Apart from statistically and clinically decreasing the mortality rate of coronary heart disease, PA has proven benefits by reducing the risks of diabetes, colon and breast cancer, and depression [7].

Young adults who are involved in daily PAs have better academic performance as well as physical and psychological wellbeing [6]. Inadequate PA can lead to a decline in psychological well-being, such as more pronounced feelings of anxiety, stress, and depression. However, participation in competitive sports which involves, MVPA has been significantly linked to a decreased occurrence of emotional distress and depression. To alleviate the levels of depression and anxiety, PA and exercise are considered the most effective treatment [8]. Moreover, remarkable differences in anxiety levels have been noticed in those who are involved in competitive sports like Basketball [9]. However, psychological measures like mood and performance anxiety are also influenced in competitive sports. These can affect the following aspects like self-efficacy, happiness, consistent participation, and others. In sports psychology, one of the most commonly evaluated variables is anxiety, which is related to psychological reactions. It is often considered as a negative emotional state defined as anxiousness, nervousness, and worry. One of the past investigations has indicated that performance anxiety is more evident in independent sports like diving as compared to group sports like basketball [10]. Engaging in sports and exercise activities can be beneficial for psychological development, as it can enhance self-confidence and facilitate social acceptance [8, 10]. Many researchers have described healthier impacts of sports participation, especially in adolescents. Research on U.S. and European adolescents demonstrated that despite age and sex, higher levels of PA have an effective impact on self-participation, life satisfaction, and perceived enjoyment. Studies conducted by Balaguer et al. and Wagnsson et al. have also indicated that there are positive influences of sports participation on the psychological health and quality of life of adolescents and young adults [10].

The term Health-related quality of life (HRQoL) is characterized as physical, mental, and social health status according to one's perception [11, 12]. Higher PA levels are associated with improved HRQoL, which is evident in Brazilian master basketball athletes, who attained higher scores on all parameters of HRQoL compared to those with sports injuries [13]. Valovich McLeod TC et al. have reported similar findings that uninjured athletes have higher scores of HRQoL than those with self-reported injuries [14]. Moreover, health-related programs in school are considered effective because they enhance healthier lifestyles that successively promote and improve HRQoL among children and adolescents [15].

Although extensive research has been carried out on levels of PA and their beneficial effects, especially on psychological well-being in each age group and among multi-sport athletes but no cross-sectional study has been carried out on female basketball athletes in Pakistan, their levels of physical activity, mental health, or HRQoL. Hence, the purpose of this paper is to assess the levels of PA, HRQoL, and psychological well-being among female basketball players in Pakistan.

Materials and methods

A quantitative cross-sectional study design was used. This design is one of the more practical ways to collect data at one point. Non-probability purposive sampling technique was employed and 121 basketball players recruited in the study via RAO software. Female participants who were basketball

athletes aged 15 to 30 years were recruited in this study; however, all those females who were injured, got fractured within the past 6 months, pregnant, or had any kind of illness at the time of recruitment were excluded from this research. The present research was initially granted approval and ethical clearance from the Advanced Study and Research Committee (ASRC) of Isra Institute of Rehabilitation Sciences Islamabad on the 11th of November, 2016. Subsequently, permission was taken from Pakistan Sports Board before data collection on the 7th of December, 2018. The study was conducted over the course of 6 months from December 2018 to May 2019 at the Islamabad Sports Complex, with all participants providing written consent.

General demographic data was collected by self-administered questionnaires in which each participant was asked about age, occupation, and BMI.

The International Physical Activity Questionnaire Short Form 7 (IPAQ-SF 7) was employed to evaluate physical activity levels. The development of the IPAQ in 1998 by the World Health Organization (WHO) was intended to allow for accurate international-level monitoring of PA [16]. Subsequent studies by researchers, like the work of Oh et al., have aimed to determine the reliability and validity of distinct versions of the IPAQ SF and concluded that the Korean version of the IPAQ SF is viable [17]. The "7-item recall scale" is considered best for the prevalence study of PA as compared to the IPAQ long-form. This short form provides information on walking, moderate and vigorous activity, and sedentary activity over the previous seven days [18]. Through the application of a scoring protocol based on the IPAQ, participant responses were transformed into metabolic equivalent task minutes per week (MET-min/wk) in the current study. For each type of activity, an average score of MET was obtained using Ainsworth et al. compendium [19]. The following values for each activity, i.e. "walking = 3.3 METs, moderate physical activity = 4.0 METs; vigorous physical activity = 8.0 METs, and total physical activity MET-min/wk = sum of walking + moderate + vigorous MET-min/wk scores" were utilized in the evaluation of IPAQ data. Physical activities were classified into three levels of intensity: low, moderate, and high. Low physical activity (LPA) involves zero or inadequate activity that doesn't belong to groups 2 or 3. Activity patterns that meet the criteria of greater than 20 minutes of vigorous activity/day for at least 3 days, as well as 30 minutes per day of moderate-intensity activity or 5 days of walking, for a total of 600 MET-minutes/week over 5 days, will be classified as moderate. Any given activity or task which meets either of the two criteria will be recognised as high-intensity due to its energetic and vigorous levels of intensity being maintained over the course of at least 3 days, with a total of MET-min per week ending at least 1,500. In addition, for 7 days or more, 3,000 MET-min must be achieved when combining any walking, moderate, or vigorous-intensity activities [20].

Psychological well-being in female basketball athletes was evaluated by the "Depression, Anxiety, and Stress Scale-21" (DASS 21). The DASS 21 was a three-subscale, self-reporting questionnaire consisting of seven items for each subscale, devised by Lovibond and Lovibond. This shortest version serves to investigate mental states that illustrate symptoms of depression, anxiety, and stress. The scoring of DASS 21 ranges from 0 to 21, and each of these subscales was titled "DASS-21-Depression (DASS-21-D)", "DASS-21-Anxiety (DASS-21-A)", and "DASS-21-Stress (DASS-21-S)". To determine how each statement relates to the participant on the DASS-21, each

player was asked to recall their experiences and incidents of the past seven days. On this scale, each of 21 items contains four possible responses: 0 "Did not apply to me at all–Never", 1 "Applied to me to some degree, or some of the time–Sometimes", 2 "Applied to me to a considerable degree, or a good part of the time–Often" to 3 "Applied to me very much, or most of the time–Almost always" [21]. Although the efficacy of DASS-21 in terms of reliability and validity has been widely documented in adolescents and adults in Western countries [22], however, the Asian population has acceptable reliability and validity, i.e. Pakistani and Vietnamese populations [23,24].

To identify HRQoL among female basketball players, "36-Item Short-Form Health Survey" (SF-36) was employed. SF-36 was a popular general questionnaire that contains eight subscales: "physical functioning (PF)", "role limitations due to physical health problems (RP)", "bodily pain (BP)", "general health perceptions (GH)", "vitality (VT)", "social functioning (SF)", "role limitations due to emotional problems (RE)", and "mental health (MH)". Players answered questions in a Likert-style format, with each subscale received a score ranging from 0 to 100, with 100 indicated the healthy, most positive, and 0 the worst and unsatisfactory quality of life [24, 26]. The SF-36 questionnaire was reliable and valid among adolescent populations [27], and athletes are noted to exhibit higher scores than non-athletes [28].

Descriptive statistics, for example, mean, standard deviation (SD), range, frequency, and percentage, were performed to analyse the demographic data, IPAQ-SF 7, SF-36-items, and DASS-21 survey questionnaires. Management and analysis of data were performed using SPSS 21 version.

Results:

A total of 121 female basketball players were recruited in this descriptive study, and the response rate was 100%. Table 1 presents the demographic characteristics of participants in the form of mean and SD.

	Mean±SD
Age (years)	19 ±1.14
Height (cm)	162±7.39
Weight (kg)	61±8.47
BMI	24±2.82

Table 1: Participants' demographic characteristics

IPAQ-SF 7 questionnaire	Mean	SD
1- Vigorous physical activities days in a week	2.45	1.54
2- Vigorous physical activity minutes in a day	27.1	12.9
3- Moderate physical activities such as lifting light weights, daily bicycling, or double basketball days throughout the week.	1.93	1.1
4- Moderate physical activities minutes in a day	28	11
5- Days of walk (at least 10minutes) in a week	2.5	1.6
6- Walking minutes in a day	28	13
7- Spend time sitting on a week	3	1.94
Calories METS	249	221.40

Table 2: Items of IPAQ-SF 7 as a mean and SD.

Items of IPAQ-SF 7 are categorized as "low physical activity, moderate physical activity, and high physical activity" and presented as a frequency in figure 1.

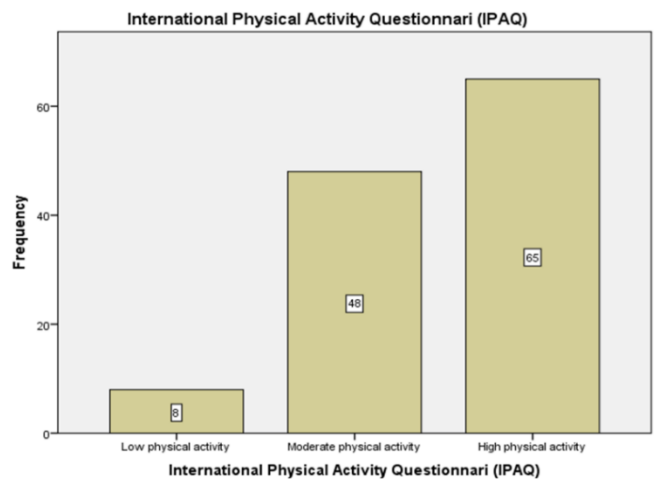


Figure 1: Level of physical activity as a frequency

This figure illustrated the engagement of female basketball players with levels of physical activities. As shown in figure 1, only 8 (6%) participants were doing LPA. Consequently, they were inactive and did not fit the requirements of categories 2 or 3. However, 48 (40%) players met the MPA criteria (category 2) by acquiring a minimum of 600 MET-mins/week, while 65 (54%) female basketball players acquired the highest level of physical activity (category 3) with a minimum of 3000 MET-minutes/week. This data signified that female basketball players had a significant level of physical activity and took part in more dynamic activities.

Psychological well-being as subscales of DASS-21 i.e. "DASS-21-D", "DASS-21-A", and "DASS-21-S", was presented individually using frequencies and percentages in the following graphs. Figure 2 depicted the extent of depression among women participated in basketball. It was found that the majority of 55% were deemed mentally healthy, 38% experienced mild depression, with only 5% and 2% experienced moderate and severe levels of depression, respectively.

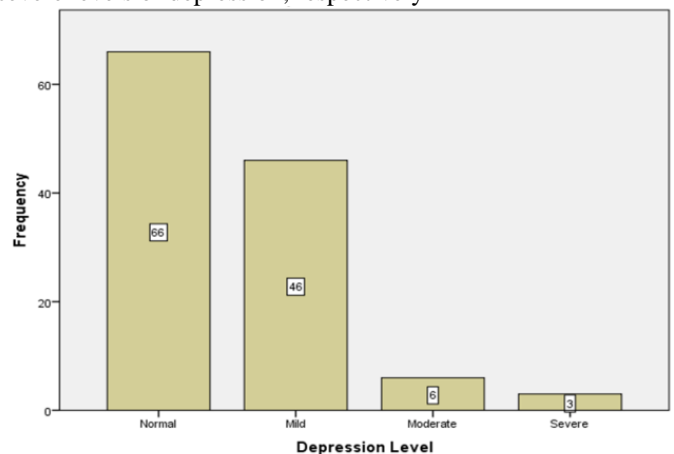


Figure 2: Level of depression as a frequency

Representing a frequency, figure 3 demonstrated the levels of anxiety among players. Anxiety levels have been categorized as mild (37%), moderate (5%) and severe (2%), while the normal bar (56%) showed those participants who scored less in DASS-21-A.

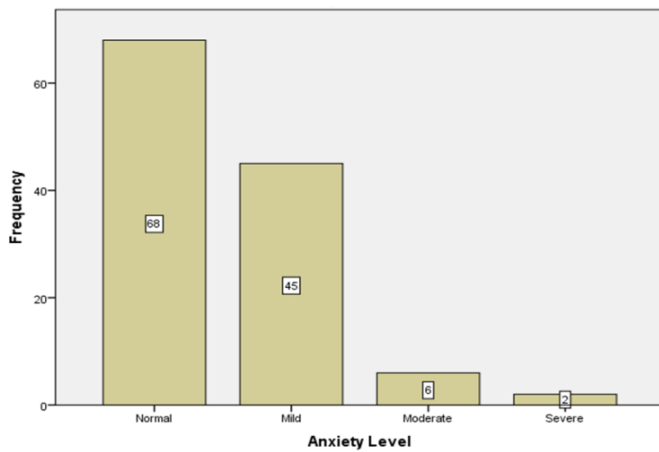


Figure 3: Anxiety level as a frequency

Stress levels have also been classified as mild, moderate, and severe. The participants without any symptoms of stress as marked in DASS-21-S illustrated as a normal bar. Figure 4 presents the levels of stress as a percentage.

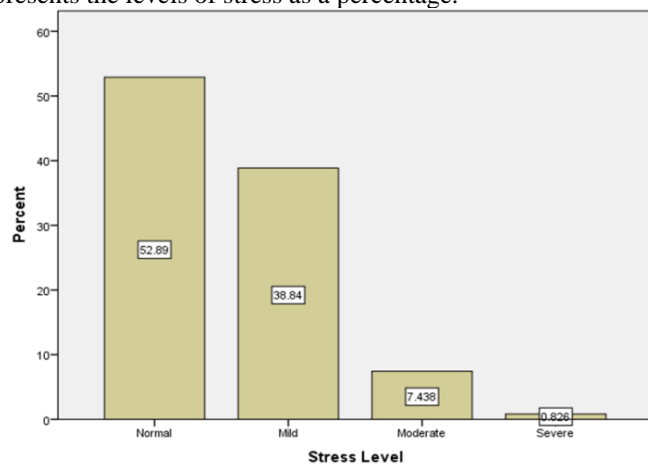


Figure 4: Stress level as a percentage

HRQoL among female basketball players was evaluated by using an SF-36 items questionnaire.

Parameters	Minimum	Maximum	Mean	SD
Physical functioning	20.00	75.00	48.00	10.85
Role limitation due to physical health	0.00	100.00	57.70	24.85
Role limitation due to emotional problem	0.00	100.00	58.33	30.93
Energy fatigue	25.00	75.00	48.91	10.23
Emotional well being	20.00	68.00	44.50	10.97
Social functioning	37.50	87.50	56.45	13.36
Pain	22.50	100.00	64.10	17.37
General health	25.00	80.00	53.00	11.54

Table 3: Items of SF-36 as a Minimum, Maximum, mean and SD

Discussion:

This research study sought to investigate the levels of PA among female basketball players along with psychological wellbeing and HRQoL. The results revealed a significant prevalence of intense PA levels among female basketball players, indicating that an extended amount of practice time was devoted to moderate to vigorous activities. The current study showed that these female athletes met the criteria of moderate to high physical activity; i.e. they had accomplished at least 600 to 3000 MET-minutes/week. Guagliano JM et al. carried out their study on 76 female basketball players aged 9 to 12 years during an organized youth sports program of 5 days in Greater Western Sydney, Australia, in 2013. Results revealed that after brief physical education sessions, these

female basketball athletes had attained MVPA without compromising their motivation levels, and a substantially smaller amount of time was dedicated to inactivity. Moreover, a remarkable involvement in VPA has been marked among these athletes, while VPA has notable health benefits in both ways, i.e. mentally and physically [4]. Similarly, Eddolls WT et al had concluded in their study that adolescents can achieve advantageous and positive levels of mental health and quality of life by increasingly participating in vigorous physical activity [29]. Another study has also revealed that participation in athletic activities at sports clubs is more beneficial in attaining advantageous and recommended levels of MVPA [30]. Findings of the psychological well-being of this study have shown that the majority of the female players had excellent mental health and less than half experienced mild degrees of depression, anxiety, and stress. These results appear to be in line with previous study that revealed that Spanish female basketball players who played at the national level exhibited lesser levels of competitive anxiety as compared to those females who played at the first divisional level. The reason for this difference was apparent as national female athletes were engaged with a greater extent of levels of PA to practice than first divisional female athletes [9]. Even though this study was not intended to find out, the relationship between levels of PA and psychological wellbeing among Pakistani female basketball players, however as recommended by the WHO and many other studies, no one can deny the positive impact of MVPA on mental health. Therefore, the findings observed in this study mirror those of a previous study that has examined VPA, sports participation among college athletes. Results revealed that consistent engagement with VPA contributed to excellent mental and physical health among college athletes [31].

The current study reported average to good scores for female basketball athletes on 8 parameters of the SF-36 subscales, which indicate those female basketball athletes had good and satisfactory HRQoL. This finding corroborated the ideas of Snyder AR et al, who suggested that non-athletes marked lower scores on SF-36 as compared to athletes thus their mental, physical and emotional wellbeing was relatively compromised. On the other hand, pronounced benefit to general health had been identified in adolescents with athletic involvement [28]. Similarly, Moreira NB et al carried out a study on Brazilian basketball master athletes to investigate the prevalence and aspects of sports injuries and their association with PA and HRQoL. This study revealed that although PA positively correlates with HRQoL sports injuries had declined the efficacy of HRQoL on both domains, i.e. mental and physical [13]. A Brazilian cross-sectional survey was carried out between undergraduate athletes and general college students to assess sports participation and levels of PA impact on HRQoL. The study concluded that excellent HRQoL was apparent in those athletes who had higher levels of PA and sports [32]. The results of the current study were further supported by Eime RM et al, who also performed a cross-sectional study on 818 females to find out the association of three different forms of PA with HRQoL and life satisfaction in Australia. The results had shown that those females who were engaged in athletic activities at sports clubs exhibited higher scores in HRQoL as compared to gym activities and walking [33].

There are some limitations in this study. This study was not explicitly devised to assess the association between levels of PA, psychological wellbeing and HRQoL in female basketball players. Although many types of research have proved a

positive correlation between these variables, it was crucial to consider these associations among Pakistani female basketball players to elaborate more findings. Furthermore, because the sample size was limited, the findings of this study cannot be generalized.

Conclusion:

In conclusion, this study highlighted the vital role of physical activity in promoting both psychological well-being and general well-being. The results clearly demonstrated that highly physically active female basketball players experience improved state of mind and overall quality of life compared to their less active counterparts. These findings were in line with previous research and add to the growing body of evidence that moderate to high levels of physical activity are crucial for good mental health and HRQoL, particularly among competitive athletes.

Suggestions

Future research should therefore recruit a large sample size to generalize the results. In addition, randomised controlled trials could provide more definitive evidence regarding the association of levels of PA and performance and competitive anxiety among the first divisional and the expert Pakistani female basketball athletes.

Disclosure and Conflicts of interest

All authors declare that they have no conflicts of interest.

Author Contribution:

Asima Irshad= Critical revisions of intellectual content, data analysis and data interpretation, and final approval
Professor Doctor Muhammad Naveed Babur= Conception and design

Sidra Kouser= Literature search, discussion, drafting, critical revisions of intellectual content, data analysis, and final approval

Sanam Naz= Data collection and drafting

Rabia Rauf= Data interpretation and drafting

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Prevalence of Adhesive Capsulitis and its associated risk factors in post CABG patients

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ABSTRACT

Background: Patients suffering from heart disease and having heart surgery are more prone to develop fibrotic capsulitis/adhesive capsulitis. This need to addressed and managed because it can lead disability of shoulder and can affect the daily activities.

Objectives: To find out the prevalence of Adhesive Capsulitis (AC) and its associated risk factors in post Coronary Artery Bypass Grafting patients.

Methodology: This analytical cross-sectional study was conducted in Imran Idrees Teaching Hospital, Pervaiz Ellahi Institute of Cardiology, Allama Iqbal Teaching Hospital and Islam Teaching Hospital from February 2023 to May 2023. Data was collected from 124 participants both female and male with ages above forty; that underwent CABG three months before, and were coming for follow up. Data was collected using Apley's scratch test to reconfirm diagnosis and self-structured Questionnaire regarding associated factors, while SPADI was used to measure disability. Data was analyzed using SPSS version 22. Chi square-test was used to find association and then results were presented in form of frequencies and crosstabs.

Results: Results showed that mean age of participants were 54.78 ± 7.61 , mean of SPADI was 29.94 ± 20.53 and prevalence of Frozen Shoulder among post CABG patient was 23.4%. The results also showed that age, female gender, Hypertension, Diabetes Mellitus, shoulder immobility after surgery, lack of physical activity, lack of physical therapy follow-up and SPADI were significantly related to the development of AC in post CABG patients.

Conclusion: The study showed prevalence of AC among post CABG patients and risk factors including hypertension, female gender, age, increased duration of shoulder immobility, physical inactiveness before surgery, diabetes and no physiotherapy follow-up significantly contributes to its increased prevalence.

Keywords: Adhesive Capsulitis, cardiac surgery, Frozen Shoulder, , hypertension, diabetes, Risk Factors



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Original Research Article

Introduction:

Coronary arteries (blood vessels that deliver blood and oxygen to the heart), sometimes become narrowed or blocked due to atherosclerosis, or the accumulation of fat and plaque within these blood vessels resulting in a condition known as Coronary Artery Disease (CAD) ⁽¹⁾. To deal with this condition, a surgical procedure was introduced known as Coronary Artery Bypass Grafting (CABG). CABG is a kind of open-heart surgery that involves grafting a portion of a blood vessel from the aorta to the coronary artery in order to bypass a blocked coronary artery and establish a new blood flow path to the ischemic region. ⁽²⁾ However, many musculoskeletal and neurological problems following CABG are clinically observed, that need rehabilitation using different interventions to minimize the complications ^(3, 4). One of them was the potential risk of developing AC. It was noticeably seen more in post CABG

patients. Patients suffering from numerous heart diseases and those who had undergone heart surgery were more prone to develop fibrotic capsulitis than general population. According to a study, adhesive capsulitis occurred in 33% of the male patients who underwent cardiac surgery ⁽⁵⁾. Adhesive Capsulitis, also known as "frozen shoulder," "fibrotic capsulitis," "primary idiopathic stiff shoulder," and "contracture of the shoulder," was a condition that develops gradually and causes deltoid insertion pain, difficulty sleeping, painful incomplete external rotation and incomplete elevation, and limitation of movements actively as well as passively. However, the condition is characterized by normal radiograph ⁽⁶⁾. The natural axillary recess was lost as a result of thickness, fibrosis, rigidity, and chronic inflammation of the capsular sub synovial layer ⁽⁷⁾. It was classified as primary or secondary, depending on whether the condition developed suddenly,

without any known reason or any trauma(primary),or it was brought on by trauma, another disease i.e. Sub acromial discomfort or surgery (secondary) ⁽⁸⁾. Some of the studies show a significant association between AC and a number of diseases, including autoimmune diseases and cardiovascular diseases ⁽⁹⁾. Studies also show that the frequency of fibrotic capsulitis is (3%-5%) in between general population, but between (28%-40%) in people with diabetes ⁽¹⁰⁾. The incidence of AC increased with the increasing age as with the increasing age and most commonly affected women between the ages of 40 and 60 ⁽¹¹⁾ and was unusual in patients aged over 70 years ⁽¹²⁾ After open heart surgery, immobilizing the shoulder joint for 1-4 weeks out of concern for the incision or pain control leads to adhesive capsulitis ⁽¹³⁾ It was also not surprising that AC develops following CABG because procedures like replacement of valves and others that include sewing the sternum and rib separation can impinge on pain-sensitive structures and immobilize the shoulder, which can result in adhesive capsulitis. The exact reason for the development of AC following CABG is still unknown however various theories state numerous secondary reasons, including nonunion of sternum after surgery ,ribs fracture, any injury to musculoskeletal structure during surgery, sternum separation from costal cartilages, to use sternal wires that put pressure on the shoulder, any infection to the wound, and prolonged immobility of shoulder as a result of sternal wires.⁽¹⁴⁾ With rapid increase in number of heart surgeries in Pakistan, it was essential to determine the prevalence of frozen shoulder in post CABG patients as disabling effects of CABG are mostly ignored thus restricting the activities of shoulder joint .Therefore by doing this research we wanted to raise awareness regarding importance of pre-operative and post-operative physiotherapy to avoid complications caused by CABG and its disabling effects on shoulder joint.

Methodology:

All the participants were informed about nature of study and its purpose. Data was collected using Non probability convenience Sampling Technique. Participants were both male and female with ages above forty and who underwent CABG 3

months before and were coming for follow-up. Exclusion criteria included those participants who had a history of thyroid disease, fibrotic capsulitis, arthritis, and any shoulder musculoskeletal disease before surgery, Parkinson’s disease or stroke. Informed consent was received from all participants in written form before data collection procedure. A Self Structured Questionnaire regarding associated factors i.e. demographics of patients, details of co morbid diseases such as diabetes and hypertension, shoulder immobility duration, hospital stay duration, follow-up of physiotherapy and physical activity before surgery was used. SPADI Questionnaire was also used to measure pain and disability. It contains thirteen questions to assess both disability and pain, a five item questionnaire measuring pain and eight item questionnaire measuring disability, every item is scored on an 11-point ordinal rating scale ranging from 0 meaning (having no pain or difficulty) to 10 meaning (having worst imaginable pain or so difficult that help is required) ⁽¹⁵⁾ Reliability co-efficient of ICC for pain scale was 0.989 and for disability scale was 0.990 ⁽¹⁶⁾.Its score was calculated by separately calculating average subscale score for five pain items and eight disability items and then calculating their average. Its greater score indicated greater impairment and disability ⁽¹⁷⁾. Its cut-off value is 46.8⁽¹⁸⁾. Then Apley scratch test was used to confirm the diagnosis of AC patients by checking their restricted range of motion pertaining to LAM (lateral rotation, abduction, medial rotation) pattern. To perform this test, patients are asked to reach their arm behind their head and touch superior aspect of opposite scapula. Through this test abduction and external rotation was checked. In order to check internal rotation, patients were asked to reach behind their back and touch inferior angle of opposite scapula. Its reliability coefficient of ICC range (0.89-0.99) (19). The data was then analyzed using SPSS version 22.

Results:

Total 124 patients were included. The mean age of the study participants was 54.78±7.61 and results revealed that the prevalence of AC among post CABG patients was n=29(23.4%) (Table 1)

Study variables	Categories	Adhesive Capsulitis			P-value
		n (%)	n=29(23.4%) Yes	n=95(76.6%) No	
			n (%)	n (%)	
Age in years(Category)	41-50	35(28.2%)	6(4.8%)	29(23.2%)	0.02
	51-60	64(51.6%)	12(9.7%)	52(41.93%)	
	61-70	25(20.2%)	11(8.8%)	14(11.29%)	
BMI(kg/m ²)	Underweight	12(9.7%)	2(1.61%)	10(8.06%)	0.02
	Normal	83(66.9%)	14(11.2%)	69(55.64%)	
	Overweight	22(17.7%)	10(8.06%)	12(9.67%)	
	Obese	7(5.6%)	3(2.41%)	4(3.22%)	
Gender	Male	84(67.7%)	15(12%)	69(55.64%)	0.03
	Female	40(32.3%)	14(11.29%)	26(20.96%)	
Hypertension	Positive	55(44.4%)	20(16.1%)	35(28.2%)	0.02
	Negative	69(52.4%)	9(7.2%)	60(48.3%)	
Diabetes	Positive	59(47.6%)	19(15.3%)	40(32.2%)	0.02
	Negative	65(52.4%)	10(8%)	55(44.3%)	
Duration of shoulder immobility after surgery	1week	9(7.3%)	1(0.8%)	8(6.45%)	0.01
	2weeks	41(33.1%)	16(12.9%)	25(20.1%)	
	4weeks	74(59.7%)	12(9.6%)	62(50%)	
Duration of hospital stay after surgery	<10days	79(63.7%)	17(13.7%)	62(50%)	0.55
	11-20days	34(27.4%)	8(6.45%)	26(20.9%)	
	>20days	11(8.9%)	4(3.2%)	7(5.64%)	
	Yes	83(66.9%)	14(11.2%)	69(55.6%)	

Physical activeness before surgery	No	41(33.1%)	15(12%)	26(20.9%)	0.01
Followed instructions of physiotherapy after surgery	Yes	32(25.8%)	3(2.4%)	29(23.3%)	0.03
	No	92(74.2%)	26(20.9%)	66(53.2%)	

*P value was significant at <0.05

Table1: Risk Factors associated with Adhesive Capsulitis after CABG

Results also showed that the mean of SPADI was (29.94±20.53) and risk factors such as age (p=0.02), female gender (p=0.03), Hypertension (p=0.02), Diabetes Mellitus (p=0.02) and BMI (p=0.02) were significantly associated with development of AC in post CABG patients. It was also found that the patients who were instructed to keep their shoulder immobile by the surgeon for 1, 2 and 4 weeks were significantly associated (p=0.01) with AC. Those patients who had a sedentary lifestyle and lack of physical activity before surgery were also significantly associated (p=0.01) with AC. Participants who did not follow physical therapy after CABG were also significantly associated (p=0.03) with AC. A significant association (p=0.00) between SPADI and Apley positive patients was seen indicating greater pain and disability in post CABG AC patients. Duration of stay at hospital after surgery (p=0.55) was however not significantly associated with AC after CABG.

Discussion

This analytical sectional study was aimed to evaluate the prevalence of Adhesive Capsulitis (AC) and its associated risk factors among postoperative CABG patients. Data was collected from 124 participants and analysis was done to find out the prevalence of Adhesive Capsulitis, Shoulder pain and disability and association of Adhesive Capsulitis with its associated risk factors in post CABG patients. Results revealed that AC was highly prevalent in post CABG patients (23%). Mean of SPADI in post CABG patients was 29.94±20.53. A significant association of Adhesive Capsulitis with associated factors (Age (0.02), Gender (0.03), Hypertension (0.02), Diabetes (0.02), physical activeness before surgery (0.01), duration of shoulder immobility after surgery (0.01), BMI (0.02), followed instructions of physiotherapy after surgery (0.03) and SPADI (0.00) was also revealed.

The results of the study demonstrated that 29 out of 124 subjects reported Adhesive Capsulitis (AC) following CABG. Hence, estimation of true prevalence of Adhesive Capsulitis (AC) in this study was 23%. This result is almost similar to the rate reported in a prior study conducted in Rawalpindi, Pakistan to discover the occurrence of frozen shoulder in Post CABG patients. According to the results of their study, 29% of patients who underwent CABG experienced Frozen Shoulder (FS) / Adhesive Capsulitis (AC). (14). Another study was conducted in Chennai, India about occurrence of adhesive capsulitis and clinical profile of patients after heart surgery patients; it showed that 20% patients suffered from AC after undergoing cardiac surgery(5) Our study revealed a significant association of Age with Adhesive Capsulitis (p=0.02). Our results were supported by another study which also showed a significant association of age with adhesive capsulitis (p=0.001)(11). Age proved to be a significant risk factor for AC since the likelihood of developing frozen shoulder increased as people aged..(20). A study also showed that Adhesive Capsulitis is highly prevalent in 50s and 60s, with the major occurrence in the mid-50s. (8) Results also showed a significant association between Gender and adhesive Capsulitis(p=0.03) showing that females were more prone to develop Adhesive Capsulitis than males .The

results of this study were supported by another study which showed significant association with female gender and Adhesive capsulitis (p=0.02). This study stated that women's are at more risk than males⁽²¹⁾.

The association between adhesive Capsulitis and diabetes mellitus was also revealed in our study (p=0.02). Our study's results were supported by another study whose results also showed a significant association between diabetes and adhesive capsulitis (p=0.001). Our study showed significant association of HTN with Adhesive Capsulitis (p=0.02). Similar results were shown by a study which stated that the incidence of hypertension increases with age and in subjects with diabetes, implying an association between hypertension and age and diabetes (0.009) thus stating that hypertension is not an independent factor and that AC is more prevalent in people who have both, HTN and Diabetes ⁽²²⁾. The current study also showed a strong association between AC development and shoulder joint immobility (p=0.01). A study supported our results by stating that it may be due to improper shoulder positioning of patient or muscular division or trauma to long thoracic nerve and injury to internal jugular vein and leading to shoulder disability and thoracic pain ⁽¹³⁾.

Our results showed significant association between lack of physical activity and Adhesive Capsulitis (p=0.01). A recent study states that living a sedentary lifestyle is the primary risk factor for the onset of insulin resistance and the buildup of advanced glycation end products in the ligaments and capsule regions of the non-dominant shoulder, which results in frozen shoulder ⁽²³⁾.

Participants who did not follow physical therapy after CABG were also significantly associated with AC (0.03). Another study supported our results by stating that those who followed physical therapy were at lower risk of developing Adhesive capsulitis ⁽²⁴⁾. Patients also tend to restrict their upper limb movement in the postoperative phase out of fear of pain ⁽²⁵⁾, which further contributes to the development of AC. A significant association between SPADI and positive Apley scratch test was seen (p=0.00). Another study supported our results by stating that occurrence of shoulder pain (47%) is much higher than reported in previous studies among the cardiac population thus resulting in greater disability ⁽²⁶⁾.

With the maintenance of an active lifestyle, doing certain exercises after CABG, monitoring your blood pressure and glucose levels, and avoiding complete shoulder immobilization for an extended period of time following CABG can all help prevent AC. Lack of knowledge, instruction, and cooperation with surgeons could be the main cause of the development of AC following surgery. Due to time constraint, we had a small sample size and thus it limits our study generalization.

Conclusion:

This study concluded that CABG increases the chances of frozen shoulder as we have found frozen shoulder has a higher prevalence in post CABG patients and the factors i.e. increasing age, DM, hypertension, female gender, shoulder immobility and physical inactivity h are contributing factors

Conflict of Interest: None declared

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Disclaimer: The study was based on undergraduate thesis

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Prevalence of Musculoskeletal Disorders among Painters- A Cross Sectional Study

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ABSTRACT

Background: Musculoskeletal disorders are considered to be one of the major sources of discomfort and pain among painters. This is due the poor ergonomics and bad posture assumed during the working hours.

Objective: To determine the frequency of Musculoskeletal disorders (MSDs) among painters.

Methodology: It was cross sectional study conducted among the painters from Lahore and Sialkot after ethical approval from the Institutional Ethical Review Committee of Superior College Lahore. A sample of n= 282 painters with age ranging from 18 to 45 years was included in the study. A pre-determined validated Nordic Musculoskeletal Questionnaire (NMQ) was used to assess for MSDs. SPSS version V.22 was used and frequencies were calculated.

Result: There gap=282 painters, among them the study comprised of n=111 (39.4%) male and n=171(60.5%) female painters with mean age of 26.69±5.57 years. There weren=168(59.6%) had discomfort or pain in shoulder in last 12 months. Whilen=227 (80.5%) had discomfort in neck in last 7 days. On upper back, n=202(71.6%) had discomfort or numbness in last 12 months while n=216(76.6%) had discomfort in last 7 days.

Conclusion: This study concluded that neck is the most affected region among the painters followed by the upper back and shoulder region.

Key Words: Musculoskeletal disorders, Nordic Musculoskeletal Questionnaire (NMQ), Pain, Painters.



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Original Research Article

Introduction:

Muscles, nerves, tendons, joints, cartilage, and supporting components can all be injured or have symptoms known as musculoskeletal disorders (MSDs). These are brought on and made worse by rapid physical exertion or continuous exposure to physical variables such repetitive use, force exertion, vibration, and uncomfortable postures⁽¹⁾. According to the definition, MSDs comprise inflammatory and degenerative disorders that can affect a variety of structures and cause acute or chronic discomfort, limited mobility, and difficulty participating in social activities. These illnesses may worsen workers' physical and emotional health while also lowering their quality of life⁽²⁾. Around 1.71 billion people worldwide suffer from MSDs, with low back pain (LBP) accounting for the highest burden with a prevalence of 586 million people, according to a World Health Organization (WHO) report⁽³⁾. Working environments are frequently thought to be a significant factor in the etiology of WMSDs and may worsen workers' physical and emotional health while also lowering their quality of life.⁽⁴⁾ Work-related discomfort, numbness, pain, or restricted movement in any region of the body, lasting more than a day, together with failure to recover after rest, were considered symptoms.⁽⁵⁾ Extended periods of work can wear out and fatigue joints, particularly the shoulder, neck, and muscles, resulting in pain, soreness, and swelling⁽⁶⁾ as well as

engaging in repetitive trunk movements. WMSDs have been linked to the development and persistence of a variety of risk factors, including age, gender, lifestyle factors like smoking, psychological stress, alcohol use, previous pain symptoms, psychosocial factors, socioeconomic variables, poor muscle flexibility and strength, physical activity, and physical workload, in addition to the working conditions.⁽⁷⁾ The prevalence, etiology, and risk factors of WMSDs varied among people with diverse occupations, environments, and geographic locations, according to studies done in the last ten years.⁽⁸⁾ The numerous risk factors connected to the type of job influence different body parts in different ways. The work of calligraphy and painting demands focus, repetitive wrist movements, and long periods of time spent in a single posture. The use of inappropriate furniture and a slouched posture when writing are recognized as risk factors for MSDs pain.⁽⁹⁾ Handicrafts are defined as any activity in which practical and aesthetically pleasing items are fully made by hand or using only basic tools, with the primary requirements being individual talent and imagination.⁽¹⁰⁾ Many developing nations, including Iran, Pakistan, Bangladesh, Turkey, and China, still have active small workshops or home workrooms where handcrafting is still largely done individually by the workforce.⁽¹¹⁾ The analysis of the literature has provided a wide range of evidence confirming the detrimental effects of MSDs

on the productivity and health of the workforce globally. For instance, according to certain studies, the prevalence of manual MSD symptoms in manual labor employment ranges from 38.5% to 96.5%.⁽¹²⁾ There have been reports of a significant prevalence of occupational health risks among painters. The great potential risk to one's professional, physical, and physiological health is inherent to the task of painting. This painter community is particularly susceptible to bone, eye, muscle, and other types of accidents because of the high risk environments where they work, such as dangerous statues, platforms, and scaffolds. Injuries ranged in severity from mild to quite severe.⁽¹³⁾ The painting workshops claimed that the majority of issues were caused by improper hand tools, difficult working positions, and inappropriate work organization.⁽¹⁴⁾ In comparison to painting at middle and low working heights, painting at high working height imposed greater muscular demands. When painting walls, work height affects shoulder muscle fatigue.⁽¹⁵⁾ The prevalence of musculoskeletal pain among Chinese calligraphers and painters varied, with neck pain (13.5%) being the most prevalent followed by wrist (10.8%), shoulders (8.1%), and back (8.1%).⁽⁷⁾ As the painters require to assume different upper arm positions for their tasks to be done. Work which requires overhead shoulder positioning may cause pain because of the fact that various shoulder disorders frequently have pain when the arm is raised. It has been suggested that lifting an arm while working will continually modify the intricate body component, making it more prone to tears.⁽¹⁶⁾ The likelihood of developing WMSDs rises with age, and one explanation for this could be because as people age, they gain more work experience, which in turn leads to years of increased fatigue and muscle strain before developing MSDs.⁽¹⁷⁾ Furthermore, addition of the break time during the working hours helps to prevent and decrease the occurrence of musculoskeletal related pain and discomfort. It can be due to the reason that muscles can get enough time to relax and to get into the optimum condition. Ultimately, reducing the discomfort and pain caused by the stress on musculoskeletal structures.⁽¹³⁾ Thus it is very crucial to investigate the MSDs among painters which can provide us the basis of accurate and reliable prevention strategies and create the awareness. Information regarding MSDs among painters is lacking therefore this study is aimed to determine the prevalence of MSDs of different regions of the body.

Methodology:

A cross sectional study was conducted on painters in Lahore and Sialkot, over the period of 6 months from January 2022 to June 2022. Ethical permission was taken from ethical committee of the Superior College, Lahore (Ref No: SU/ANCRD/IERC/59). The data was collected from the painters and calligraphers of different cities in Punjab.

The informed consent was signed by the participants showing the willingness to participate in study and confidentiality of the data was maintained. After informed consent the participants were recruited using non probability purposive sampling technique. Painters of both genders were added with age 18 to 40 years⁽⁹⁾, minimum 8 working hours per week, having no recent accidents and injury in last 6 months. Individuals with any traumatic injury, any other musculoskeletal disease and systemic disease were excluded from the study.

The sample size was calculated to be n=282 by epitoool software using the formula: $n = (Z^2 \times P \times (1 - P)) / e^2$. Where z= 95% CI, P= 0.43 and e= 0.05. The Nordic Musculoskeletal Questionnaire (NMQ) was developed to rapidly and inexpensively identify musculoskeletal problems that were appropriate for use in workplaces and for a large number of workers. The neck, shoulders, upper back, lower back, elbows, wrist/hands, thighs, knees, and ankles were among the nine body regions included by this questionnaire. Musculoskeletal complaints were classified as pain that interfered with activities in the last 12 months and was described as an ache, discomfort, or numbness, difficulties in the previous 7 days, or both⁽¹⁸⁾. validity ranging from 0.501 to 0.823 and cronbach's $\alpha = 0.726$ ⁽¹⁹⁾.

The questionnaire was filled along with the general demographics. On the basis of inclusion criteria, the participants were asked to fill the questionnaire and the data collected was analyzed by using SPSS version 22. The numerical data was presented as mean and standard deviation, while categorical data as frequency (n) and percentages (%). The SPSS ver. 22 was used for data analysis.

Results:

The mean age of the painter included in the study was 26.69 ± 5.57 years. While the study comprised of n=111 (39.4%) male and n=171(60.5%) female painters and calligraphers from Lahore and Sialkot. Among them n=187 (66.3%) were having normal BMI. Majority of them n=(174(61.7%) had less than 5 year of experience. While n=181(64.2%) had 10 hours' work per day and n=162(57.4%) never exercised. (Fig No. 1)

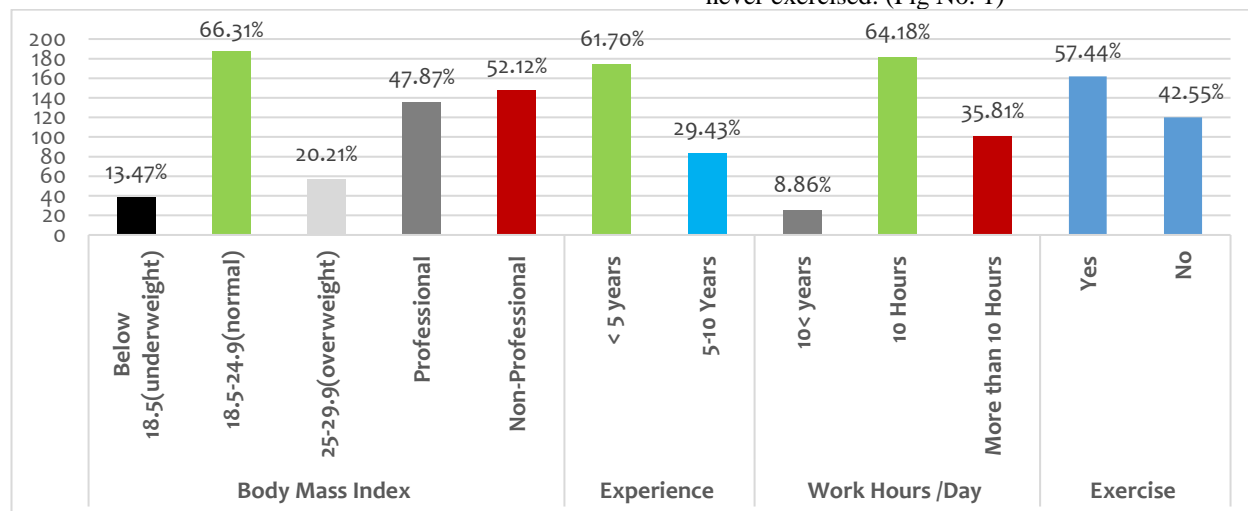


Figure 1: Frequency Distribution of Demographic

There were 168(59.60%) participants who had discomfort or pain in shoulder in last 12 months while 200(70.9%) participants attended the physician due to discomfort in last 12 months. Regarding elbow, 204 (72.3%) participants reported no ache or discomfort in last 12 months and 276 (97.9%) hadn't attended physician in last 12 months due to any discomfort. Whereas 227 (80.5%) had discomfort in neck in last 7 days while 233 (82.6%) had not visited the physician for any pain or discomfort in last 12 months. Similarly, on upper back, 202(71.6%) had discomfort or numbness in last 12 months while 216(76.6%) had discomfort in last 7 days. (Table.No.1)

Body Region	Patient Response	Have you at any time during the last 12 months had trouble	During the last 12 months prevented from carrying out normal activities	During the last 7 days have you had trouble	During the last 12 months seen a physician for this condition
Shoulder	Yes	168 (59.60%)	121(42.9%)	82 (29.10%)	200(70.90%)
	NO	114(40.4%)	161(57.1%)	200(70.90%)	82 (29.10%)
Elbow	Yes	78 (27.7%)	11 (3.9%)	119(42.2%)	6(2.1%)
	NO	204(72.3%)	271 (96.1%)	163(57.8%)	276(97.9%)
Wrist	Yes	137(48.6%)	50 (17.5%)	188(66.7%)	21(7.5%)
	NO	145 (51.4%)	232(82.3%)	94 (33.3%)	261(92.6%)
Neck	Yes	208 (73.8%)	125(44.3%)	227(80.5%)	49(17.4%)
	NO	74(26.2%)	157(55.7%)	55 (19.5%)	233(82.6%)
Upper Back	Yes	202(71.6%)	121 (42.9)	216 (76.6%)	66(23.4%)
	NO	80(28.4%)	161(57.1%)	66(23.4%)	216(76.6%)

Table.01: Frequency Distribution of Musculoskeletal Disorders

Discussion:

This cross sectional study was conducted on painters of the Sialkot and Lahore to determine the prevalence of musculoskeletal disorders among them. The study was conducted on 282 painters to evaluate the prevalence of MSDs during the different time period including last 12 months and last 7 days thus, found out that most of the participants were affected from number of MSDs of different region including shoulder; neck and upper back were most prevalent. This can be due to the fact that they must hold themselves in uncomfortable positions for long periods of time; painters frequently experience postural discomfort and musculoskeletal problems.

The results of this study was consistent to the result of another study conducted by Padmini Pandey to evaluate the musculoskeletal disorders among painters and concluded that a wide range of physical pain or discomfort experienced by painters were reported by 69.23% of the respondents as neck pain, and 57.6% of the respondents as shoulder pain. The least number of respondents reported experiencing foot pain, wrist pain, elbow pain, or hand pain.(13) Painting is time consuming and highly intensive task involving the hands which requires the involvement of the other body region while maintaining the different postures. Another study conducted by M Shanmugam et al also showed the presence of musculoskeletal disorders among different region of the body of the building painters. It was found that the shoulder (69.5%) and neck (65.4%) regions had the highest prevalence rates of discomfort. Lower back (60.3%), finger/wrist (57.8%), upper back (42.4%), were the next most common body parts. It was discovered that specific job duties were linked to a number of ergonomic concerns, including repetitive motion, strenuous lifting and pushing, prolonged hanging or standing, forceful exertion, contact stress, grip force, and improper posture. Therefore, these ergonomic risk factors have primarily contributed to discomfort in the shoulder and neck regions.(20) Another study was carried out by Mustafa Ahmed Alshagga et al in Saudia Arabia on calligraphers and concluded that upper back was the most affected area followed by the neck and the shoulders. Painters have to do repetitive tasks using instruments that are made according to conventional designs. Using these instruments incorrectly and repeatedly increases the chance of developing musculoskeletal illnesses linked to the workplace.

Understanding and implementing appropriate workplace ergonomics will boost worker safety, productivity, and revenue generating.(21)

Another study showed among the workforce, neck and shoulder pain were common and imply that there is a statistically significant correlation between ergonomic risk factors and wrist pain. This demonstrates that wrist pain is more common in handicraft workers and is caused by inadequate ergonomics(22) which was inconsistent with our current study which shows more discomfort among neck shoulder and upper back.

These work related musculoskeletal disorders can be decreased by the education of the painters to use the correct posture which applies minimum force on the structures and thus incorporating the adequate rest intervals, providing the structures to relax. In addition to this correct ergonomics should be administered to prevent such discomfort and pain. The study was carried out in Sialkot and Lahore only and there was limited data available to compare the results with other studies.

Conclusions:

This study concluded that neck is the most affected region among the painters followed by the upper back and shoulder region. Most of the participants suffering from neck pain complained of discomfort on last 7 days, whereas those having problem in upper back had discomfort or numbness in last 12 months and in last 7 days.

Conflict of Interest: None declared

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Comparative effects of hold relax with agonist contraction and active release therapy on pain, functional disability and sleep quality in piriformis syndrome

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ABSTRACT

Background: Piriformis syndrome develops from a variety of contributing factors causing numbness and tingling leading to functional limitations and affecting ADL's.

Objective: The objective of this study was to compare the effects of active release therapy (ART) and hold relax with agonist contraction (HRAC) on pain, functional disability, and sleep quality in patients with piriformis syndrome.

Material and Methods: This study was conducted from March 2022 to November 2022. A total of 82 participants of both genders, 25 to 55 years of age, diagnosed with piriformis syndrome were involved in the study. Those with a history of fracture of the pelvis or hip, disc disease, or postural deformity were excluded. Participants were assigned into two groups; HRAC and ART with routine physical therapy. Outcome measures were pain, functional disability, and sleep quality measured by the Numeric Pain Rating Scale, Roland Morris Disability Questionnaire, and Chronic Pain Sleep Inventory respectively. The assessment was made at baseline, in the 1st and 2nd weeks. Mann-Whitney Test was used for between-group analysis and Friedman's ANOVA was computed for within-group differences.

Results: Between-groups analysis showed a statistically significant difference in pain (0.000) and functional disability (0.012) till 2nd week but no significant difference was found in sleep quality (0.838). However, the within-group analysis showed statistically significant results in all outcome measures ($P < 0.05$).

Conclusion: ART was more effective in reducing pain and functional disability. Whereas, both techniques had equal effects on sleep quality among patients with piriformis syndrome.

Keywords: Active release therapy, Functional Disability, Hold relax with agonist contraction, Piriformis Syndrome, Pain, Sciatica, Sleep Quality

Level of Evidence: 2



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Original Research Article

Introduction:

Piriformis syndrome is an enervating musculoskeletal condition caused by many factors. Piriformis syndrome is also known as deep gluteal syndrome, wallet neuritis, and sciatica. It is misdiagnosed with other similar conditions like compression fractures, lumbosacral radiculopathies, sacroiliac joint syndrome, gynecological conditions, etc. ^(1,2)

Most evidently patient comes with buttock pain which can be caused by myofascial pain or irritation/compression of the sciatic nerve due to certain positions maintained by the patient. This pain is mostly persistent and can sometimes be presented with numbness and paresthesia of the lower limb, it is often worse at night causing poor sleep as the patient may feel a burning sensation throughout the leg due to compressed sciatic nerve ^(3,4). It is also reported that the population having a sedentary lifestyle or who have a routine of sitting for more

than eight hours may develop tightness in many back muscles including the piriformis muscle ⁽⁵⁾.

Research based on longitudinal and experimental studies shows that pain and sleep quality are interrelated. Chronic pain can lead to sleep disturbance and even insomnia. Many people with chronic back pain have poor sleep quality ^(6,7). The prevalence of insomnia in chronic pain patients is reported to be about 53% which is higher than any other factors ⁽⁸⁾.

Among noninvasive treatment options, physical therapy is proven to be the most effective for managing piriformis syndrome ⁽⁹⁾. Techniques such as proprioceptive neuromuscular facilitation (PNF) are particularly good at reducing pain symptoms and restoring a specific muscle's range of motion, enhancing flexibility and muscle strength ^(10,11).

Stretching also seems to be beneficial for different neuromusculoskeletal conditions. It enhances the joint's range of motion and reduces the risk of injuries ^(12,13), it can be of

different types e.g. active, passive, and dynamic stretching⁽¹⁴⁾. Muscle stretching is thought to be effective in improving the sleep quality of patients with leg cramps and restless leg syndrome but no evidence exists for its effect in patients with piriformis syndrome⁽¹⁵⁾.

Active release techniques (ART) are defined as a multidisciplinary procedure that is practiced nowadays by numerous practitioners. ART is different from other manual therapy procedures because it combines precise patient movement (lengthening the muscle through the ROM) with site-specific manual pressure^(16,17).

Many studies suggest that stretching and soft tissue mobilization are excellent at easing pain and enhancing the range of motion in many musculoskeletal disorders^(18,19), but there are currently no randomized control trials (RCTs) to compare the effect of stretching and active release therapy in piriformis syndrome. Hold relax technique is more easily performed and understood by patients and requires less force by the therapist as compared to active release therapy

Methodology:

This single-blinded, randomized clinical study was carried out at the Physiotherapy Department of the University of Lahore Teaching Hospital, Lahore from March 2022 to November 2022. The trial was registered in clinicalTrials.gov under registration number: NCT05370378 before the recruitment of participants. Approval from the ethical committee of the University of Lahore before data collection was collected under Ref No: REC-UOL-/21-02/2022. Informed written consent was taken from the participants before enrollment. All information and data collection were kept confidential and participants remained anonymous throughout the study. The subjects were informed that there were no disadvantages or risks in the procedure of the study and they were free to withdraw at any time during the process of the study. The study followed the Consolidated Standards of Reporting Clinical Trials (CONSORT) and the entire process is given in the flow diagram in Figure # 1.

The sample size of 82 participants was calculated through a manual of sample size determination in health sciences by WHO using the mean value, $\mu_1 = 1.5$ and $\mu_2 = 3.5$ of back disability by Roland Morris disability questionnaire score. After adding 20% dropout, the sample size was $34 + 7 = 41$ in each group. Participants were selected based on criteria for inclusion and exclusion and were randomly allocated to groups A and B through a non-probability purposive sampling technique. Participants aged 25-55 years, of both genders, having unilateral pain with or without radicular symptoms, pain score >3 , and sub-acute and chronic cases were added to this study. However, a history of fracture, mechanical back pain, sacroiliac joint dysfunction disc pathology, or any postural deformity were excluded from this study⁽²⁰⁾.

Intervention:

Group A received Hold Relax with Agonist Contraction (HR-AC) technique and Group B received Active Release Therapy and routine physical therapy was provided to both groups. The protocol was given for two weeks (6 sessions on alternate days, 3 sessions per week). Each session was provided for approximately 60 minutes.

In Group A, a heating pad was applied to the gluteal region of participants for 10 to 15 minutes, this warms up the muscle improves flexibility, and lowers the chance of injury during stretching. Then piriformis muscle was passively stretched for

10 seconds. For around 10 seconds afterward, the participant was instructed to actively contract the muscle before relaxing (isometric contraction) and then instructed to actively contract the muscle for a further 6 to 10 seconds while resisting the therapist. After stretching the muscle to its new tissue tension barrier point and holding it there for 30 seconds, the participant was asked to relax. Starting from where the previous repetition left off, this maneuver was done three to four times in one session. Afterward, an ice pack was applied and a general range of motion with strengthening exercises was performed to prevent soreness⁽²¹⁾.

In Group B, a specific muscle was warmed up by applying a heating pad for 10 to 15 minutes. The participant was positioned prone lying and the therapist was standing at the side of the affected limb. The therapist applied deep pressure at the area of tenderness while the patient was actively moving the limb from internal to external rotation repeatedly. This maneuver took about 15 minutes to complete in one session and was applied alternatively 3 days a week for two weeks. After this, a cold pack was applied and general ROMs and strengthening exercises were performed to prevent soreness⁽²²⁾.

Pain intensity, functional disability, and sleep quality were measured through the Numeric Pain Rating Scale (NPRS), Roland Morris Disability Questionnaire (RMDQ), and Chronic Pain Sleep Inventory (CPSI) respectively. The data was gathered at baseline, first, and second weeks. After collecting data, pain, functional disability, and sleep quality were compared. The outcome assessor was kept blinded to the treatment group.

Statistical Analysis:

The data was entered and analyzed using IBM-SPSS Version 24. The numerical data was presented in the form of mean \pm SD. Categorical data was presented in the form of frequency (Percentage). The normality of the data was assessed with the Kolmogorov-Smirnov test. As the data did not follow the assumptions of normality, non-parametric tests were applied. The Mann-Whitney U test was used for between-group analysis. Friedman's test was used for within-group comparison. The median and interquartile range were measures used for each variable. The p-value < 0.05 was considered statistically significant.

Results:

A total of 82 participants were enrolled in the study. The mean age of participants was 38.41 ± 9.43 years. Among selected participants majority i.e., around 49 (59.8%) were females, 42 (51.2%) had left-sided involvement of piriformis muscle and 43 (52.4) reported cases were of the sub-acute stage. The summary of demographic characteristics of both groups is given in Table No. 1. The groupwise comparison shows no significant difference between both groups ($p > 0.05$), representing both groups were homogenous at baseline.

The results of the Mann-Whitney U test are given in Table No. 2. It showed a statistically significant difference in pain intensity and functional disability ($p < 0.05$). However, no difference in sleep quality was observed in both groups ($p > 0.05$). Table 3 shows the results of Friedman's Test for within-group comparison depicts significant improvement in pain, functional disability, and sleep quality at each level of assessment in both groups ($p = 0.000$).

Demographic Variables	Characteristics	Treatment groups		*P-value
		Group A (HRAC)	Group B (ART)	
		Mean ± SD	Mean ± SD	
Age (in years)		38.15 ± 9.48	38.68 ± 9.49	0.799
Body Mass Index kg/cm ²		28.82 ± 4.56	27.34 ± 3.03	0.086
		N (%)	N (%)	
Gender	Male	16 (1.5)	17 (20.7)	0.822
	Female	25 (30.5)	24 (29.3)	
Occupation	Office workers	8 (9.8)	13 (15.9)	0.673
	Healthcare Workers	6 (7.3)	4 (4.9)	
	Labor Staff	4 (4.9)	6 (7.3)	
	Housewives	13 (15.9)	12 (14.6)	
	Teachers	5 (6.1)	4 (4.9)	
	Students	5 (6.1)	2 (2.4)	
Effected side	Left	23 (28)	19 (23.2)	0.377
	Right	18 (22)	22 (26.8)	
Duration of symptoms	Sub-acute	19 (23)	24 (29.3)	0.269
	Chronic	22 (26.8)	17 (20.7)	

*p-value was calculated using chi-square analysis and Mann-Whitney U-test

Table 1: Group-wise comparison of demographic variables at baseline

Outcome variables	Assessment	Mean Ranks of Treatment Groups		P-value
		Group A (HRAC*1)	Group B (ART*2)	
Pain	Baseline	42.72	40.28	0.634
	1st week	47.77	35.23	0.014
	2nd week	51.71	31.29	0.000
Functional disability	Baseline	45.93	37.07	0.091
	1st week	47.44	35.56	0.023
	2nd week	48.04	34.96	0.012
Sleep Quality	Baseline	41.37	41.63	0.959
	1st week	41.35	41.65	0.956
	2nd week	40.96	42.04	0.838

*HRAC: hold relax with agonist contraction, ART: active release technique, P-value <0.05

Table 2: Between Groups Comparison for Pain, Functional Disability and Sleep Quality

Outcome variables	Assessment	Group A (HRAC)			Group B (ART)		
		Median ± IQR	Mean Rank	P value	Median ± IQR	Mean Rank	P value
Pain	Baseline	9.00 ± 1	2.99	0.000	8.00 ± 3	2.98	0.000
	1st week	7.00 ± 2	2.00		6.00 ± 1	2.02	
	2nd week	4.00 ± 2	1.01		3.00 ± 2	1.00	
Functional disability	Baseline	12.00 ± 6	3.00	0.000	10.00 ± 6	3.00	0.000
	1st week	10.00 ± 7	1.96		7.00 ± 6	1.95	
	2nd week	6.00 ± 7	1.04		3.00 ± 5	1.05	
Sleep Quality	Baseline	40.00 ± 38	2.82	0.000	43.00 ± 34	2.78	0.000
	1st week	25.00 ± 23	1.90		22.00 ± 28	1.91	
	2nd week	15.00 ± 23	1.28		18.00 ± 18	1.30	

Table 3: Within-group comparison for Pain, Functional disability, and Sleep Quality

Discussion:

This study aimed to determine the comparative effects of active release therapy and hold relax with agonist contraction on pain, functional disability, and sleep quality in piriformis syndrome. The results showed that both groups had statistically significant improvements in pain intensity, functional disability, and sleep quality over time. However, ART therapy was more effective in reducing pain and functional disability compared to hold relax technique. The same finding was observed in a study represented that active release therapy is more effective than PNF techniques in improving range of motion, and functional disability and reducing pain in patients with piriformis syndrome (p<0.05), however, they applied post-isometric relaxation technique of PNF in their study⁽²³⁾.

Likewise, a study directed by Shraddha et al concluded the superiority of the active release technique to the positional release technique in improving hamstring ROM and flexibility (16). On the parallel, the current study was conducted on

piriformis syndrome, suggestive to improve the pain status and resulting disability. In S. Rajendran's study comparing the effects of myofascial release technique to stretching, both treatments were found to be beneficial in reducing pain and improving range of motion. However, the study exclusively included young female participants. Consequently, their findings may be more specific to this demographic than representative of the general population⁽²⁴⁾.

In a study comparing the effects of Proprioceptive Neuromuscular Facilitation (PNF) with a modified hold-relax technique and the Active Release Technique (ART) on hamstring flexibility in individuals with persistent low back pain, both interventions demonstrated equal effectiveness in reducing pain and impairment while enhancing hamstring flexibility over time. However, the study indicated that the modified hold-relax PNF stretch was superior to ART in terms of efficacy⁽²⁵⁾. This finding contradicts the current study's results, which employed a hold-relax agonist contraction

technique. It suggests that the use of a hold-relax stretch technique in the previous study may yield better outcomes compared to the hold-relax agonist contraction used in the current investigation, potentially contributing to the observed superiority of PNF over ART.

It is recommended to consider a combination of ART and hold-relax agonist contraction for optimizing benefits in pain improvement, functional disability reduction, and sleep quality enhancement. Additional research endeavors should be undertaken to thoroughly assess the combined effects of ART in conjunction with various forms of PNF.

Conclusion:

The study concludes that active-release therapy is more effective in reducing pain and improving functional disability. However, both hold-relax agonist contraction and active release therapy demonstrated similar effects in enhancing sleep quality among patients with piriformis syndrome.

Disclosure and Conflicts of Interest

The authors declare that they have no conflict of interest.

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There was no funding available for this study.

Patient Consent:

Authors should state that the consent of the patient/guardian was taken before the inclusion of participants in the study.

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Effects of Deep Breathing Exercises On Oxygen Saturation and Functional Capacity in Hospitalized Patients with Chronic Obstructive and Pulmonary Disease

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ARTICLE INFORMATION	ABSTRACT
<p>Corresponding Author:</p> <ul style="list-style-type: none">• azunaira55@gmail.com <p>Affiliations:</p> <p>¹ Houser officer, Rashid Latif College of Physical Therapy /Arif Memorial Teaching Hospital, Lahore-Pakistan</p> <p>^{2,5,6} Assistant professor, Department of Physical Therapy, Rashid Latif Khan University Lahore-Pakistan</p> <p>³ Professor, Department of Physical Therapy, Rashid Latif Khan University Lahore-Pakistan</p> <p>⁴ Lecturer, Department of Physical Therapy, Rashid Latif Khan University Lahore-Pakistan</p> <p>Citation: Received: 01-12-2023 Revised and Accepted: 25-01-2024 Published On-Line:21-02-2024</p>	<p>Objective: The study aimed to examine the effect of deep breathing exercises on oxygen saturation and functional capacity in hospitalized patients with Chronic Obstructive and Pulmonary Disease (COPD).</p> <p>Methods: This quasi-experimental study included 37 male patients aged between 60-75 years. This study was conducted from 25th November 2022 to March 2023 at Arif Memorial Teaching Hospital, Mayo Hospital, and Gulab Devi Hospital. There were 6 sessions, 3 sessions per week. Each session was of 15-20 min. Deep breathing exercises were performed on each patient. Patients included in the study were hospitalized for exacerbated COPD without the use of NIV (non-invasive ventilation). The measuring parameters were pulse Oximetry for oxygen saturation and dyspnea index for functional capacity respectively. Using SPSS version 25 the qualitative variables were shown in frequency and Paired samples T-test was used to measure the mean score of the group for pre-test protest comparison and P value less than 0.05 was taken as significant.</p> <p>Results: The study comprised of 37 participants with mean age of 66.51± 4.65. The sample t-showed there was a significant difference between oxygen saturation of COPD patients post-intervention with a mean value of -1.972±1.301 with a p-value of 0.05. Similarly the dyspnea index showed a significant difference between pre (23.18±4.77) and post-mean score (16.86±1.11) with p-value < 0.05.</p> <p>Conclusion: The findings of the current study showed that deep breathing exercises were effective in improving oxygen saturation and functional capacity among hospitalized COPD patients.</p> <p>Keywords: COPD. Deep breathing exercises, Hospitalized patients, oxygen saturation, functional capacity,</p>



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Original Research Article

Introduction:

COPD (Chronic Obstructive and Pulmonary Disease) is a chronic inflammatory lung disease that extremely affects human health⁽¹⁾. It is characterized by restrictions in airflow brought on by an abnormally persistent inflammatory response to noxious or toxic gas particles in the lungs and airways⁽²⁾. Patients with COPD who experience progressive airway restrictions run the risk of developing major medical problems like immobility, muscular atrophy, and various psychological conditions over an extended period, and positioning managers can facilitate it^(3, 4). Major symptoms are classified as (dyspnoea, sputum purulence, and increased sputum volume) and minor were (nasal discharge, wheezing, sore throat, and cough).⁽⁵⁾ Dyspnoea, ventilatory restriction, and exhaustion are symptoms of peripheral and respiratory muscle dysfunction, which lowers functional ability and quality of life.⁽⁶⁾ Alterations in lung function, alveolar destruction, and damage to the terminal bronchiole walls that may clog the terminal bronchioles are what cause the most significant changes in COPD patients.⁽⁷⁾ The most severe cases of COPD also cause

increased labor of breathing and dyspnoea, as well as an increase in the paradoxical movement of the chest wall.⁽⁸⁾ The number of COPD fatalities increased by 17.5% between 2007 and 2017 as a result of continued exposure to risk factors like smoking and the aging population.⁽⁹⁾ As air pollution increases COPD has become one of the leading causes of fatality worldwide.⁽¹⁰⁾ According to WHO, it will be the third leading cause of death by 2030.⁽¹¹⁾ Pulmonary rehabilitation is a wide-ranging intervention that can effectively enhance the physical and psychological condition of patients with COPD^(1, 12). Patients with COPD are advised to avoid becoming physically unfit.⁽¹³⁾ Pulmonary rehabilitation (PR) has been shown to improve symptoms, exercise tolerance, and health-related quality of life as well as reduce hospitalizations^(14, 15). A maximal inspiration during diaphragmatic breathing, (DB) is designed to assist in breathing correctly while strengthening the diaphragm, reducing labor required for breathing by slowing breathing rate, and reducing oxygen demand.⁽¹⁶⁾ Pursued lip breathing (PLB) also causes an increase in inspiratory capacity (IC) in COPD patients at rest while performing PLB, indicating

a reduction in pulmonary hyperinflation.⁽¹⁷⁾ This study aimed to investigate the effect of deep breathing exercises on oxygen saturation and functional capacity which may lead to the improvement of gaseous exchange among patients with COPD. The study also examined the effect of combining diaphragmatic, pursed lips breathing, and segmental breathing exercises on the clinical outcomes of patients with COPD.

Material and Methods:

This was a quasi-experimental study and non-probability purposive sampling. The ethical approval of the study was taken from the Ethical Committee of Rashid Latif Medical College. The study was conducted from 25th November 2022 to March 2023. Sample size n=37 was calculated by this formula $N = (Z\alpha)^2 S^2 / d^2$. The study was held in Arif Memorial Teaching Hospital, Mayo Hospital, and Gulab Devi Hospital. Before the start of their participation in the study, all participants were informed about the study and its purpose. The inclusion criteria included male patients aged between 60-75 with a confirmed diagnosis of COPD (mild to moderate) and having exacerbations or hospitalization in the past 4 weeks.⁽²⁾ However, exclusion criteria included patients with a pulmonary disease comorbid with COPD and congestive heart failure. It also included patients with orthopedic problems (especially on the back) / muscle-joint disease. Before giving an intervention plan demographic data was noted. The report files of each patient were checked for any comorbidities and surgical history. Demographic data for each respondent was acquired through a self-designed questionnaire. Pretest measurements were taken at the start of treatment and post-test measurements were taken after two weeks of treatment. Deep

breathing exercises were performed by each patient according to the instructions by the researcher over two weeks (alternate days in each week) which included pursed lip breathing, diaphragmatic breathing, and segmental breathing. After each breath, there was a pause of 1-2 seconds. There were 6 sessions, 3 sessions per week. Each session ranged from 15-20 mins. Pulse Oximetry was used to estimate the oxygen saturation and dyspnoea index was used to measure the functional capacity of each patient respectively before applying the intervention and again measured after two weeks and the results were noted. Patients were assured that their data would remain confidential. Informed consent was taken from each patient. All ethical considerations were taken into consideration including confidentiality, respect for patient identity, and disclosure of information. The data was first collected, and it was then analysed in SPSS for Windows software version 25. All qualitative variables were shown in frequency tables and percentages. Paired samples T-test was used to measure the mean score of the group for pre-test post-test comparison. Quantitative variables were presented as mean \pm standard deviation. P value less than 0.05 was taken as significant.

Results:

Demographics	Frequency (%age)
Smoker	30 (81.1)
Non-Smoker	7 (18.9)
Mean Age	66.51 \pm 4.65

Table 1: Smoking history and Age of respondents

Out of 37 participants, 30 were smokers and 7 were non-smokers. The results showed that the mean score of the age of respondents is 66.51 \pm 4.659

Outcomes	Evaluation	N	Mean \pm SD	Std. Error Mean	Mean Differences	t	P-value
Oxygen saturation	Pre-test	37	90.297 \pm 0.292	0.292	1.97 \pm 1.301	-9.222	0.000
	Post-test	37	92.270 \pm 0.341	0.3414			
Dyspnea Index	Pre-test	37	23.189 \pm 4.777	0.785	6.324 \pm 3.979	9.667	0.000
	Post-test	37	16.864 \pm 1.115	1.115			

Table 2. Pre-test Post-test Comparison of O2 Saturation and Dyspnea Index (n=37)

There is a significant difference between pre mean values of 90.2 \pm 1.77 and post mean value of 92.27 \pm 2.07 of oxygen saturation with a significant p-value of 0.05. There is a difference between pre (23.18 \pm 4.77) and post mean score (16.86 \pm 1.115) of the dyspnoea index with a significant p-value of 0.00.

Discussion:

The present clinical trial was conducted to study the impact of deep breathing exercises on COPD patient's oxygen saturation and functional ability. The improvement in oxygen saturation was assessed using a pulse Oximetry, and the dyspnoea score was utilized to gauge functional capacity. The combined effect of deep breathing exercises was checked. Deep breathing exercises showed significant improvement among COPD patients. A study was conducted to use the six-minute walk test and the dyspnea score to assess the impact of active cycle breathing as an airway clearance approach on functional capacity in people with productive bronchiectasis⁽¹⁸⁾. Therefore, in individuals with bronchiectasis, an active cycle breathing technique is a useful way to clear the airways and enhance functional ability. However, this clinical study is a short-term study that included COPD patients instead of bronchiectasis patients and deep breathing exercises were performed to check the functional capacity. The previous study was conducted to analyse how exacerbations affect the course of COPD or whether the usage of inhaled corticosteroids (ICS) and blood eosinophil counts (BEC) have an impact on the disease's progression.⁽¹⁹⁾ As a result, COPD patients who experience exacerbations experience a faster decline in lung

function. The difference between the previous studies from this study is that they examine the influence of exacerbations on COPD progression but in my study, deep breathing was conducted on COPD patients to reduce the exacerbations, and that reveals substantial differences. Another study was conducted to observe the effects of pursed-lips breathing versus diaphragmatic breathing in COPD individuals. Both diaphragmatic and diaphragmatic with pursed lips breathing significantly increased the tidal volume and its compartments in the chest wall and decreased the frequency of breathing.⁽¹⁴⁾ In the current study they compared the different breathing exercises but the difference in my study was to determine the combined impact of deep breathing exercises among COPD patients. Among many other studies, there this study to assess the level-one pulmonary rehabilitation physiotherapy intervention.⁽²⁰⁾ It is conceivable that high-frequency chest wall oscillation (HFCWO) on the chest, soothing massage, vigorous exercise, electrical stimulation via electro-acupuncture, and an incentive spirometer were among the physiotherapy approaches employed in patients hospitalized for COPD exacerbation.⁽²¹⁾ However, my study doesn't include many interventions, only deep breathing exercises were used to improve chest condition, oxygen saturation, and functional

capacity. In previous studies, there was no literature available in which the combined effect of deep breathing exercises was seen on oxygen saturation and functional capacity. These studies only included different interventions that differ my study from these clinical trials.

This study included only male patients, female patients were not included in this study. Not a single patient who engaged in exercise was placed in the experimental or control groups. The study had a brief duration. Only three settings were used to conduct the study. It is advised that bigger sample sizes be used in future research, with the experimental group and the control group included. Future researchers should also take samples from other cities. Female patients should also be included in the study to check the effectiveness in females. The study should be of long duration to get better results of the interventions.

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